JUNE 2013

Factors That Influence Fruit Set

Hans Walter-Peterson, Finger Lakes Grape Program

A Pinot Noir cluster at harvest exhibits signs of poor fruit set including few berries per cluster and small green (shot) berries.

Photo by Patty Skinkis, Oregon State University.

Source: http://www.extension.org

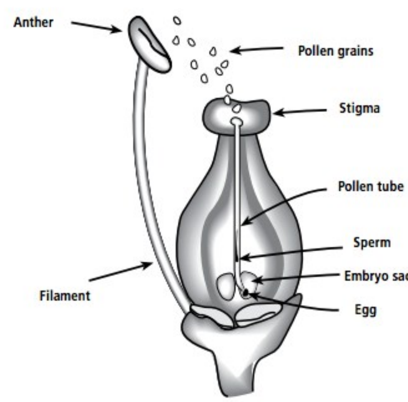
One of the components that influences yields in grapevines is the number of berries that set and mature on each cluster, or "fruit set". Each flower cluster contains many individual flowers, each of which has the potential to because a grape. However, not every flower will successfully pollinate or get fertilized or develop a healthy embryo and the surrounding tissue that becomes the fruit that we want.

If too many flowers become berries, clusters because compact and are much more susceptible to bunch rots like botrytis. If only a small number of berries set, yields can be significantly impacted, and therefore grower profitability as well. Ideally, we'd like to have a certain percentage of those flowers to turn into berries, but not all of them.

What factors influence fruit set?

There are a number of factors that determine how much fruit will end up being set on clusters. Some of these factors can be influenced to some extent by growers, while others are out of their control.

<u>Environmental Factors</u> – probably more than anything, the environmental conditions present before and during the bloom period can have a significant impact on fruit set. Cool, cloudy or wet conditions can all cause some problems that manifest themselves during set. If cool and cloudy conditions predominate in the prebloom period, the flowers may not develop normally, which will reduce the number that will ultimately form berries. Cool or hot temperatures (below 65°F and above 100°F) during bloom can also slow the growth of the pollen tube towards the egg, which is only viable for a certain amount of time. Rain during bloom can prevent the calyptra (the "caps" or petals on each flower) from completely detaching from the flower, which can also interfere with pollination. It can also dilute the fluid



Cut away diagram of a grape flower during pollination.
Source: "Grape Berry Growth & Development", N. Dokoozlian. In Raisin Production Manual, ed. L. Peter Christensen.

(Continued from page 1)

that sits on top of the stigma, which can prevent pollen grains from germinating.

Vine Nutrition – Poor fruit set can be the result of nutrient deficiencies in the vine. Recall that most of the vine's nutrient needs before bloom are actually met by reserves in the permanent structure of the vine being remobilized, which means that significant deficiencies from the year before can impact the development of the flowers in the early part of the current season. The two mineral nutrients most often associated with fruit set are boron and zinc. The ratio of carbon to nitrogen may also play a role in as far as it influences vine vigor, and nitrogen levels have been suggested as a possible explanation for early necrosis of the cluster. Many growers will include boron in one or two sprays before bloom to try to increase B levels in the tissues.

Vine Vigor/Balance – At bloom, the flowers on the vine are competing for resources with the growing shoot tips. The shoot tips are very strong sinks for resources. On an overly vigorous vine (or one that is undercropped), they can outcompete the flower clusters for nutrients and result in poor flower development and set. Vines that are overcropped or with weak growth will generally set poorly as well because of a lack of nutrients for the overall functioning of the vine.

What can growers do to influence fruit set?

While environmental factors often have the greatest influence on how much fruit ends up set on a cluster, there are a few tools that growers have at their disposal that can influence fruit set, either to increase or decrease it.

Increasing fruit set

Nutrient sprays – As mentioned above, the two mineral elements most often associated with fruit set are boron and zinc. A number of growers in the Finger Lakes include boron in their spray tank for one or two applications just before bloom. Some will also occasionally apply it to the soil in their early herbicide spray. Some work by Tim Martinson back in 1998 showed that both soil and foliar applications of boron before bloom can improve fruit set on Concord *in a vineyard where boron is deficient*. This is an important point – the vineyard where this work was done consistently had poor set and showed deficient levels of boron (<20 ppm) in petiole tests. While boron is not very expensive, adding some when vines already have an adequate supply can result in toxicity symptoms. Research in California has shown that applying boron to the foliage after harvest is more effective at improving fruit set than applications made at or before bloom. This assumes, of course, that you have leaves that are functional for a few weeks after harvest, which isn't always the case around here. Because of the soil pH in most of our soils and some of the spray materials that we use, I have very rarely run across a vineyard that shows signs of zinc deficiency, or with low levels in petiole tests. However, if a block consistently shows zinc deficiency and inadequate set, adding a zinc-containing foliar material may help.

Shoot Tipping—Removing shoot tips in the midst of bloom has been shown to consistently increase fruit set. The basic reason that this works is that removal of the shoot tip alters the competitive balance between the tip and cluster as sinks for nutrients. By removing the strong sink at the end of the shoot, more nutrients and photosynthates can be directed to the flowers. The downsides of this practice include 1) the cost to do it if done by hand (shoots may not be long enough at bloom to be cut by a mechanical hedger), and 2) removing the tip from the main shoot encourages lateral growth, which can cause shading and disease problems if a lot of lateral shoots push.

Plant Growth Regulators and Other Materials - Until a couple of years ago, a plant growth regulator called mepiquat chloride (sold as "Ponnax") was used by some Concord growers in both the Finger Lakes and Lake Erie regions to increase fruit set. It could increase fruit set by 10-20% in some years and under certain conditions, and did this by temporarily slowing the growth of shoots during the bloom period. Unfortunately, Ponnax is no longer available. There are other materials being marketed that tout the ability to improve set when applied to the vines, but most of them have had very little research done on them, so it's hard to make any recommendation to use them for this purpose.

Decreasing Fruit Set

Early leaf pulling – Removing leaves from around the cluster zone just prior to or at the beginning of bloom can reduce fruit set because it removes the source of photosynthates to the flowers during bloom, resulting in more of the flowers not fertilizing and being able to sustain early development of the seed and berry. This can be an effective solution to reducing compactness in tight-clustered varieties. The practice has been tested in a few different regions on

(Continued from page 2)

different varieties, including work by Bryan Hed at Penn State's Lake Erie research station in Northeast, PA on Vignoles and Chardonnay. Removal of the basal 4-5 leaves (which looks and sounds extreme) no later than trace bloom has shown to be pretty effective at reducing fruit set and making clusters less compact, and thus less vulnerable to bunch rots later in the season. As with many practices, the question comes down to cost. This is not an inexpensive process, obviously. I've seen estimates of $150/acre if it's done by hand. Can it be done mechanically? Perhaps, especially with some of the newer machines that are better at removing leaves and not damaging clusters.

Plant Growth Regulators

There are plant growth regulators available that are able to decrease fruit set in grapes, and are used extensively in table grape production. Gibberellic acid (GA) is a compound that exists in many fruiting plants, including grapes, and is used to reduce set in seedless table grape varieties. The problem with using GA and other materials like it on seeded wine varieties is that they will often have negative effects on shoot and cluster formation in the following season. At this point, there are no materials that have been shown to have a reliable and predicatble impact on fruit set, while also not impacting the following year's growth and fruit production.

Resources:

Skinkis, Patty (Oregon State University) "Causes of Poor Fruit Set in Grapes"

http://www.extension.org/pages/ 33106/causes-of-poor-fruit-set-in-grapes

Smith, Rhonda (University of California Extension). "2008 Update on effects of CPPU on fruit set in Merlot". http://stream.ucanr.org/sonoma_grape_day/Smith/index.htm

Dokoozlian, Nick (University of California – Davis). "Grape Berry Growth and Development" in *Raisin Production Manual* (L. Peter Christensen, ed.), pp. 30-37. http://iv.ucdavis.edu/files/24467.pdf

Hed, Bryan, Henry Ngugi & Naomi Halbrendt (Penn State University). "Management and research of fruit rot diseases in vineyards". http://www.pawinegrape.com/uploads/PDF%20files/Meeting%20Presentations/IPM%202012/HED_2012%20Wine%20Grape%20IPM%20workshop%20presentation.pdf

Martinson, T. 1998 Boron Trial in Concord Grapes. *Finger Lakes Vineyard Notes,* May 3, 1999.

1 Christensen, L. P., R. Beede and W. Peacock. Fall foliar sprays prevent boron-deficiency symptoms in grapes. In *California Agriculture*, 60(2): 100-103.

2 Pool, R. The Who, What, Where, When and Why of Ponnax for New York Vineyards. *Finger Lakes Vineyard Notes*, May 3, 2001.

Cover Crops

Michael Colizzi, Finger Lakes Grape Program

Green manures, catch crops, cover crops it can be confusing which term to use. Often when we plant a "cover crop" our goal may be to increase nitrogen availability. However, that is actually one of the goals of planting a green manure. When we sow a "cover crop" to prevent nutrients from leaching through our soils and ending up in one of our beautiful lakes that is considered a catch crop. Typically plants grown for one of these reasons will accomplish the other objectives as well. To make things a little easier for this article I will refer to them all as cover crops.

There are many options when it comes to choosing a cover crop. Legumes and grasses seem to be the most popular. Before planting a cover crop you will need to ask yourself what goals am I trying to accomplish.

- What is the erosion potential of the site?
- Am I looking to increase the overall organic matter content of the vineyard?
- Do I want to add nitrogen to the soil?
- Am I looking to alleviate compaction?
- Do I want to scavenge nutrients and water from the soil in an effort to devigorate the vines?
- Am I trying to plant something that will outcompete weeds?
- Do I want this cover crop to winter kill?

For the most part in bulk variety production where tonnage is crucial it makes perfect sense to have bare row middles. Research from Alan Lakso and Robert Pool has shown that

(Continued from page 3)

row middle cover crops can use as much as 2.5 inches of water per month. This direct competition for water can dramatically decrease vine size and lead to smaller crops. This is why many growers will apply an herbicide in the spring to eliminate as much competition as possible. This may not be possible on steep slopes where there is an increased risk for erosion. One option in this setting would be to plant rye in late summer or fall. This will help control erosion, suppress weeds and act as mulch for the following year. In this scenario rye is planted, overwinters, and is then mowed, crimped or rolled before it heads out. This creates a nice carpet of "mulch" which will help to retain moisture and suppress weeds for the growing season. This method can however produce a high C:N ration, which could lead to nitrogen deficiency. An application of glyphosate during the season can help to control weeds that may slip past the mulch.

Erosion in a vineyard with minimal ground cover.

Conversely in wine grape production where excessively vigorous vines are not desired cover crops might be a great way to devigorate vines. Excessive growth can shade this year's fruit and decrease bud fruitfulness for the following year.

A nice stand of 2/3 annual rye grass and 1/3 medium red clover

The three most common reason cover crops are used in vineyards locally are; to reduce erosion, increase the soil organic matter, and add plant available nitrogen to the soil. This is why a mix of 2/3 annual ryegrass and 1/3 medium red clover is the most popular seeding. The annual ryegrass establishes quickly and produces a thick fibrous root structure to help hold soil in place. Medium red clover has the potential to fix a lot of atmospheric nitrogen and add it to the soil. Its taproot helps to break up compacted soils. This mix can help to suppress weeds as well.

Clover is slow to establish therefore a nurse crop can help.

In a newly established vineyard the main reason a cover is planted is to reduce the risk of erosion. For this annual ryegrass is an excellent choice. It establishes quickly has a dense root system that is great at holding onto soil and suppressing weeds. It also increases aggregate stability. Some growers may be looking to break up compaction or plant something that can be used a bio-fumigant. Cover crops in the Brassicaceae family would be a good choice. These include mustards, radishes, and turnips.

A great resource for deciding what cover crop to use is Cornell's Cover Crop Decision Tool. While geared more towards vegetable growers it still has a lot of use for viticulturists. You input your management goal, planting time, and how long you would like the crop to stay viable. The website then tells you what the best option(s) are. It provides; seeding rate, seeding dates, managements tricks, and possible problems. For some cover crops it even provides prices. Cover crops are best viewed as another tool to help you meet your vineyard management goals.

Vine Size: *Improved Efficiency Through Practical and Inexpensive Data Gathering*

Kevin Martin, Lake Erie Regional Grape Program

Current Vine Size

When it came to current vine size in bulk juice production, not a lot was known about the state of vineyards. We know that Eastern conditions do not lend themselves to overly large Concord vines. We also know that the increasing pressure on vines to produce more and compensate for long-term trends in price should result in small vines. Complicating the matter, it is fair to assume nutrition management strategies' have intensified to help compensate for additional yields. Anecdotal observations indicated, with no surprise, that there is likely a trend toward smaller vines. Given yield histories that are not necessarily explained entirely by site selection, it is also likely that improvements can be made in vine size that result in an increase in yield and gross profit

NDVI Measurements and Commercial Pruning Weights.

Thanks to Dr. James Taylor, Dr. Terry Bates, CLEREL staff and commercial growers, we had the opportunity to take NDVI measurements in over 700 acres of commercial vineyards. In order to ground truth that data, pruning weights were taken at the nine-site study. Growers themselves took pruning weights in other blocks.

Average Vine Size

Across a block some growers have adequate vine size in the 2.5-3 lb. range. To obtain this average some vines are too large, but it does not appear to occur frequently enough to be a significant problem in the vineyards measured so far. A significant number of vineyards also have an average vine size below 2.5. With only one year of data, low pruning weights in some areas can be explained by frost damage impacting primary and secondary buds. Due to the significant variability in management styles, we should see commercial vineyards with smaller vines that cannot be explained by frost. Nutrition and crop load management strategies' are sometimes overly aggressive.

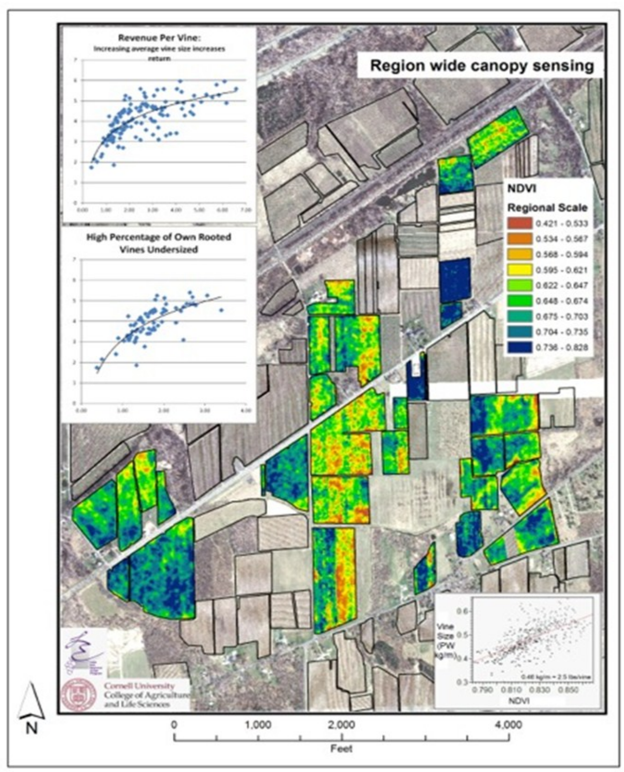
Zonal Patterns

NDVI sensors provide some insight into zonal patterns. Even for growers able to maintain a healthy average vine size, nearly all will have variation within those blocks. Some of that variation may be vine to vine. Other variation is zonal. Typically soil type, drainage or other conditions create zones of small and large vines. Some patterns may even be observable without a sensor. We've found the NDVI sensors to reveal some meaningful zonal patterns that were not readily observable. In addition, NDVI sensors may validate or quantify a zonal pattern observed by a grower.

Vine Size Variation

Vine size variation has the potential to cause a great deal of economic inefficiency. It is challenging to observe this variation. Even if it is observable, it is also challenging to diagnose. Even if a problem is diagnosed, managing the problem is also difficult. Down the road, the technology and viticulture knowledge may make this type of management possible. Working through zonal patterns could reveal itself to be a step in that direction. In the meantime, concentrating on renewals and overall vine health is really the best we can do.

Vine Size: Return On Investment



[Return to top](#)

(Continued from page 5)

Benefit

The gross value of increasing average vine size is easily determined. Years of research show a logarithmic relationship between yield and vine size. Points within the curve are fairly steep. In other words, gross revenue increases substantially when increasing average vine size from 1.8 lbs. to 2.8 lbs.

Increasing vine size based on zonal patterns should increase efficiency. Uniform block management may result in overly aggressive investments on portions of the block that have adequate vine size.

Cost

The cost of investment required to increase vine size depends on the diagnosis as well as the accuracy of the diagnosis.

Effective tile drainage, for example, is fairly expensive. The vine size response to drainage, in the East, is more dramatic than other investments.

We typically do not see a situation where the cost of increasing vine size is greater than the benefit. Zonal variation in most of the commercial vineyards observed, even where average vine size is adequate, justified significant investment.

Vine Size Variability at CLEREL

Take a look at the CLEREL block outlined in yellow. This block began as one of the most variable blocks on the farm. We have more NDVI data from this block than any other. Scaling that data to the individual block now reveals less variation than other blocks and much less variation than commercial vineyards. In that particular block variability was reduced substantially through renewals. Renewal work does have a high cost. Hourly workers are actively temporarily reducing crop-load levels to improve long-term vine health. While we know this type of activity is cost effective, it is particularly important to phase intensive renewal work through a farm to maintain cash flow.

Low Yield Potential

The last few growing periods have been unusual. Various sites have been ripening fairly uniformly. The lower yield potential some sites exhibit may have more to do with vine size variability. It may also be related, not to variability, but generally smaller vines.

Growers that have their vineyard mapped and follow-up with pruning weight samples during the dormant season will be able to quantify the extent these factors play in their potential yield. While successfully identifying undersized vines and finding a solution to increase vine size, dividends are worth the challenge. Increasing 30% of vines within an acre from 1.8lbs to 3lbs increases potential yields by more than one ton per acre. In addition, these 3lb vines are more resilient. Years that result in stress can reduce pruning weight but larger vines will not lose significant yield potential until weights drop below 2.75lbs.

Based on the 700 or so commercial and research acres scanned, this kind of improvement in yield potential is a conservative estimate. For large growers this should mean an increase in gross revenue of approximately $14,000 per year.

Commercial Potential

There are a few challenges to commercialization of sensor technology that we are working to overcome. These sensors are already commercially available for use in grapes in ways that roughly approximate what this research is trying to accomplish. The key difference is the middleman. Commercially available systems do not manipulate or interpret the data. Instead an attempt is being made to make decisions and skip this step.

We would like to familiarize growers with the process of calibrating NDVI so that the data has a better relationship with vine health. The data manipulation is also an important step that helps increase the correlation between NDVI and pruning weights. We'll continue to work toward automating this step.

Finally and most importantly NDVI identifies problem areas, but not problems themselves. When we identify a potential benefit of $14,000 it does anticipate the grower and extension educator coming up with solutions to improve variability. Given the relatively low cost of the sensors we have chosen to work with, it has a real practical application in vineyards when used to improve vine size and calculate vine balance.

Yield Monitoring in (Juice) Grapes

James Taylor, Lake Erie Regional Grape Program

As you all know, profit in bulk juice production is basically a question of yield, provided that you get to the sugar cut-off. What you may not know is that your yield (and profit) varies considerably in your vineyard blocks – even small blocks. Work from around the world has shown that high-yielding areas in vineyards can have 2 to 3 times as much yield as low-yielding areas. For an 'average' vineyard in the Lake Erie region (which we will say averages 7 ton/ac) there is likely to be a range in yield from 3 – 10 ton/ac (possibly more). Knowing where these low (and high) yielding areas should help to understand where the profit (or loss) is occurring in your production system. (I do not know anyone who is successfully farming at 3 ton/ac).

Last year a commercially available grape yield monitor (http://www.atv.net.au) was installed on the harvester at the Cornell Lake Erie Research and Extension Laboratory. The intent was to measure the amount of yield variation in local vineyards. Unfortunately, last year was far from an 'average' year. However, there was still a crop and the yield monitor was used to monitor and, with a GPS attached, map the spatial variation in yield at the Fredonia and Portland vineyards (see maps). The maps show a large range in yield values (6- -8 t/ac in Fredonia and Portland respectively). Spatial patterns (trends) in the yield can be seen and most blocks had at least a 4 ton difference between the high and low yielding areas. There are various reasons for these patterns – frost damage, insect (grape berry moth) damage, differences in soil moisture (growth potential), and differences in soil type (productivity). Some of these effects are manageable; some can be mitigated while others cannot be controlled. Unfortunately there is no one standard answer to what is causing yield variation and how to manage it. Every block is different and must be interpreted on its own. However, what can be said is that nearly every vineyard block has yield variation and can (probably) be better managed (more efficiently/profitably). I am sure many growers know roughly where their best and worst producing areas are. The real questions are: What is the actually yield difference? Where exactly does this difference occur? With this information growers can make good decisions about whether alternative management practices are worthwhile.

How good is the yield monitor?

The accuracy of the yield monitor was also evaluated last harvest against individual bin weights (on our own scales) and against truck weights across the scales at delivery. Over the season the sensor was within 10% of the actual weight (at both bin and truck weights). This is not as accurate as some other yield monitors (e.g. grain yield monitors). However, given the range in yield values observed, measurement errors of 10% are (relatively) small. In our case, which is probably the case for most small-mid size growers, harvesting was done with a single harvester to a single truck. Therefore the yield data could easily be corrected to the (truck) delivery weight to remove this error. Because of this we have a lot of confidence in the yield values and spatial patterns in the maps.

Other potential uses for the yield monitor.

Making yield maps is not the only way that the yield sensor could be used. The information can be used in other ways. These include:

- Making gross margin maps (Yield*Price minus Cost of production)
- (Potentially) Mid-season yield estimation
- Monitoring (and adjusting) crop thinning rates
- Assess production losses (frost/disease damage)
- Assess the value of remedial management (e.g. tile drainage)
- Collect production (yield) data from on-farm experiment trials (e.g. different rates of lime/gypsum/ fertiliser)
- Estimate spatial nutrient budgets (e.g. how much potassium was removed in the fruit and how much needs to be replaced)
- Create crop load (ripening) maps by adding canopy vigor maps (Yield + Vine size)

More work with the yield monitor along these lines is continuing this year, particularly the potential to use the yield sensor for a one-man operation crop estimation. If you'd like to know more or see the system installed, please do not hesitate to contact the LERGP.

Return to top

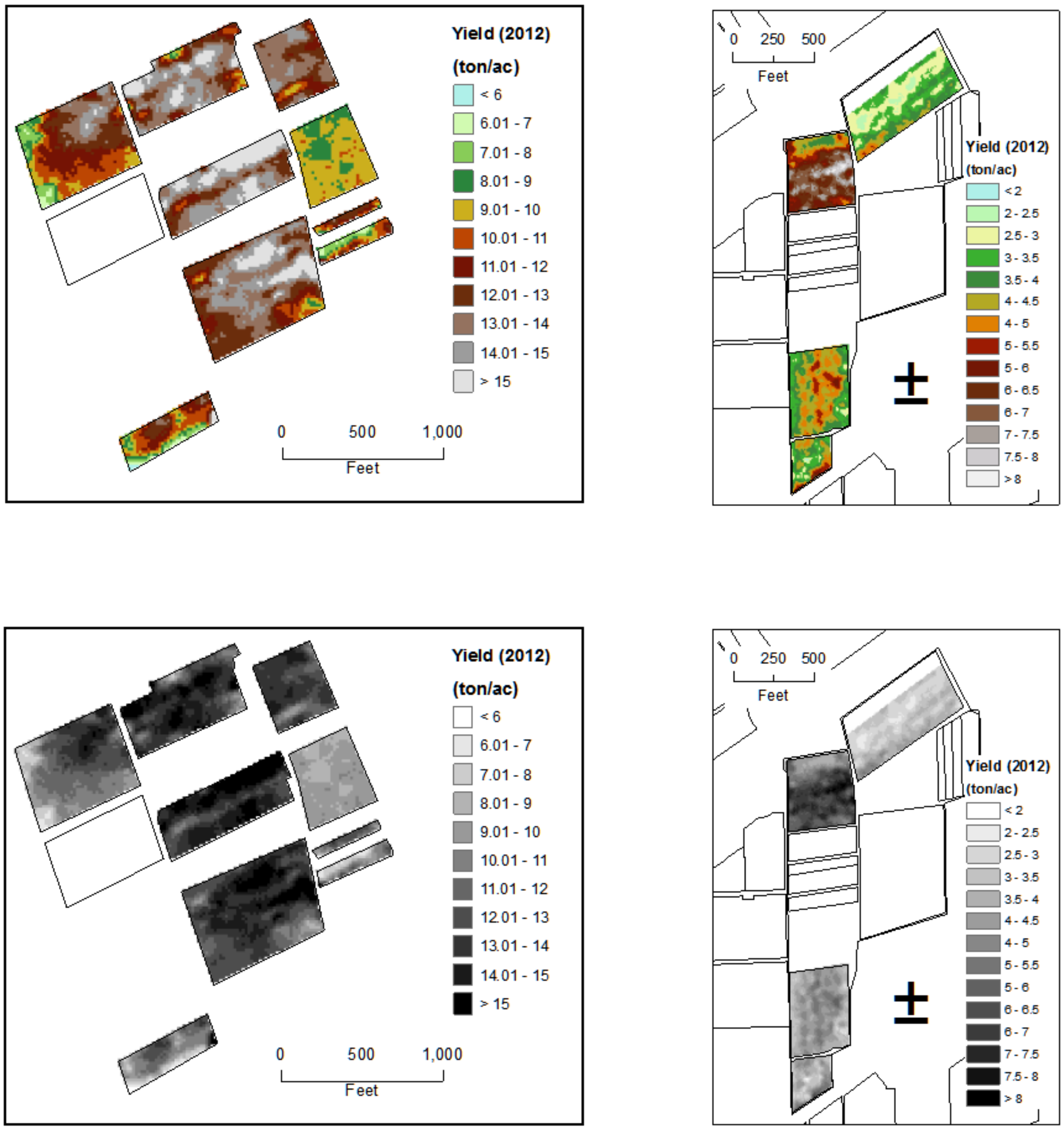


Figure caption: *Yield maps from (left) the original Fredonia research vineyard and (right) the Cornell Lake Erie Research and Extension vineyard at Portland. Both vineyards have the same color scale but the yield (scale) at Fredonia is much higher. The Fredonia vineyard was minimally pruned and, thanks to the (probable) urban heat effect from our Walmart neighbors, did not have a lot of frost damage. The low yielding (mid-eastern) block at Fredonia and the high-yielding (north-west) block at Portland are Niagaras. The remaining blocks are Concords. The low yield on the western edge of the north-west block in Fredonia is likely to be insect damage (this block adjoins an old orchard/vineyard). Low yield in the north of the high-yielding Portland Niagara block is a frost effect. Other trends in the yield can be related to soil variability.*

Using NEWA in a Vineyard IPM Strategy

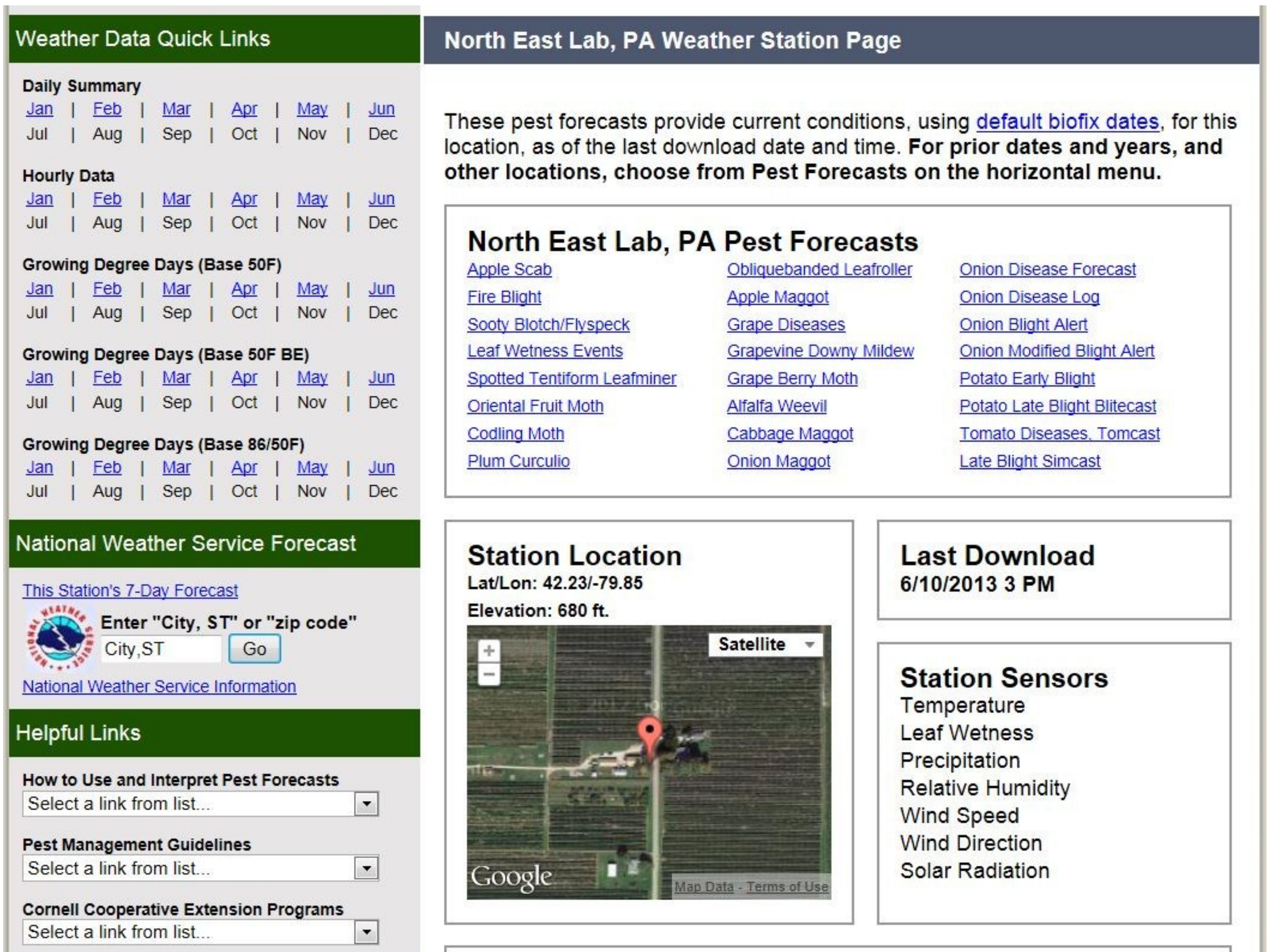
Tim Weigle, NYSIPM, Lake Erie Regional Grape Program

The Network for Environment and Weather Applications (NEWA) is a web-based system that collects weather data from over 100 stations in New York, Pennsylvania and across the Northeast, compiles it and then provides the weather and pest model information needed for more precise implementation of IPM and crop production practices.

I have written a number of 'how-to' articles in newsletters and LERGP Crop Updates on how to navigate the NEWA website so I will only reiterate that the best way to learn how to access the information found on NEWA is to go to the home page http://newa.cornell.edu/ and start exploring.

How Does Rainfall Affect a Vineyard IPM Program

Conversations at the Lake Erie region Coffee Pot meetings have often been dealing with the frequent rain events and thunderstorms we have experienced so far this spring. One of the questions is how much rain can we have before we need to reapply our sprays? The rule of thumb has been 50% of the material is gone after an inch of rain and pretty much gone after two-inches. So the question is always, "Do I need to go out and reapply my materials if it rained hard right after I sprayed?" I maintain that the amount of rain is only one aspect that you should be looking at when deciding when your next spray should occur. Some of the other factors I look at to determine if shortening a spray interval is needed are how hard the rain fell, the severity of the infection periods that have occurred since your last application, the amount of overwintering inoculum and finally, the type of material that was applied.



Return to top

(Continued from page 9)

The NEWA website can provide information on the amount of rainfall since the last spray, how the rain fell and the severity of the infection period. The Lake Erie and Finger Lakes regions have a number of weather stations that send their data to NEWA so there is a very good chance there is a station near you. To access the information you need use the interactive map on the home page or use the *Station Pages* drop down menu to select the station nearest you. If you have several stations nearby, you should look at the information from all of them to give a better extrapolation of the conditions at your vineyard. Once you are on a station page (in this example we are using the North East Lab in North East, PA), the amount of rain can be found by accessing the *Daily Summary* under *Weather Data Quick Links* (Figure 1.). To determine how the rain fell, access *Hourly Data* in the *Quick Links* (Figure 2). You can see that the 1.56 inches of rain on June 6 in the daily summary occurred over 15 hours with over an inch of it occurring in a three hour period.

The frequency and severity of infection periods can be found by using the link, *Grape Diseases*, on the *Station Page*. First you will notice the *Grape Disease* page provides information on the occurrence of infection periods for Phomopsis, Black Rot and Powdery Mildew as well as what disease management strategies can be used at that point in time (information on downy mildew can be found by using the Grapevine Downy Mildew link). By scrolling to the bottom of the page you will notice buttons to *Show grape infection events log and Show Leaf wetness events log. The Grape Infection Events Log* (Figure 3) provides information on the hours of leaf wetness, average temperature during the hours of leaf wetness and total rainfall that occurred during the infection period for Phomopsis or Black Rot. By accessing this log you can determine the number of infection periods that have occurred since your last application. This table will also provide a sense of the severity of the infection events. However, this table provides information from combined wetting periods so I would suggest taking a look at the *leaf wetness events log* (Figure 4) as well. As seen in Figure 4 the 42 hour long infection period reported on June 6 – 8 is broken down into a 30-hour leaf wetness period during which 1.61-inches of rain fell, and a 12-hour leaf wetness period with no rain fall recorded, sandwiched around an 11 hour period without leaf wetness. While the first 30 hour portion of the infection period would be classified as severe, this is an example of how this information is recorded. While this type of reporting errs on the side of caution, knowing this type of information can be especially helpful in situations where multiple leaf wetness periods – that by themselves would not be infection periods – may be combined to make it look like it was a severe infection period.

The information found on NEWA is only as good as the manager who is using it. Knowing your vineyard blocks, their history of disease and insect pressure and having an pesticide application plan that ensures excellent coverage once a decision is made to spray is needed before this information can be utilized to its full potential.

Grape Berry Moth Model on NEWA

With wild grape bloom being found across the belt over the past week or so it means that it is time to start using the Phenology-based Degree Day model for grape berry moth found on NEWA. This model uses wild grape bloom as the trigger to start accumulating degree days. Research and extension implementation projects involving the model of the past several years has shown it to be more effective in the timing of spray for grape berry moth when compared to the traditional method using the Grape Berry Moth Risk Assessment protocol (GBM RA). The main reason for this is that the GBM RA relied on a calendar-based system for scouting and applications of control measures while the new phenology-based model uses the number of growing degree days it takes for the GBM to complete its lifecycle (810 DD at 47.14ºF). Knowing the time of wild grape bloom near your vineyard is critical in getting the model off to a good start as this model is interactive and allows you to input the date of wild grape bloom in your area. If you do not know the date of wild grape bloom in your area, the model provides a wild grape bloom date based on growing degree day accumulations.

Mike Saunders (Penn State), Rufus Isaacs (Michigan State) and Greg Loeb (Cornell), the entomologists involved in developing the model, joined forces and produced an excellent article on how the new model was developed and how it works in determining the appropriate timing. The article can be found at http://grapesandwine.cals.cornell.edu/cals/grapesandwine/appellation-cornell/issue-14/loader.cfm?csModule=security/getfile&PageID=1101424

While we are still a while away from needing to apply an insecticide for grape berry moth, (unless you have a severely high risk vineyard) it is not too early to get on NEWA and familiarize yourself with the GBM model. The model will assist you in the timing of scouting as well as insecticide applications.

North East Lab, PA

Date	Avg Temp (F)	Max Temp (F)	Min Temp (F)	LW Hours	Total Rain (in)	RH Hrs >= 90%	Avg Wind Speed (mph)	Solar Rad (langley)
North East Lab - Daily Data Summary								
6/1/2013	73.0	84.1	65.5	11	0.81	7	5.0	568
6/2/2013	67.1	71.8	59.1	6	1.12	9	6.6	694
6/3/2013	53.4	58.1	47.9	0	0.00	2	2.9	740
6/4/2013	55.2	64.4	45.2	0	0.00	10	1.0	817
6/5/2013	58.5	66.2	48.4	0	0.00	6	3.2	739
6/6/2013	56.4	59.6	53.3	18	1.56	18	1.8	77
6/7/2013	54.7	57.2	51.9	14	0.05	24	0.6	182
6/8/2013	58.6	64.9	54.3	11	0.00	17	3.2	387
6/9/2013	62.7	72.2	51.9	0	0.00	8	1.6	676
Monthly Summary	60.0	84.1	45.2	60	3.54	101	2.9	4884

Figure 1. Daily Summary

North East Lab, PA

Date/Time	Temp (F)	LW (minutes)	Rain (inches)	RH %	Dewpoint (F)	Wind Spd (mph)	Wind Dir (degrees)	Solar Rad (langley)	Est LW (minutes)
06/07/2013 05:00	52.9	50	0.00	97	52	0.0	67	0	60
06/07/2013 04:00	53.7	53	0.00	97	53	0.1	67	0	60
06/07/2013 03:00	53.3	53	0.01	97	52	0.2	67	0	60
06/07/2013 02:00	53.1	52	0.00	97	52	0.0	67	0	60
06/07/2013 01:00	53.8	54	0.00	97	53	0.9	67	0	60
06/07/2013 00:00	53.2	55	0.01	97	52	0.4	67	0	60
06/06/2013 23:00	53.3	57	0.03	97	52	0.1	67	0	60
06/06/2013 22:00	53.5	48	0.00	97	53	0.5	63	0	60
06/06/2013 21:00	53.4	48	0.00	97	53	0.9	61	0	60
06/06/2013 20:00	54.5	49	0.01	97	54	1.7	71	1	60
06/06/2013 19:00	54.8	48	0.00	97	54	0.6	44	3	60
06/06/2013 18:00	56.2	48	0.01	97	55	2.6	67	4	60
06/06/2013 17:00	55.6	48	0.11	97	55	0.8	58	5	60
06/06/2013 16:00	58.6	27	0.03	98	58	1.5	67	8	60
06/06/2013 15:00	58.7	48	0.01	98	58	1.4	67	15	60
06/06/2013 14:00	57.3	48	0.04	97	56	0.7	67	9	60
06/06/2013 13:00	57.7	48	0.02	97	57	2.1	68	10	60
06/06/2013 12:00	56.7	48	0.25	97	56	2.7	70	5	60
06/06/2013 11:00	55.6	48	0.48	97	55	2.5	66	2	60
06/06/2013 10:00	55.4	51	0.32	97	55	2.0	67	3	60
06/06/2013 09:00	55.4	60	0.05	97	55	3.2	68	3	60
06/06/2013 08:00	55.4	60	0.04	97	55	2.2	68	2	60
06/06/2013 07:00	54.7	60	0.02	96	54	2.2	72	0	60
06/06/2013 06:00	55.1	45	0.14	94	53	2.9	67	0	60

Figure 2. Hourly Data

Hide grape infection events log | Show leaf wetness events log

Grape Infection Events Log

When calculating combined wetting periods we use the following rules: 1) an infection event must start with precipitation, 2) successive wetting periods are combined into a single infection event until a dry period of over 24 hours or a wetting period with no precipitation is encountered.

Starting Date/Time	Ending Date/Time	Hours LW	Avg Temp	Total Rain	Phomopsis	Black Rot	Combined Event
Download Time: 6/10/2013 11:00							
Jun 6 5:01	Jun 8 10:00	42	55.2	1.61	Infection	Infection	Yes
Jun 1 20:01	Jun 2 5:00	9	66.2	1.78	Infection	Infection	No
May 31 18:01	Jun 1 19:00	11	68.1	0.30	Infection	Infection	Yes
May 28 0:01	May 29 13:00	20	61.7	2.76	Infection	Infection	Yes
May 21 20:01	May 24 10:00	33	55.8	0.62	Infection	Infection	Yes
May 8 14:01	May 12 1:00	41	55.5	1.48	Infection	Infection	Yes

Disclaimer: *These are theoretical predictions and forecasts.* *The theoretical models predicting pest development or disease risk use the weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage, pest presence, and disease occurrence determined through scouting or insect pheromone traps.*

Figure 3. Grape Infection Events Log

Show grape infection events log | Hide leaf wetness events log

Leaf Wetness Events Log

Starting Date/Time	Ending Date/Time	Hours LW	Avg Temp	Total Rain	Phomopsis	Black Rot
Download Time: 6/10/2013 11:00						
Jun 10 9:01	Jun 10 10:00	1	68.4	0.01	No infection	No infection
Jun 10 5:01	Jun 10 7:00	2	67.8	0.01	No infection	No infection
Jun 7 22:01	Jun 8 10:00	12	56.7	0.00	No infection	No infection
Jun 6 5:01	Jun 7 11:00	30	54.7	1.61	Infection	Infection
Jun 1 20:01	Jun 2 5:00	9	66.2	1.78	Infection	Infection
Jun 1 18:01	Jun 1 19:00	1	70.7	0.00	No infection	No infection

Figure 4 Leaf Wetness Events Log

Rainfast Characteristics of Insecticides in Grape

John Wise of Entomology & Trevor Nichols Research Center

(Editor's Note: This article is reprinted from the June 4, 2013 Edition of the Michigan Grape & Wine Newsletter.)

The rainfall events experienced in Michigan have prompted questions about the relative "rainfastness" of the insecticides used in fruit production. In 2006 AgBioResearch provided funds to purchase and install a state-of-the-art rainfall simulation chamber at the MSU Trevor Nichols Research Center (TNRC), after which we have conducted trials (with generous funding support from MI fruit commodity groups) on fruit crops for a range of insecticides.

There are several critical factors that influence impact of precipitation on a pesticide's performance. First, is the plant penetrative characteristic of the various compounds. Some pesticide chemistries, like organophosphates, have limited penetrative potential in plant tissue, and thus are considered primarily as surface materials. Some compounds, such as carbamates, oxadiazines and pyrethroids penetrate plant cuticles, providing some resistance to wash-off. Many newer compounds, such as spinosyns, diamides, avermectins, and Insect Growth Regulators (IGR) readily penetrate plant cuticles and have translaminar movement in leaf tissue. Others, like the neonicotinoid insecticides, are systemic and can have translaminar as well as acropetal movement in the plant's vascular system. Penetration of plant tissue is generally expected to enhance rainfastness of pesticides.

The second factor is the inherent toxicity of an insecticide to the target pest and the persistence of the compound in the environment. In some cases a compound may be highly susceptible to wash-off, but its persistence and inherent toxicity to the target pest compensates for the loss of residue, thus delaying the need for immediate re-application.

The third factor is the amount of precipitation. In general organophosphate insecticides have the highest susceptibility to wash-off from precipitation, but their high level of toxicity to most insect pests overcomes the necessity for an immediate re-application. Neonicotinoid insecticides are moderately susceptible to wash-off, with residues that have moved systemically into plant tissue being highly rainfast, and surface residues less so. Carbamate, IGR and oxadiazine insecticides are moderately susceptible to wash-off, and vary in their toxicity to the range of relevant fruit pests. Diamide, spinosyn, avermectin, and pyrethroid insecticides have proven to be moderate to highly rainfast on most fruit crops.

For most insecticides, a drying time of 2 – 6 hours is sufficient to "set" the compound in/on the plant. With neonicotinoids, for which plant penetration is important, drying time can significantly influence rainfastness. For neonicotinoids up to 24 hours is needed for optimal plant penetration, thus the time proximity of precipitation after application should be considered carefully. Spray adjuvants, materials intended to aid the retention, penetration or spread on the plant, can also improve the performance of insecticides.

Based on the results from the current studies the following charts have been developed to serve as a guide for general rainfastness characteristics and re-application recommendations for certain insect pests (also printed in the 2013 Michigan Fruit Management Guide E-154). Note that these recommendations should not supersede insecticide label restrictions or farm-level knowledge based on site-specific pest scouting, but rather are meant to compliment a comprehensive pest management decision-making process.

Grape Insecticide Precipitation Wash-off Re-application Decision Chart: Expected Japanese beetle control in juice grapes, based on each compound's inherent toxicity to JB adults, maximum residual, and wash-off potential from rainfall.

Insecticides	Rainfall = 0.5 inch		Rainfall = 1.0 inch		Rainfall = 2.0 inch	
	*1 day	*7 days	*1 day	*7 days	*1 day	*7 days
Imidan		X	X	X	X	X
Sevin			X	X	X	X
Capture				X	X	X
Actara		X		X	X	X
Avaunt		X		X	X	X

***Number of days after insecticide application that the precipitation event occurred.**

X – Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.

- An un-marked cell suggests that there is sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

Table 1. Insecticide persistence, plant penetration and rainfastness rating.			
Compound Class	**Persistence Residual on Plant**	**Plant Penetration Characteristics**	**Rainfast Rating**
Organo-Phosphates	Medium - Long	Surface	Low
Carbamates	Short	Cuticle	Moderate
Pyrethroids	Short	Cuticle	Moderate -
Neonicotinoids	Medium	Translaminar	Moderate
Oxadiazines	Medium	Cuticle	Moderate
Avermectins	Medium	Translaminar	Moderate
IGRs	Medium -	Translaminar	Moderate
Spinosyns	Short -	Translaminar	Moderate -
Diamides	Medium - Long	Translaminar	Moderate - High

Rainfastness Rating Chart: General characteristics for insecticide chemical classes.						
Insecticide Class	Rainfastness $\leq$ 0.5 inch		Rainfastness $\leq$ 1.0 inch		Rainfastness $\leq$ 2.0 inch	
	Fruit	Leaves	Fruit	Leaves	Fruit	Leaves
Organophosphates	L	M	L	M	L	L
Pyrethroids	M/H	M/H	M	M	L	L
Carbamates	M	M/H	M	M	L	L
IGRs	M	M/H	M	M		
Oxadiazines	M	M/H	M	M	L	L
Neonicotinoids	M,S	H,S	L,S	L,S	L,S	L,S
Spinosyns	H	H	H	M	M	L
Diamides	H	H	H	M	M	L
Avermectins	M,S	H,S	L,S	M,S	L	L
*** H – highly rainfast ($\leq$30% residue wash-off), M – moderately rainfast ($\leq$50% residue wash-off), L – low rainfast ($\leq$70% residue wash-off), S – systemic residues remain within plant tissue**						

Upcoming Events

Vineyard Tailgate Meetings

Tuesday, June 25, 2013   5:00 – 6:30 PM

Dr. Konstantin Frank's Vinifera Wine Cellars

9749 Middle Road, Hammondsport NY 14521

(click here for map)

These are a series of informal meetings held with growers in different locations around the Finger Lakes during the growing season. Meetings are held every other Tuesday afternoon, starting at 5:00 PM and usually ending around 6:30 PM. During the day of each meeting, Mike and I visit a few growers and vineyards near the meeting location to get a sense of what has been happening in the area, and give us some ideas about some potential topics for the meeting later that day. There will also be ample time to discuss any questions or issues that others want to bring up as well. There is no need to register ahead of time – just show up when you can, and leave when you have to.

There will be 0.75 pesticide recertification credits available for each meeting. As with other events where credits are available, you need to be present at the beginning of the meeting to sign the meeting roster – make sure to have your card with you - and stay until the end to receive your certificate.

Here is the schedule for the rest of our Tailgate meetings this season:

Date	Address
July 9	Hermann J. Wiemer Winery, 3962 State Route 14, Dundee NY 14837
July 23	Vine Country Farms (Roy & Gordon Taft), 8531 County Rd 79, Prattsburgh NY 14873
August 6	Atwater Vineyards, 5055 Route 414, Hector NY 14841
August 20	Goose Watch Winery, 5480 Route 89, Romulus NY 14541

ASEV-Eastern Section Annual Conference and Symposium

July 15-18, 2013

Winston-Salem Marriott and Embassy Suites

Winston-Salem, North Carolina

Join us for the 38th Annual American Society of Enology and Viticulture Eastern Section Conference and Symposium July 15-18, 2013 in Winston-Salem, North Carolina.

On Monday, July 15th, there is a **preconference tour** of North Carolina wineries and vineyards. The **conference** will begin with technical/research presentations on Tuesday and Wednesday, July 16th -17th and include Tuesday's Oenolympics Grazing Dinner with Wines of the East and Wednesday's Sparkling Wine Reception and Grand Award Banquet.

The conference will be followed by the **Symposium on Advances in Red Wine Production: Berry to Bottle** on Thursday, July 18th. The Symposium, designed for vineyard managers and winemakers, will feature experts in red wine production.

Additional information about registration, lodging and conference events can be found at http://www.asev-es.org.

We look forward to seeing you in North Carolina!

Field Meeting on Soils & Compaction

Tuesday, July 30   4:00 – 6:00 PM

Doyle Vineyard Management - Dresden Farm

1255 Ridge Road, Penn Yan NY

This is just an early heads-up about a field meeting we are in the process of organizing that will be focused on soil management, including a demonstration of several different pieces of equipment that could be used to deal with compaction in vineyard soils. More details to come soon.

Return to top

DOUBLE A VINEYARDS, Inc.
AND
DOUBLE A WILLOW

10277 CHRISTY ROAD • FREDONIA, NEW YORK 14063

GROWERS OF QUALITY GRAPEVINES

We grow a full line of grapevines:
- American • French Hybrid -
- NY Bred Cultivars • Vinifera -
- Seedless • Winter Hardy -

Call for our catalog or to place an order today.
We also carry Blue-X vine shelters.
Call for a sample.

Phone: 716/672-8493
Fax: 716/679-3442
e-mail: sue.rak@doublevineyards.com
website: www.doubleavineyards.com

equipment that works for you!
H&W equipment
for vineyard&winery

BINGER BRAUN ERO LIPCO SAUERBURGER
827 Line 4, Niagara on the Lake, ON L0S 1J0 / Canada, Phone: (905) 468-5016
Fax: (905) 468-5676; e-mail: info@vineyardmachines.com; www.vineyardmachines.com

LAKEVIEW
VINEYARD EQUIPMENT INC.
40 Lakeshore Road, R.R. #5, Niagara-on-the-Lake, ON L0S 1J0
Phone (905) 646-8085 or Toll Free 1-866-677-4717
www.lakeviewvineyardequipment.com

Complete Vine Maintenance
Pre Pruners, Leaf Removers, Hedgers, & Sprayers

New & Used Grape Harvesters
Demo Models Available!!
Tow Behind Harvesters From $125,000!

Why Lakeview? We know what you need, we stock parts, and we back up EVERYTHING that we sell. Check out our website today to view our inventory!
Also from Lakeview – Orchard Rite Wind Machines, the market leader in cold weather & frost protection!

BIGGER VALUE IN NARROW ROWS

The NEW 76-PTO horsepower TD4040F tractor combines BIG power and BIG value in streamlined, low-profile, narrow package so you can work productively in confined spaced and in the narrow rows of orchards, nut groves and vineyards. You get a choice of convenient Synchro Shuttle™ mechanical transmissions – a 12x12 or 20x12 creeper. Stop in today to see the latest addition to the New Holland Specialty tractor line-up.

PROVEN 4-CYL. 195 CU. IN. ENGINE
4WD FRONT AXLE FOR ADDED TRACTION
ISO-MOUNTED, LOW-VIBRATION OPERATOR PLATFORM
EASY-TO-USE CONTROLS

NEW HOLLAND AGRICULTURE

Larry Romance & Son Inc
2769 Rt 20 - Box 38
Sheridan, NY 14135
(716) 679-3366
tractorsales@netsync.net

© 2012 CNH America LLC. New Holland is a registered trademark of CNH America LLC.

Cornell University Cooperative Extension Finger Lakes Grape Program

finger lakes grape program

The information, including any advice or recommendations, contained herein is base upon the research and experience of Cornell Cooperative Extension personnel. While this information constitutes the best judgment/opinion of such personnel at the time issued, neither Cornell Cooperative Extension nor any representative thereof makes any representation or warrantee, express or implied, of any particular result or application of such information, or regarding any product. Users of any product are encouraged to read and follow product-labeling instructions and check with the manufacturer or supplier for updated information. Nothing contained in this information should be interpreted as an endorsement expressed or implied of any particular product.

Newsletter No.3

June 2013

FINGER LAKES VINEYARD NOTES

Is published by

Cornell Cooperative Extension

Finger lakes Grape Program

Ontario, Schuyler, Seneca, Steuben and Yates Counties

417 Liberty Street, Penn Yan, NY 14527

Comments may be directed to

Hans Walter– Peterson

Viticulture Extension Educator

Finger Lakes Grape Program

315.536.5134

hcw5@cornell.edu

Cornell Cooperative Extension

Finger Lakes Grape Program

417 Liberty Street

Penn Yan, NY 14527

Helping You Put Knowledge to Work

Cornell Cooperative Extension provides equal program and employment opportunities. NYS College of Agriculture and Life Sciences, NYS College of Human Ecology, and NYS College of Veterinary Medicine at Cornell University, Cooperative Extension associations, county governing bodies, and U.S. Department of Agriculture, cooperating.