

Greetings Foothill Grape Growers! As 2010 winds down I am in the process of finishing research projects, beginning new collaborations, and planning future programs to assist you in optimizing your vineyards. Thanks to everyone who responded to my email request for collaborators for the leafroll genetic study. We sampled 15 blocks in El Dorado and Amador, all with classic leafroll symptoms, but I was not able to get to every block or grower that contacted me. In each block we sampled 20 individual petioles from symptomatic vines. Each petiole will undergo RNA analysis in UC Berkeley researcher Rodrigo Almeida's lab, and compared to the RNA from known leafroll strains. This means we will have a good database of what leafroll virus strains we have present here, and perhaps some insight on what else might be causing "red leaf" symptoms. I am especially grateful to everyone who gave public testimony and sent letters and emails in support of UCCE to El Dorado County's Board of Supervisors during the recent budget hearings-we were spared a potentially devastating cut, at least for now. I wish you all a happy and healthy holiday season and I hope to see you at future workshops-stay tuned for details!

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The following excellent article on potassium is used by permission by the authors. References are made to soils in the Sacramento and San Joaquin Valley but the principles of potassium fixation to clays are the same for our foothill soils.

Potassium Nutrition in Vineyards

By **Chuck Ingels (UCCE Sacramento), Paul Verdegaal (UCCE San Joaquin), Stuart Pettygrove and Ria DeBiase (UC Davis Plant Sciences)**

Potassium in Vines

Potassium (K) is required by plants in large amounts. It has a major role in many plant processes, such as promoting root growth, increasing fruit size, and providing key features in metabolism that include the formation of starch, translocation of sugars, stomata regulation, and the formation of xylem vessels. The K concentration in grapevines can range from 1 to 4% on a dry weight basis, depending on

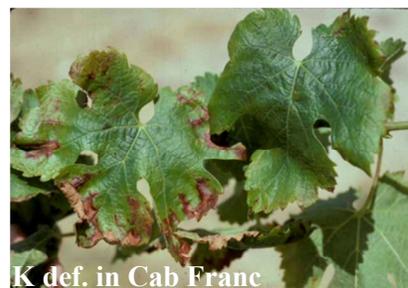
the tissues and time of sampling. Harvest removes about 5 lbs. K/ton of grapes, although this varies, based upon the rootstock and cultivar being grown. Varieties with high K demand, such as Cabernet Sauvignon, Merlot, Cinsaut, or Syrah, should not be grafted to rootstocks prone to K deficiency if soil levels are low. UC research has shown that vines on rootstocks with *Vitis berlandieri* genetic background, such as 420A, 110R, 5BB, 5C, and 1103P are sensitive to K deficiency. Freedom, 1616C, SO4, and 039-16 are examples of rootstocks that provide high K to the scion vines.

Annual soil analyses are of relatively little value in determining vine K needs since there are so many other factors that affect uptake and utilization, including soil type, texture and depth; amount of soil compaction; root pest damage; variety; rootstock; irrigation practice; and crop size. Petiole analysis has been the main tool for assessing K status and the need for K applications to vines. Petioles are usually collected at bloom from leaves opposite the cluster position on the shoot. Vines are generally sufficient at 1.5 to 2.0%, and deficiency may occur at 1.0% or less. Though it is not a completely reliable tool for making K management decisions, petiole analysis is the most consistent guideline currently available.

Potassium Deficiency

Grapevines tend to show K deficiency when they are heavily cropped and maintenance applications of K have not been made in the vineyard. Deficiency can be more likely to occur under these conditions:

- Soil cut areas
- Areas where the K-rich surface soil was removed during land leveling
- On sandy soils that have low native K fertility
- On clay soils of certain geologic origin
- Shallow soil areas
- Poorly drained soils
- Where soil pests have caused root problems
- Water stress can also increase this deficiency by reducing vine uptake of K – keep this in mind when using deficit irrigation on red grapes.



Deficiency symptoms can appear in early spring in cool, wet years, into June, but mild deficiencies will not be seen until just before harvest. The first symptom is a fading of green color at the leaf edges and between the main veins, while leaf margins tend to curl upward. The leaves may turn chlorotic and begin to turn brown on the margins, and some leaves may die as the deficiency becomes more severe. Severe K deficiency also reduces vine vigor and crop yield, and can result in defoliation. Oftentimes petioles can remain attached as blades defoliate. Vines also tend to have fewer and smaller clusters that are tight, with unevenly colored, small berries.

Local Soil Composition and K Fixation in Soil

Soil composition plays a large role in which areas of a vineyard are K deficient. K ions are strongly adsorbed on clay; without this adsorbing ability, the soluble K in sandy soils is easily leached from surface soil. Therefore, sandy soils or sand streaks often have less plant-available K. Soils high in clay or silt content may also need added K because of their K fixing capacity. In K fixation, clay minerals remove K from solution by trapping it on sorption sites within the mineral layers. Many soils in the San Joaquin Valley have high K fixing capacity and can tie up 50% or more of added K fertilizer. This K is not lost, but rather stored between layers of clay and slowly released in soil solution as exchangeable K. However, most will not become available fast enough during times of high K demand, especially following veraison. The actual K available for plant uptake represents a very small fraction of the total K in soils – it is found in the soil solution and on the cation exchange sites of both clay particles and humus. This is why soil K levels have generally not been reliable criteria for indicating the actual K status of grapevines.

The major clay minerals responsible for K fixation are illite, weathered mica, smectite, and vermiculite. Soils high in vermiculite are found on the east side of the Central Valley of California including in the Lodi wine grape district, especially on landscapes with soils deriving from granitic parent material and that are weakly to moderately weathered. Vermiculite is a clay mineral, but actually it can be found in the silt and fine sand size fractions, which explains why coarse-textured soils are often found to fix K. In recent years, graduate students and staff in the UC Davis laboratories of Drs. Randy Southard, Toby O’Geen, and Stu Pettygrove have examined the K fixing capacities of soils in Sacramento and San Joaquin counties and have developed a map of five general regions with similar “soilscape” characteristics. These regions help predict the likelihood of soil’s K fixing capacity. Soils with a high K fixation potential may need greater K applications to reverse any deficiencies. We are currently comparing fertilizer applications in vineyards having high and low soil K fixation in both Sacramento and San Joaquin counties.

Potassium Fertilization

Response to a K fertilizer strategy may be influenced by several factors, including soil type and depth, variety, rootstock, cropping pattern, time of year and irrigation system or general growing conditions, especially if in a drought or a heavy rainfall year. The particular form of K fertilizer chosen offers no inherent advantage as grapevines don’t care how their needed K becomes available, only that it is available. However, particular formulations of K do offer advantages to growers, such as cost and convenience of application vs. possible soil effects (e.g., acidification of soil, salinity, etc.). Foliar sprays for K are not without benefit, but at best they reduce foliar symptoms, at great cost. K can be applied in the fall as long as field access is possible. Early spring applications in bulk or through drip systems can be as effective, depending on formulation and timing.

For a comparison of some general formulations of K fertilizer see the table below:

| Potassium Product | % K ₂ O* | % K | Advantages and Disadvantages |
|--|------------------------|-----------|--|
| <u>DRY FORMS</u> | | | |
| Potassium sulfate K ₂ SO ₄ | 53 | 43 | Most popular due to safety to plants and high K content; contains 18% sulfur. Low solubility limits liquid formulation; readily applied with gypsum solution applicators for drip. |
| Potassium chloride KCl | 62 | 51 | Highest K analysis and lowest cost; high solubility for liquid formulations. Chloride can cause salt injury. |
| Potassium nitrate KNO ₃ | 46 | 38 | Contains 14% N. Most expensive dry form. |
| Potassium-magnesium sulfate, K ₂ SO ₄ · 2MgSO ₄ | 22 | 18 | Contains 10% magnesium (Mg) to offset potential Mg deficiency. High cost for K content; Mg may interfere with K uptake. |
| <u>LIQUID FORMS</u> | | | |
| Potassium thiosulfate K ₂ S ₂ O ₃ | 25 | 21 | Contains 17% sulfur; acid-forming for alkaline soils. |
| Potassium carbonate K ₂ CO ₃ | 30 | 25 | High pH is suitable for acid soils; high solubility for liquid formulation and drip irrigation. |
| Potassium sulfate K ₂ SO ₄ | 8 | 7 | N (as ammonia) is commonly included in the formulation to assist K ₂ SO ₄ solubility. |
| Potassium chloride KCl | 8 or 10 | 7 or 8 | Most economical liquid formulation. Often sold with 2% N content. |

*Multiply K₂O (called *potash* by the fertilizer industry) by 0.83 to determine actual K content.

Source: Raisin Production Manual. 2000. Pub. #3393;

Generally, K use by grape vines can be as much or more than annual N demand, but the need for K applications is often not as critical as N. This is because K doesn't leach from the soil profile as readily as N and certain soil types provide enough K for fairly long periods under moderate crop demands.

Because of the strong fixing capacity of some soils and the relatively slower movement of K, a single heavy application (a "slug") of fertilizer is needed to quickly mitigate K deficiency and show a vine response. The method of application and formulation of K will be determined by how fast a response is needed and how long it has been since any K was applied, or whether a more maintenance type strategy is being used.

Talk with your PCA or fertilizer company about what you want to accomplish and how fast, and try to keep your winery in "the loop". Some important considerations are:

- What is the soil type?
- Are there some soil concerns, such as pH, salinity, or drainage?
- How long has it been since K was applied, if ever?
- Are symptoms present in just the leaves, in the fruit, or in certain sections of the vineyard?
- What have the yields been in recent years?
- What is the comparative cost per unit of K₂O?
- How can the formulation of choice be applied, and at what cost?
- When do you want to apply the fertilizer?

Whether you choose a dry formulation in the fall, or dry in early spring, or liquid in late spring/summer, or a combination depends more on your operation and schedule than on critical periods of the vines' ability to use K. Do talk with your winery about your strategy as some wineries have concerns about amount or timings of K. Generally, there is no hard or fast rule on K application, amount or timing, but too much K just before or just after veraison can affect K uptake by fruit and pH. However, the interaction of available nutrients, soil type, crop load, irrigation management, variety and rootstock make it complicated to predict. All the more reason to stay in communication with your winery or grape buyer.

For more information on K composition of local soils, see "Soil-landscape model helps predict potassium supply in vineyards", Calif. Agriculture, vol. 62, no. 4, p. 195-201 (Oct.-Dec. 2008).

WEATHER NEWS ITEMS

LA NINA YEAR PREDICTED

Rick Snyder, CE Biometeorology Specialist, has announced that the NOAA Climate Prediction Center (CPC) is currently tracking one of the largest La Nina events ever recorded. According to Rick, La Nina could have a big impact on California weather this winter. Although it is not an exact science yet, the CPC long-term winter outlook for California is to be cold over the State and dry (mostly in Southern California). In the past, California has experienced bad freeze/frost events during La Nina conditions, and we usually get a low snow pack leading to drought conditions the following summer. The conditions that we are experiencing this fall are typical of a La Nina event. For more information and maps showing the outlook, go to

http://www.cpc.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.php

You will see monthly temperature and precipitation forecasts for North America. Click on the individual boxes to enlarge them. When I did this, I saw that for much of our foothill area the immediate forecast was a bit uncertain and labeled "EC", which according to the legend on the map, indicates equal chances for "A" (above normal), "N" (normal) and "B" (below normal). So far this winter, we are experiencing "A"! However, if you look at the precipitation map forecast for Feb-March-April we are in the "B" zone-meaning the forecast is for below normal precipitation for those months. Likewise, if you click on the temperature forecast maps for Jan-Feb-March and March-April-May, we appear to be in the "B" zone for temperature as well. This could mean a cold and dry spring-conditions that could put us at risk for frost (again, I know). The UC Davis Biometeorology website at: <http://biomet.ucdavis.edu/> is Rick's home site and provides information on frost protection, irrigation scheduling, and more.

NEW ONLINE EVAPOTRANSPIRATION AND WEATHER FORECAST TOOL

UC, the California Dept. of Water Resources, and the National Weather Service have developed a new reference evapotranspiration (ETo) forecast product with the National Weather Service office in Sacramento. (CIMIS only provides ETo up to the previous day.) The ETo forecast is on-line at <http://www.wrh.noaa.gov/forecast/evap/FRET/FRET.php?wfo=sto>. ETo is an important tool in planning irrigations.

The map is quite impressive, and although it does not cover all of California it DOES cover our foothill counties! (You have to decipher the outline of your county on the map as counties are not labeled). You can select the day of the week (starting with the current day), and it will show a color map indicating the ETo rates for that day. The forecast is for up to six days in addition to the current day. According to Rick, the Weather Service is more interested in helping agriculture now than in the last 30 years, so this is a good chance to gain valuable information that was unavailable in the past. They have also developed a useful product for growers to obtain weather trends. From the ETo map page, click on Forecast Weather Tables in the left-hand column. You can select hourly, 3-hourly, 6-hourly forecasts for several days in tabular format. There is a lot of information there that growers want and use, including dew point, relative humidity, and wind. The FRET values are really ETo. It stands for Forecast ET. Check it out!

DIAMOND SPRINGS CIMIS STATION UP AND RUNNING

Thanks to the El Dorado Irrigation District (EID), “retired” EID IMS consultant Kirk Taylor, and local grape growers Lloyd Walker and Ann Johnson, El Dorado County has a new CIMIS weather station. CIMIS stands for California Irrigation Management Information Systems and is a component of the California Department of Water Resources. The new station, #228 “Diamond Springs” (named after the closest town), came online on Sept. 29 and is located at an elevation of 2050 ft., compared to the Camino station, #3, at an elevation of 2780 ft. CIMIS information is available online for free at their website <http://wwwcimis.water.ca.gov/cimis/welcome.jsp>

Brown Marmorated Stink Bug-the Next Big Threat?

UC researchers are warning Farm Advisors to alert their growers and PCAs to the Brown Marmorated Stink Bug, *Halyomorpha halys*, an invasive pest species that is proving to be extremely damaging for fruit growers in the Eastern United States. Native to Asia, the Brown Marmorated Stink Bug first appeared in the eastern US in 2001 but has recently been found in the Pacific Northwest. It attacks a wide variety of crops, including ornamentals, citrus, apples, grapes, peaches, and other stone fruits and is extremely difficult to monitor for and to control, according to UC Berkeley Specialist Kent Daane. It has an odor, “stink”, and has been reported to have a negative effect on wine quality when even a few insects are present in fruit sent to the press.



Brown Marmorated Stink Bug,

Unfortunately, this pest is an effective hitchhiker and is easily transported in packing materials and stored household goods. One colony of the insects has been found in a storage unit in Vacaville and was destroyed by CDFG. I will keep you updated on the tracking of this pest. It looks very similar to other California stink bugs. If you think you’ve found BMSB, please contact me. The Oregon Department of Agriculture has some good pest alerts as below:

http://www.oregon.gov/ODA/PLANT/docs/pdf/ippm_halyomorpha.pdf?ga=t

http://www.oregon.gov/ODA/PLANT/docs/pdf/ippm_halyomorpha_alert_09.pdf?ga=t

Spirotetramat (Movento) Re-registered

US EPA announced on October 15, 2010 that Movento (Bayer CropScience, active ingredient spirotetramat) is now re-registered and will be available for use in 2011. Registration was previously cancelled in April, 2010, due to a problem with the registration process. Spirotetramat is a new insecticide chemistry, a foliar systemic that purportedly moves both up and down within the plant. It is effective against plant sucking insects, such as mealybugs. Use of a spray adjuvant with penetrating and spreading properties (NOT a sticker) is recommended to improve uptake. In my work with Gill's mealybug control, Movento @ 8 oz. applied with 0.0125% Syl-tac gave excellent control as seen in cluster evaluation prior to harvest. 98% of the clusters from vines treated with Movento were rated with a "0", compared to 33% in the untreated, in one of my 2009 Gill's mealybug trials. My understanding is that the new MRL (maximum residue levels) set for Movento fall within those required by most countries, but check with your winery if you plan to use Movento next year just to be sure they are OK with a Movento treatment.

Weed Control in your Vineyard

If pre-emergent herbicides fit into your vineyard weed management plan, now is the time to think about what product you might use and how that product works best. Pre-emergents are applied in late fall (after harvest and then you can turn on the sprinklers for activation) or spring (Feb, March, prior to bud break and when a light rain is forecast)-BEFORE weed seeds germinate. I am remembering the words of wisdom from John Roncoroni, UCCE Napa Weed Science Advisor, during the field day we had back in July. John said that pre-emergents are activated by rain or irrigation, but you only need about ¼ inch (not 2-5 inches which can wash the pre-emergent out of the soil profile). So, you need to look at the weather forecast before you make your application. John also made the point that pre-emergent herbicides need to hit the SOIL-spraying a pre-emergent over a groundcover (of weeds, mulch, or vine choppings) will be a waste as the herbicide will never contact the ground where it needs to sink in. John has done some experiments where he used a brush to sweep away leaf debris under the vines and showed much better results with a pre-emergent application when the soil surface was clear.

There are many, many herbicides on the market, each with a unique set of chemical and physical properties. You need to understand how each of these herbicides work in order to get the best results. Some pre-emergents require incorporation (i.e. Matrix) while others you do not want to cultivate (Goal). John said "Goal works like a sheet of plastic. Once you put it down, you don't want to cultivate or even scratch the soil". Some are inhibit cell division in the roots and shoots (Prowl, Prowl H2O, and Surflan) while others are "PPOs". PPO herbicides (Goal and Chateau) provide both pre- and post-emergent control because they kill weeds by targeting the chlorophyll synthesis pathway, where they inhibit the enzyme protoporphyrinogen hence the name "Protox" or "PPO" is given to this class. John said Chateau has pre-emergent and "a little" post- and Goal has both pre and post-emergent qualities. These PPOs kill plants as they germinate and come through the soil, rather than inhibiting root growth. Hence the reason why you don't want to disturb the layer of Goal on the soil surface, once you put it down. It is also critical that you have good uniformity of coverage on the soil surface, or you will see uneven weed control results. Goal and Chateau are both strongly adsorbed onto the soil, and not readily desorbed. Goal is known, however, to have the potential to "lift off" from the



Weed Science Advisor John Roncoroni,
at my Weed Day last July.

soil after an application-rain or foggy conditions can cause this phenomenon so you want to be really careful to avoid drift with pre-emergents the same as you would for a post-emergent herbicide. Matrix, on the other hand, requires incorporation and has no post-emergent activity. Matrix is in the class of sulfonyleurea herbicides, and works by inhibiting an enzyme involved in amino acid synthesis within the plant.

Although Round-Up, which is applied as a post-emergent and translocates in the plant, may be “cheap”, John stressed that weeds can also become resistant to herbicides if the same material is used again and again without rotation with other types and classes of herbicides. Willowherb, which many of you have established in your vineyards, is “tolerant” to Round-up. A Round-Up application will stop the top of the willowherb plant from growing, but lateral buds will push. So, consider some other form of control: non-chemical options such as cultivation and/or a pre-emergent will help you combat those weeds next season. (Always read the label and follow application and safety instructions).

New Publications

Andrew Landers, Application Technology Specialist at Cornell University, has published “**Effective Vineyard Spraying- A Practical Guide for Growers**”. According to the advertisement (I’ve ordered the book but not received it yet), the book is a comprehensive resource that will help you improve deposition throughout the canopy and reduce drift. It includes information on nozzle selection, herbicide sprayers, and handheld and small sprayers for the smaller vineyard. The cost is \$55.00 plus shipping and is available at www.effectivespraying.com I plan on having another calibration workshop this winter (about Feb.) and I’ll have this book available for those who want to look it over.

“**Establishing Hedgerows on Farms in California**” is a free UC publication written by UC Farm Advisor-Yolo County Rachel Long and grower John Anderson. Hedgerows consist of a mixture of plants including trees, shrubs, and grasses and have many benefits to agricultural landscapes including air and water quality protection, soil erosion control, biodiversity, and increased beneficial insect activity. Check it out at <http://anrcatalog.ucdavis.edu/pdf/8390.pdf>

Save the Dates for These Upcoming UC Courses

Information for all of the following can be found on the UC Viticulture Online website at <http://ucanr.org/sites/intvit/>

2/24/2011 Current Wine and Wine Grape Research

3/1/2011 Varietal Wine Grape Short Course

5/19/2011 Variety Focus: Chardonnay

And look for more meeting announcements, coming your way in 2011!!

2/14/2011 Vine Pruning Field Day with Andy Walker at Lava Cap Vineyard