VIT TIPS

San Joaquin Valley Viticulture Newsletter

UC CE University of California Agriculture and Natural Resources Cooperative Extension

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Keys to Grape Sampling

Lindsay Jordan, UCCE Madera, Merced & Mariposa

In This Issue

I spent many hours walking down vineyard rows in the early morning hours collecting grape samples as a winery intern. At the time, I focused on getting my job done – collecting samples from each vineyard block, measuring the sugar and acid, and reporting these values promptly to the vineyard managers and winemakers, but I didn't appreciate how important grape sampling was to the entire harvest operation. Every grower knows that getting an accurate, representative sample of fruit in order to track ripening and plan for harvest is critical, but this is not an easy thing to do.

Identify What to Sample

The first step to a successful maturity sampling protocol is recognizing your own needs within a vineyard. It's important to identify any sub-blocks that may be harvested separately, due to different rootstocks or vine age or just because of logistics, and to sample these blocks independently.

Samples should never be taken from vines at the end of a row or the rows at the edge of the vineyard, since these vines can sometimes ripen more quickly than the rest of the vineyard block and this "edge effect" will not represent your vineyard block.

All sugar sampling should occur in the cool morning, because sampling in the heat of the day can yield artificially high sugar values that will not represent the actual sugar at harvest. Sampling should be postponed if there is rain, dense fog, or dew because this can give diluted values.

When processing your collected grapes, it is critical to ensure every berry of the sample is crushed. Underripe fruit is harder to squish, but if missed during processing, the resulting juice will appear more ripe than what is actually in the vineyard. You can avoid this by crushing the berry sample in a clear plastic bag and visually checking there are no intact berries left or you can use a food mill, a piece of kitchenware commonly used in canning to separate fruit skin and pulp from juice. After the fruit is crushed, you can decant, filter using a coffee filter or paper towel, or centrifuge the juice to remove solids. No matter how you process your grapes, always process samples the same way if you want to compare results for harvest scheduling.

...Sampling continued on page 4

Around the San Joaquin Valley

County Updates

Kern County

Ashraf El-Kereamy

Research projects are underway to determine the best PGR treatment and pruning system for Autumn King and Scarlet Royal table grapes. Evaluation of different rootstocks for both cultivars is in progress as well. Higher than normal populations of Glassy-winged Sharpshooters have been trapped in Kern County this year.

Tulare & Kings Counties

Allison Ferry-Abee

In September and October, keep on the lookout for symptoms of leafroll virus and red blotch virus. We are especially interested in figuring out the scope and severity of red blotch affected table grapes in the San Joaquin Valley. If you see vines with symptoms similar to leafroll, please let your farm advisor know so we can come out and take a look. For examples of Pierce's disease and leafroll virus symptoms, check out the UC IPM website www.ipm.ucdavis.edu/. To learn more about red blotch virus and symptoms, look at http://iv.ucdavis.edu/Viticultural Information/?uid=284&ds=351 or google "red blotch grapes" and click on the UC Integrated Viticulture site.

Fresno County

George Zhuang

Raisin harvest began with Zante Currant in the last week of July and Selma Pete was ready for drying at 20-22° Brix in Parlier and a couple of locations in Fresno at the beginning of August. Ripening can be variable in different locations. For wine grapes, the harvest of Pinot Grigio and Chardonnay started during the last week of July in some areas of Fresno. The peak of harvest is upon us.

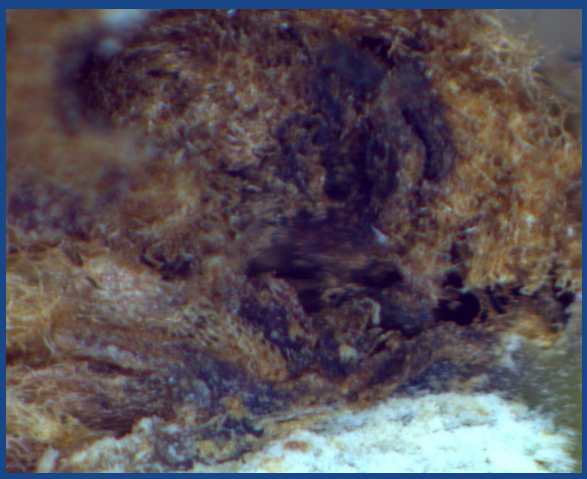
Madera, Merced, & Mariposa Counties

Lindsay Jordan

Wine grapes were being harvested in late July this year in Madera County, so like last year, it is another early start to grape harvest. The comparatively cool (aka not scorching hot) months of June and July may have contributed to the higher than normal acid levels in juice and musts at harvest. Understanding the composition of your fruit is critical for making harvest decisions and creating quality raisins and wine, so check out this issue's articles on raisin quality and on grape sampling methods. Happy harvest everyone!

In the lab of Dr. Gubler at UC Davis, several different fungal pathogens have been identified within the budwood of table grape species. More bud samples from table grapes across the San Joaquin Valley are needed to continue this work to better understand these infections and their effects on bud rot.

If you have noticed bud necrosis or stunted shoot growth and/or have concerns about trunk disease in your table grape vineyard, contact your local UC Cooperative Extension viticulture farm advisor about collecting samples to send to Dr. Gubler's lab for testing.



Pictured: Brown rot of a grape bud

Grape Maturity and Raisin Quality

Matthew Fidelibus, UCCE and UC Davis Viticulture and Enology

Raisin appearance, texture, flavor, moisture content, and wholesomeness, are all important contributors to product quality. However, maturity, or the sugar content of fresh grapes at the initiation of drying, has the most dominant and fundamental influence on raisin quality and yield. When grapes are dried on trays, berries that have amassed a sufficient quantity of solids will dry into well-filled raisins having a rounded shape with numerous fine wrinkles, or shallow wrinkles with thickened edges; such raisins are assigned the best raisin quality grade, 'B and better'. In contrast, grapes with inadequate solids will lack bulk and dry into raisins having a flattened, angular appearance, with deep and thin wrinkles. The physical characteristics of raisins of different grades enable their separation with an airstream sorter, and the proportion of raisins having 'B and better' or 'substandard' grades are thus determined.

In general, tray-dried raisins may meet minimum quality standards when made from grapes having $\geq$ 19% soluble solids, though yield and quality will increase with soluble solids up to at least 22 °Brix. In late summer, raisin grape soluble solids commonly increase about 1 °Brix per week, so it could take three weeks to go from 19 to 22 °Brix. Such an increase in solids can substantially improve quality and yield, but delaying drying by three weeks may substantially increase the risk of exposure to poor weather, and may not always be possible depending on labor availability.

Drying method also affects the shape and surface texture of raisins and may thus influence raisin airstream-sorter grades. For example, former UC viticulture specialist Fred Jensen showed that grapes treated with a drying emulsion may form raisins with finer wrinkles than non-treated grapes, and thereby improve airstream sorter grades. Likewise, dry-on-vine (DOV) raisins also tend to form finer wrinkles and a more compact shape than tray-dried raisins and these differences may somewhat improve their airstream sorter grades. This could be a useful benefit for DOV raisin growers, since DOV raisins take longer to dry than tray-dried raisins and might sometimes have less than optimal soluble solids at drying. However, we recently showed that consumers preferred 'B and better' raisins made from grapes having >20 Brix at drying to 'B and better' raisins made from berries with lower soluble solids, so grape maturity effects on raisin quality may extend beyond the assignment of USDA grades.

Clearly, accurate knowledge of grape maturity is very important for making harvest decisions. To ensure an accurate assessment, the samples must be representative of the block to be harvested. Cluster or berry samples may be used, but the goal should always be to collect a sample that is representative of the area to be harvested. Collecting multiple samples from a block may be useful to determine the uniformity of maturity within a block. Raisin quality is generally better from blocks with good uniformity than those from blocks with poor uniformity, for a given average soluble solids level.

Pictured: Poor quality DOV raisins, made from grapes of low soluble solids.

...Sampling continued from Page 1

Understand Vineyard Variability

During maturity sampling, the variation within a vineyard block must be considered. Identifying zones of different growth or stress is critical to collecting an accurate sample. Soil types may change within a block or gravel or sand streaks can create regions with weaker growth. Pest and disease pressures may vary throughout the vineyard causing variable growth, such as phylloxera which causes radiating circles of weak growth. Younger replant vines will be smaller than mature vines. Clogged or leaking irrigation drip lines may cause differences in vine growth. Areas with lots of weeds may exhibit weaker vine growth. Even small swales and rises in the vineyard topography can create dramatic differences in vine growth and subsequent ripening. There are many sources of variation within a vineyard block, but no matter the cause, the key to proper grape sampling is to recognize these regions of variability and make sure they are represented in your grape sample.

Becoming familiar with each of your vineyard blocks is one way to identify the natural variation, but it can be challenging to properly ground-truth. Aerial imaging can be extremely useful when planning how to collect a representative maturity sample. Accessing aerial images can be as simple as looking up your vineyard on an online search engine satellite map that may help you identify spots of weaker and stronger growth. There are several companies now offering relatively inexpensive aerial imaging services including infrared and NDVI (normalized difference vegetative index) that can help a grower see the variation within a single block or across an entire vineyard property.

While achieving vineyard uniformity is always a goal of any grape grower, it can be hard to accomplish. When there is variation within a block, then a grape sample must be representative of this variation. If for example, my vineyard block has a natural swale in the middle where my vines are growing much more vigorously and generating denser canopies, this fruit will likely mature more slowly than the rest of the vineyard. If this denser part of my vineyard represents 20% of the whole block, then 20% of my grape berries or clusters should come from that area for my maturity sampling.

For an accurate sample, it is critical to get a proportional sample from different areas of vine growth.

Choose Berry and Cluster Sampling

Every vineyard manager, grower relations representative, and winemaker will have a preferred method of sampling and there will be pros and cons to any protocol.

Berry samples involves collecting individual berries from clusters to create a pooled sample for the block. A minimum of 100 berries is typically needed, but for processing and accuracy it is best to collect 300+ (which will typically leave sufficient juice for tasting as well). Berries should be collected from both sides of the vine row and from all parts of the cluster, making sure to make an effort to equally sample berries from the top, front, back, and bottom of clusters located in positions across the entire fruiting zone of the vine.

Pros:

- It is the most convenient method; in my years of sampling as an intern, I always found berry sampling to be easier than cluster sampling, because a bag of berries is much easier to carry around, crush, and process than a heavy bucket of clusters.
- Processing berry samples is relatively easy and it is easy to ensure 100% of berries are crushed and sampled for an accurate juice sample.
- Berries can be weighed to track berry growth at the start of the season and later, shrinkage from dehydration.

- Berry sampling works well for varieties with looser clusters where individual berries are easy to collect.

Cons:

- Sampler bias to collect only the ripe berries can lead to artificially high sugar readings.
- Sampler bias can favor collecting berries at the top and bottom of the cluster and miss representing the central region of the cluster.
- Samples early in the season, when fruit is not as ripe, may not yield enough juice for sugar and acid measurements.

Instead of collecting berries, many people prefer to take whole clusters for their maturity sampling. To properly sample a vineyard, a minimum of 20-30 clusters is needed, 40 or more is best for large and/or variable blocks. Clusters should be collected from both sides of the vine row and from all positions on the vine (near the head, middle of the cordons/cane, edge of the cordon/cane).

Pros:

- Assures berries are sampled from everywhere on the cluster and avoids bias from collecting fruit on only the top and bottom of clusters.
- Samples can be weighed to track cluster weight for yield estimations.
- Cluster sampling works well for varieties with compact clusters where individual berries are hard to collect.

Cons:

- Collecting a representative cluster sample is difficult. If your vineyard has a lot of variability, more than 20 clusters may be needed to sample accurately, but a representative berry sample can be more easily collected from variable regions.
- It is time consuming and laborious to crush 20+ clusters completely for an accurate juice sample and the use of an almond mallet or similar tool may be required.
- Any bias to collect only ideal-looking, larger clusters must be avoided. Not including clusters that are small or have rot or sunburn will not represent your actual harvested fruit.

Taking the time to understand your vineyard variability and grape sampling methods can help ensure accurate, representative grape samples that play a key role in your harvest decision-making.

Thanks to Quintessa Winery and Mumm Napa for the use of their fruit and lab for sampling photos and testing.

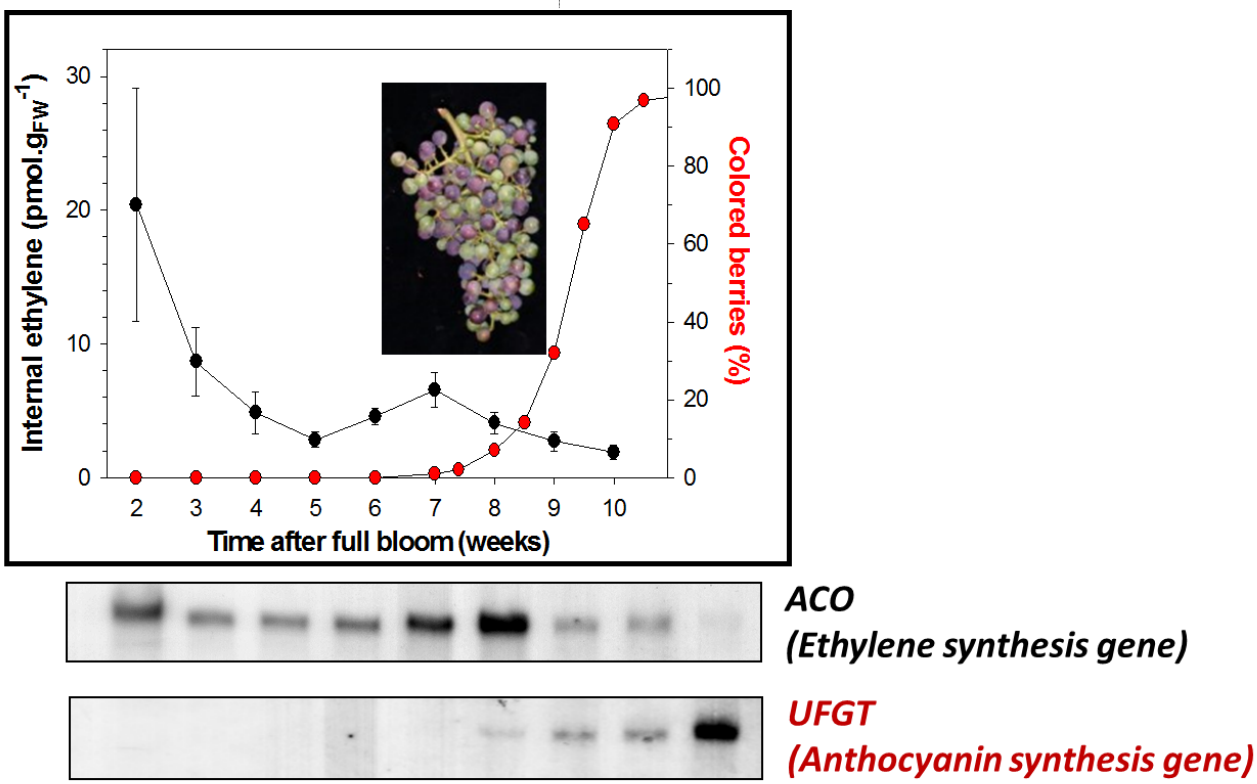
Pictured: Cluster sampling (left) and berry sampling (middle) can both be used effectively to track the ripening in your vineyard. However a bucket of clusters can be much more difficult to process than a bag of berries. A food mill (right) can be a useful tool for processing berry samples.

Factors Affecting Red Grape Coloration

Ashraf El-Kereamy, UCCE Kern County

Red, purple and black colors in grapes are due to the plant pigments, anthocyanins. After harvest, grape ripening will cease and no further color will develop, but anthocyanin degredation may occur during postharvest. Anthocyanins are derived from basic products of photosynthesis which are subsequently converted by enzymes to flavonoid and coupled to sugar molecules by other enzymes to yield the final anthocyanin pigments. Several enzymes are thus required to synthesize these pigments, each working in concert. Each enzyme is coded by a specific gene that controls one step of the pathway, leading to the accumulation of substrate for the following step until ultimately reaching the final product, the red pigment, anthocyanin.

Disruption in any of the mechanisms of these enzymes by genetic, environmental or cultural practices could alter anthocyanin production and grape coloration. For example, it is documented that a mutation in one or more genes in this pathway can change grape color. Similarly, reducing the expression of any of these genes results in a significant reduction in anthocyanin biosynthesis, and consequently, grape coloration. It is reported that activation or suppression of these genes is under hormonal control. For example, the plant hormones ethylene and abscisic acid (ABA) can be used as plant growth regulators at the commercial level for inducing the expression of several genes in this pathway, causing anthocyanin to accumulate in grapes. Other plant hormones



Grape Coloration and its coordination with ethylene and anthocyanin genes expression

such gibberellic acid (GA) and auxin are known for their antagonistic effects on ethylene and ABA action and consequently have a negative role on the anthocyanin pathway and red color accumulation in grapes. Plant cells produce hormones in small quantities to activate a specific pathway. Plant growth regulators are the commercial forms of these hormones. It is well established that under optimum management conditions cultivars differ in their response to a specific dose of one of these plant growth regulators (PGRs). Using the right concentration at the right application time and stage of development are the main factors that determine the success of using these plant growth regulators to obtain full coloration in grapes. Failure in doing so results in an undesirable effect and lower grape yield and quality. However, other vineyard management practices affect the vine response to the PGR treatments.

My studies on anthocyanin in grapes have demonstrated that grapes produce a small amount of ethylene at veraison which is required to induce the expression of genes involved in the anthocyanin biosynthesis pathway and start anthocyanin accumulation in red grapes. Factors that may affect internal ethylene concentration in grapes will affect the anthocyanin accumulation and grape coloration. Exogenous application of ethylene releasing compounds causes an increase in internal ethylene concentrations and thus activates the anthocyanin biosynthesis pathway. Conversely, inhibition of ethylene action suppresses the expression of anthocyanin biosynthesis genes thus limiting anthocyanin accumulation.

The other plant hormone well known for its role on anthocyanin biosynthesis is ABA. Many studies have shown than an increase in the ABA content of berries coincides with veraison and red color induction in grapes, and the application of ABA to grape at veraison also stimulated anthocyanin biosynthesis. Like ethylene, ABA is able to induce expression of anthocyanin biosynthesis genes and lead to the accumulation of red pigments in grapes. Commercial agrochemicals containing an ethylene-releasing compound or ABA as the active ingredient are regularly used in vineyards to improve grape red coloration. However, special attention should be given to varietal difference, timing of the application and other cultural practices during the application. Other plant hormones, such as Jasmonic acid (JA), have also been reported to stimulate anthocyanin biosynthesis.

The biosynthesis and action of plant hormones themselves are influenced by cultural practices and environmental variables and thereby significantly alter anthocyanin biosynthesis and grape coloration. In addition, other factors are involved in the grape response to either exogenous or internal hormone action. Sugars may interact with, or be required by, hormones such as ethylene and ABA. Furthermore, nitrogen and potassium can also influence grape coloration and must be managed carefully. For example, moderate nitrogen supply before bloom and moderate potassium during veraison may optimize anthocyanin and grape coloration. Excessive nitrogen and/or potassium negatively influence anthocyanin biosynthesis and grape coloration. Foliar potassium application can enhance grape anthocyanin accumulation and coloration. However, this reduces berry size and the mode of action is not clear yet, but it could be through osmotic stress responses.

Anthocyanin biosynthesis and accumulation in grapes is subject to environmental conditions such as temperature and water status. As a physiological process, anthocyanin biosynthesis increases with temperature to reach its maximum at 95°F. When daily temperature exceeds this level, anthocyanin biosynthesis is reduced and degradation is increased significantly causing poor red grape coloration. The negative effect of high temperature could be reduced by cultural practices and vineyard management that help in building a good early season canopy and through water management. Grape anthocyanin biosynthesis and accumulation are optimized when nighttime temperature during

...Anthocyanins continued on page 8

...Anthocyanins continued from page 7

ripening is below 73°F which is not always attainable in some subtropical areas of the world, including the Coachella Valley in California. Higher night temperature inhibits red grape coloration which is probably due to the hormonal changes that act against the activation of anthocyanin biosynthesis genes.

Finally, red coloration is a critical parameter for table grape quality and under hormonal control that is influenced by several factors. Nowadays, vineyard management includes using nutrients and supplements with different composition and different modes of action. Special attention should be given when using any of these compounds at the critical stage for anthocyanin induction and development.

Upcoming Events

San Joaquin Valley Grape Symposium

January 6th, 2016
At the C.P.D.E.S Hall
Easton, CA
For information and special needs accommodation, contact gzhuang@ucanr.edu

Vineyard Spotlight: Esca

Apolplexy or a severe Esca infection can cause the sudden dieback of entire shoots, as seen here in Cabernet Sauvignon. For a complete description of Esca symptoms and management, check out the UC IPM website: http://ucanr.edu/ipmesca

Pictured: Complete shoot dieback and fruit raisining caused by Esca and later bud push after shoot dieback at the Kearney Agriculture Research and Extension Center.

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Contact your local viticulture farm advisor or UCCE county office to be added to the e-mailing list or if you wish to receive a mailed copy.

Our programs are open to all potential participants. Please contact your local UCCE county office (two weeks prior to the scheduled activity) and/or the event organizer listed if you have any barriers to participation regarding accommodation.

Contact Us

Questions? Concerns? Follow up? Please feel free to contact us.

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In This Issue

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