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Viticulture Notes

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I. Seasonal reminders:

Weather forecasts can change dramatically within a short period of days, even hours. When I put this newsletter together over the Easter weekend, there were no forecast low temperatures in the thirties (F) for Shenandoah County. Now Sunday the 28th is forecast to dip into the upper thirties. With Chardonnay out about 3 inches, we're not completely out of the "Spring frost" woods. We're also seeing (and hearing of other) situations of apparent winter injury to vines in the northern Shenandoah Valley and northern Piedmont. The injury ranges from bud kill to some cases of trunk splitting. It includes varieties that we would consider to be relatively cold hardy, including Cabernet franc. Predisposing factors could be lower elevation areas of the vineyard and early defoliation of the vines due to disease last fall. Our lowest temperatures of the winter occurred in late-January as an "Arctic vortex" transited the Mid-Atlantic, with the southern fringes of that cold air sweeping northern Virginia. If you're seeing a lot of non-fruitful or low-fruitfulness shoots on vines, or uneven budburst, the vines might have sustained more bud injury than you realized, unless you assessed bud mortality before pruning and after the winter extremes. At this point, it's wait and see. We'll issue reminders about crop estimation after fruit set has occurred.

On the disease management front, I'd remind readers of Dr. Mizuho Nita's disease management resources available on-line. If you have not visited Dr. Nita's blog, http://grapepathology.blogspot.com/ check it out. The latest posting featured timely information on phomopsis management. There is a wealth of information there that can help keep you out of trouble with grape diseases. Scroll down his website to see other resources available.

Here's a rundown on some relevant topics for this time of year, starting with some cultural practices:

1. Shoot-thinning:
In many cases, but particularly with cordon-trained and spur-pruned vines, we end up with greater shoot density than desired, even when appropriate dormant pruning had been done. The excessive density translates into greater disease and insect (i.e., fruit fly) pressure later in the season. Shoot-thinning is often necessary in these cases to reduce the density to an optimal level of 3 to no more than 4 shoots per foot of

canopy. The rationale for shoot-thinning is discussed in the Wine Grape Production Guide, but here are some reminders from previous newsletters:

- Thin shoots when they are 3 to 6 inches long. You can thin larger/longer shoots too, but the vascular connection between shoots and older wood lignifies as shoots grow, and they become difficult to rub off by hand once they are about 18 inches long.
- For most varieties on non-divided canopies, aim for retaining only about 3 to 4 shoots per foot of canopy. Our goal with shoot-thinning is to promote a desirable canopy architecture for fruit ripening by starting now. Remember, it's far easier to thin shoots now than it is later, after you realize the canopy is too dense!
- If you are in a windy location, or with high-trained vines, you might go a bit higher with this density goal, as shoot breakage may occur and further thin the canopy. Some varieties such as P. Verdot are also prone to shoot breakage, so thin more conservatively until you've got some experience under your belt.
- Shoot density for Smart-Dyson (or other divided canopy training systems) should be altered to reflect the upper and lower canopies. For S-D, or S-D Ballerina, we would aim for 3-4 shoots/foot of cordon going UP and 2-3 shoots/foot going DOWN on the two opposing planes of vertically-divided canopy
- Cannot over-emphasize the importance of shoot-thinning now for improved disease management and fruit ripening later.
- Shoot-thinning goes a long way towards achieving desirable canopy architecture AND balanced crop load.
- More effort is required with cordon-trained vines due to abundance of base buds at spur locations. In fact, you'll probably find that a second round of shoot-thinning is necessary with some cordon-trained vines. Our Cab Sauvignon are notorious for pushing base buds/shoots even after bloom.
- Try some different levels of shoot-thinning in separate rows this year and look at your results in September.

2. Vineyard fertilization:

Nitrogen is the nutrient most commonly applied in Virginia vineyards, with typical maintenance applications ranging from 20 to 50 pounds per acre of actual N per year. Here are some reminders on nitrogen fertilization:

- The need for N is based on visual assessment of vine size, canopy color and crop yield, and confirmed with plant tissue analysis. See our Wine Grape Production Guide for Eastern North America (2008) for details on the visual assessment. Plant tissue analysis (leaf petioles) can be done either at bloom time or at veraison; however, we believe that veraison provides a somewhat better assessment of the actual vine N status.
- Nitrogen fertilizer is generally applied in the bud burst to bloom period, but closer to bloom than to bud burst. Split applications are warranted if total rate per acre is greater than 30 pounds/acre (apply ½ at bloom and the balance 4 to 6 weeks later).
- Compost is an excellent source of N, but it also can add undesirable levels of other nutrients such as potassium. Urea (46% N) is often the most economical form of N to apply.

- Banding soil-applied N under the trellis provides more N to the vine and less to the cover crop. This is particularly important where under-trellis cover crops are used to restrict water availability to vines and/or to minimize soil erosion.
- Relatively heavy rates (30 to 50 pounds of actual N per acre) of soil-applied N are most effective at increasing vine capacity (vegetative growth AND crop), while foliar-applied N (urea), is very effective at increasing yeast assimilable N (YAN).
- If no increase in vine size/vine vigor is needed, one or two foliar apps of N (urea, at 5 lbs actual N per acre) around veraison is very effective in increasing YAN levels.

Got nitrogen. What about other nutrients? What did your petiole (or whole leaf) tissue samples of 2018 reveal? My guess is that potassium (K) was very high, phosphorus (P) and iron (Fe) might have been a bit low, and that some of the other micros such as zinc (Zn) and copper (Cu) might have also been a bit high relative to established standards. Let's unpack this: If phosphorus, magnesium and/or calcium are consistently low with tissue analyses, each can be added in fertilizer form. Start with a detailed soil test though to ensure that soil pH is adequate and to evaluate the *availability* of these macro-nutrients in your soil. Specific instructions for adjusting soil levels of nutrients are provided in the Wine Grape Production Guide, but a few reminders are warranted. First, it's difficult to adjust soil pH once the vineyard is established. I've seen this done in a few cases, but it takes time and requires some creative measures to incorporate the lime, renovate the disturbed cover crop, and avoid severe damage to the grapevine's root system. A second alternative is to use pelletized lime and spread the lime on the established vineyard without incorporating it. If you envision the existing vineyard lasting another 10+ years, this might be an option. The third basic option would be to wait until the vineyard is renovated, as in conversion to another variety, elimination of diseased vines, or your wishes to redesign the vineyard. Use that opportunity to apply and incorporate soil amendments, including lime. Some of the nutrients, including nitrogen, magnesium, calcium and boron, can be applied as foliar fertilizers, although soil application is generally superior to foliar application if the nutrient is actually deficient. I don't get too alarmed by low iron (Fe) levels in our samples, particularly at the typical soil pH range (5.5 – 6.5) that we see in most vineyard soils. Unless the vines are showing chlorosis of the younger leaves, I don't believe that the report of a "low" analysis of Fe is causing a reduction in performance of the vines. The nutrient that is most commonly out of "sufficiency" range for our wine grapes in Virginia is potassium (K). Thanks to abundant K in most soils, a large vine and corresponding root system, usually ample moisture and warm temperatures to drive transpiration, we end up with a lot of K in the vine. Yes, in cases this can lead to elevated fruit (and wine) pH, as previously discussed in this article: https://tinyurl.com/y292r98o. But, as explained in this article, it's very difficult to reduce potassium uptake in vines. Finally, recognize that some of the micro-nutrients -- Zn, Cu, and manganese (Mn) in particular -- can be elevated on tissue test results due to fungicide residues on the leaves at the time of collection. Washing the samples with clean tap water at the time of collection can reduce the likelihood of such artifacts in the sample results.

3. Pest Management reminders:

a) *Grape berry moth*: Scout for grape berry moth (GBM) infestation in developing grape clusters. First generation adult moths are typically observed at or just prior to bloom and the resulting larvae will be

apparent as small areas of the flower and developing fruit clusters webbed together (Figure 1). Insecticide options, if warranted, are in the Pest Management Guide (grapes), found here. Traps and GBM pheromone lures are useful for monitoring adult grape berry moth activity and abundance, and can be obtained from several sources including Great Lakes IPM (https://www.greatlakesipm.com/); however, with the possible exception of the first generation of moths, the subsequent two or more generations per year become less apparent as distinct peaks of adult moth captures. Thus, trap capture data are less useful as a means of targeting insecticide sprays later in the season.

Figure 1. Grape berry moth larval "webbing" in young grape cluster. Photo credit: Andy Muza, The Pennsylvania State University.

Andy Muza of Penn State has a nice 3-phase approach to GBM management that is a very useful resource for growers: https://psuwineandgrapes.wordpress.com/2017/04/28/three-phases-to-managing-grape-berry-moth/. Grape pest management programs in states to our north, including Pennsylvania, are using a degree-day model for timing GBM sprays that use bloom of *Vitis riparia* as a biofix, and then the accumulation of degree-days (DD) from that date using a threshold temperature of 47.14°F. The model is based on research originally conducted in Pennsylvania that showed that 810 DDs were required for GBM to complete a generation. This DD approach to GBM management is explained in the Penn State article, referenced above, which I'd encourage you to read. In speaking to our entomologist, Doug Pfeiffer about this approach, he cautioned that the GBM model has not had extensive testing in Virginia. Furthermore, the DD GBM model uses bloom of *V. riparia* as the start (biofix) of the DD accumulation, but *V. cinerea* and *V. vulpina* are perhaps more common "wild grapes" in many parts of Virginia. Off-hand, I'm not sure of the relative differences in bloom dates of these species. While I'm not in a position to recommend using the DD model approach for GBM management here in Virginia, I am inclined to track DD with our NEWA-networked met station (http://newa.cornell.edu/), as described in the above article, and to observe wild grape bloom date (*V. vulpina*) near our vineyard as a biofix for the model. You don't need the built-in GBM model in the NEWA met stations. If you have access to daily high and low temperatures, or average daily temperatures, you can sum DD based on the 47.14°F threshold temperature. We had accumulated 285 DD, based on daily average temperatures of 47.14°F since 1 March on our NEWA station here at the AREC as of 22 April. The biofix date of wild grape bloom ignores the first generation of the year, but "sets the clock" for 2nd, 3rd, and potentially 4th generation broods in the season. Again, in states to our north where the model has been tested, the application of GBM insecticides is generally timed to coincide with egg-laying cycles that are predicted by the GGM DD model. In speaking with Andy Muza about the utility of the model, he indicated that he still recommends that growers consider the historical risk of GBM infestation, the landscape patterns of infestation (vineyards that border deciduous woods with wild grapes are at greater risk that those surrounded by large expanses of pasture; edge effects are also apparent) and that growers scout their vineyards for GBM infestation rather than spraying based only on model predictions. The above-mentioned article has some great photos of GBM injury to young as well as mature berries as well as damage threshold values that can be used to gauge the need for an insecticide application. I take a fairly conservative approach in our research vineyard with GBM injury, as those berries can serve to increase

overall bunch rot incidence at harvest. Bear in mind too that some insecticides used for Japanese beetle management can also be depressing GBM numbers.

b) Gall-forming insects: We often see various galls on vines at this time of year – some are important and some are not: tomato tumid galls, which appear as pea- to marble-sized, often reddish galls on shoot stems, cluster rachises and sometime leaf petioles are generally inconsequential (https://www.virginiafruit.ento.vt.edu/grapegalls.html). These and similar galls, some more conical in appearance, are tissue overgrowths caused by egg-laying of small insects (midges). The insects and the galls they produce are usually benign. An exception is tomato tumid gall on 'Traminette'. For whatever reason, Traminette is particularly attractive to this gall-maker and the galling can be severe enough to warrant control (Figure 2). Movento insecticide (see the Pest Management Guide) is one of the registered materials recommended as a pre-bloom spray. Growers who have had to spray Traminette claim they get best control of the gall-forming insects by making the first application well before bloom –at about 10" shoot growth stage, rather than waiting until "pre-bloom".

Figure 2. Grape tumid galls on shoot tip of 'Traminette'. Photo credit: Dr. Bruce Bordelon, Purdue University.

c) Phomopsis:

- See http://grapepathology.blogspot.com/ for photos and overview. This is Dr. Nita's disease blog and it was recently updated with reminders about phomopsis.

My "take home" notes on phomopsis management:

- Early shoot growth period is most important for cluster and base of shoot infections; start fungicide program at ½ to 1 inch of shoot growth if phomopsis has been an historic problem; repeat at 7- to 10-day interval (7-day if wet weather, 10-day if dry weather).
- There are no effective post-infection fungicides – protection in advance of infection is critical
- Early season (through bloom) control will aid late-season fruit rot phase of phomopsis, but some fungicide protection should be continued post-bloom in wet years to reduce mid-season fruit infections (those sprays will help with downy mildew too, if you use the appropriate fungicide)
- Old, even dead wood that was previously infected with phomopsis can continue to serve as a source of inoculum for some years; prune out infected wood where possible.
- Fungicides: captan, EBDCs (mancozeb, ziram), Adament, Topsin M. Here are Mizuho's most recent comments on fungicides: If rain events are coming into the picture after bud break, mancozeb (FRAC = M3, Penncozeb, Dithane, Manzate, etc.), Ziram (FRAC = M3), and captan (FRAC = M4) are effective protective materials against Phomopsis. In a typical year, one or two applications from 1-2 inch shoot growth will be sufficient, because your downy mildew or black rot applications, which happen in the

late spring, will cover Phomopsis. QoI (FRAC = 11) insecticides, such as Abound and Pristine, as well as SDHI (FRAC = 7), such as Luna Experience and Aprovia, work too. However, you probably don't want to use them this early in the season because you will need these materials for the latter part of the season to control other diseases. Once again, protection is the only mean of chemical management because no materials are effective after infections have occurred.

- Need good coverage – and frequent application during rainy weather.
- EBDC fungicides (e.g., mancozeb) can flair mite populations early in season.

d) Fruit fly management: The need for fruit fly management is a distant concern yet, but some recent developments on fruit fly management are worth mentioning at this early stage. Entomologists have discussed the need to rotate insecticide mode of action (MOA) materials for fruit fly management to slow the development of resistance developing to one or more classes of insecticide. We're hopefully all familiar with the need to rotate fungicides to avoid fungal resistance development; the same concept applies to some of the newer insecticides. And like fungicides, insecticides have mode-of-action classification numbers to help distinguish their MOA so that materials can be logically rotated or tank-mixed to slow the development of resistance to a specific MOA insecticide.

A recent paper in the journal Nature Ecology and Evolution highlighted the potential for resistance development to the insecticide imidacloprid in populations of the common fruit fly, *Drosophila melanogaster*; the likelihood of resistance development was greater among populations of flies in temperature regions, compared with tropical regions. We also recently learned of resistance to Mustang Maxx insecticide (Group 3A, pyrethroid) in a population of fruit flies collected from a Finger Lakes vineyard in 2018. The vineyard had been treated with Mustang Maxx for 3 seasons, and the fruit flies also appeared to have cross-resistance to Assail (Group 4A, neonicotinoid) as well as malathion (Group 1B, organophosphate). This is hopefully a reminder, and otherwise a "head's-up" that repeated use of one insecticide is apt to lead to resistance development against a prolific insect such as fruit fly (*D. melanogaster* or *D. suzukii*). The product labels are specific in terms of resistance management, as well as limits on how much product can be used per season, and how many sprays per season are allowed.

The PMG and insecticide product labels are very specific about "reducing" (no one says "avoiding") the potential for resistance development. The Mustang Maxx label, for example, has the following prescriptive labeling, which is good advice in a more generic sense too:

- Rotate the use of MUSTANG Maxx Insecticide or other Group 3A insecticides within a growing season, or among growing seasons, with different groups that control the same pests.
- Use tank mixtures with insecticides from a different group that are equally effective on the target pest when such use is permitted. Do not rely on the same mixture repeatedly for the same pest population. Consider any known cross-resistance issues (for the targeted pests) between the individual components of a mixture. In addition, consider the following recommendations provided by the Insecticide Resistance Action Committee (IRAC):
    - Individual insecticides selected for use in mixtures should be highly effective and be applied at the rates at which they are individually registered for use against the target species.
    - Mixtures with components having the same IRAC mode of action classification are not recommended for insect resistance management.
    - When using mixtures, consider any known cross-resistance issues between the individual components for the targeted pests.

- Mixtures become less effective if resistance is already developing to one or both active ingredients, but they may still provide pest management benefits.
- The insect resistance management benefits of an insecticide mixture are greatest if the two components have similar periods of residual insecticidal activity. Mixtures of insecticides with unequal periods of residual insecticidal activity may offer an insect resistance management benefit only for the period where both insecticides are active.

• Adopt an integrated pest management program for insecticides that includes scouting, uses historical information related to pesticide use, crop rotation, record keeping, and which considers cultural, biological, and other chemical control practices.
• Monitor after application for unexpected target pest survival. If the level of survival suggests the presence of resistance, consult with your local university specialist or certified pest control advisor.

Note the last recommendation here about monitoring for "unexpected target pest survival". This was apparently the situation observed with the Finger Lakes population of fruit flies where the grower had used the insecticide over three seasons. Again, this is just a head's up, and we'll issue some reminders later in the growing season.

II. Winery seeking wage assistance:

Vineyard Manager Training Program & Internship: Practice and learn all of the steps required in managing a vineyard following the winegrower's explicit instructions on the maintenance and care of the vines. Assist in pruning, canopy management, pest management, cover crop management, pesticide application, berry sampling and analysis, harvest and grape processing into wine. 8:30 am - 5:00 pm Mon-Fri 20-40 hours/week. Must be 18 years of age or older. Communicate directly with contact for additional requirements and terms of employment.

Contact: Kerem Baki – kerem@hillsboroughwine.com
Hillsborough Vineyards
36716 Charles Town Pike, Hillsboro VA 20132

III. Questions from the field: Biodynamics. What is it, and what's the deal with the cow horn?
Tremain Hatch, Viticulture Extension Associate

In late-June 2018, the Maryland Wineries Association held a vineyard focused biodynamics workshop in Carroll County MD. I attended the workshop as a way to learn about biodynamics in the context of vineyard management in the east. The workshop was led by Joseph Brinkley, a Virginian now working in California for Bonterra, one of the largest organic and biodynamic vineyards in the country. Joseph does understand Virginia viticulture, as he previously managed a large vineyard in Central Virginia. Going in, I was aware biodynamics involved low input agriculture and the use of a cow horn and manure in the vineyard. Having gone through the workshop, the following is how I would answer some of the questions a grower may have about biodynamics and vineyard management.

What is biodynamics?
Biodynamics is a set of agricultural practices first introduced by Rudolph Steiner in the 1920s. Biodynamics advocates holistic farm management recognizing the interplay and interdependence of plants, animals, and people within a farm; eschews the use of synthetic materials in the vineyard, and utilizes biodynamic preparations as a means towards overall increased vitality. The philosophy behind biodynamic agriculture

centers on making a farm more like a natural system, where the farmer is the main component of a holistic farm organism.

Using natural systems as a guide for how a farm functions. Sounds great, but what does that mean?
Take soil fertility for instance. The rule is that fertility on a biodynamic farm comes from living processes. To achieve this, a practitioner of biodynamic agriculture would provide a higher level of fertility in the vineyard through the use of cover crops, compost derived from on-farm inputs as much as possible, biodynamic preparations, and livestock integration, rather than bringing in a synthetic fertilizer produced via an industrial process.

Ok, so what's the deal with the cow horn?
Biodynamics often characterized by the use of biodynamic preparations, this is where the cow horn comes in to play. The inception of the preparations is based on an alchemical world-view, where a preparation following specific materials and sequences result in a product greater than the sum of the components that went in. There are multiple biodynamic preparations each one with specific functions to balance the health of one's soil, compost, and crops, and each one requiring a specific process to marry a plant material with an animal organ, though there are a few exceptions to the animal requirement. Yes, there is a cow horn that is filled with cow manure and buried, then dug up and applied to the field.
These preparations are the part that can easily be misconstrued. It's not that all biodynamics practitioners believe that the preparations do all the work of pest management and fertility programs; and it's not that the cow horn and manure will change the soil conditions or fertility of the vineyard in a way we can objectively measure. But that the process of animal husbandry on the farm to produce the livestock materials, coupled with gathering the necessary flowers and minerals, assembling, processing and applying the preparations can impact both the manager and the land.

Well, does it work?
Our instructor was clear that going with a full organic and biodynamics program is not appropriate for vinifera vineyards in the mid-Atlantic. The challenges here do not make this a viable option, particularly prohibiting the use of synthetic materials. But the instructor also made it clear that it is worth exploring components of the biodynamics preparations, practices, and philosophy, even if it's not possible to go all the way to a certified biodynamic vineyard.

Would you recommend biodynamics to a grower?
I put the biodynamics philosophy in the category "it won't hurt the vineyard, but the benefits will be hard to tease out." Growers ought to weigh out the opportunity cost associated with any use of their time. Time spent creating and applying the biodynamic preparations is time that won't be available for doing other vineyard tasks. Therefore, if it is a decision between making biodynamics preparations or a vineyard task that has a known benefit such as canopy management, then your time is better spent on canopy management. However, if you are on top of vineyard tasks and still looking for improvement, go for it.

I suspect that following biodynamics does not inherently make one better at making decisions on the farm. However, exploring biodynamics or any other agricultural philosophy is a way for one to learn and gain experience, which can lead to improved decision-making on the farm.

More about Biodynamics from Joseph Brinkley: https://www.sustridge.com/regenerative-farming-bonterra

44th Annual meeting of the American Society for Enology and Viticulture-Eastern Section (ASEV/ES)
16-18 July 2019
Hobart and William Smith Colleges
Geneva, NY

The 2019 ASEV-ES conference will be held at the Hobart and William Smith Colleges in Geneva, NY July 16-18, 2019. The **ASEV-ES conference** will begin with technical/research presentations on Tuesday, July 16 and include the awards/lunch and Oenolympics with Wines of the East Reception. On Wednesday, July 17 there will be a **New York Digital Viticulture Tour and Equipment Demonstrations** in vineyards on Keuka and Seneca Lakes. The **Nelson J. Shaulis Symposium** on Thursday, July 18 will feature invited speakers to discuss "Digital Viticulture: New Tools for Precision Management of Vineyards". Click here for more information about the tour and symposium. Visit our website http://asev-es.org/ for more information.

There are several options for hotel and room accommodations for the ASEV-ES Conference and Nelson J. Shaulis Symposium. Click here to download the conference registration information.

If you have never visited the Finger Lakes and its many wineries, July is a perfect time of the year to enjoy the views, the wines and the cooler weather! Here's one of many websites that explain what's available to see and visit: http://www.fingerlakeswinecountry.com/wine-food/wineries/