

VINTAGE REPORT **Sonoma** 2017



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Introduction

The 2017 Sonoma Vintage Report was held on March 7th 2018 at The Vintners Inn Event Center in Santa Rosa, CA. This was the second year in which the Vintage Report had the opportunity to present in Sonoma County. The 2017 Vintage Report aimed to provide an engaging platform for winegrowers to share their experiences with the 2017 vintage, discover new technologies and research, and explore how this impacts future winemaking and vineyard management practices. The content of the conference was organized based on five stages of plant growth affecting viticulture and enological practices

Keynote Address: Rob Davis

2017 marked a year of extremes according to **Rob Davis**, Winemaker at Jordan Winery and Keynote Speaker at the 2017 Sonoma Vintage Report. Throughout Sonoma County, the early growing season saw record levels of rainfall with the total annual rainfall nearly doubling the average for the region. These extreme rains surpassed annual records going back over 100 years to 1904. Significant volumes of early season rainfall helped provide “fuel” for high levels of vegetative growth following bud break. Aside from high levels of rainfall in the early season, Davis pointed out that extreme weather patterns continued throughout the year in the form of repeated heat wave events. During much of the mid and late growing season, repeated extended heat waves created a high level of heat stress that was reflective of the 1996 vintage in Sonoma. These extended heat waves resulted in a high amount of aborted fruit throughout the county, with Chardonnay cluster weights down 23% from normal. Additionally, extreme heat impact on fruit performance was evidenced by an overall decrease in average yield (in tons per acre) in 2017: 20-30% in chardonnay, and 10-30% in cabernet. While the county as a whole experienced the effects of these unusual heat patterns, some vineyards performed better than others. Those with around 2 meters of soil for water retention tended to perform better than those with less than a meter. Davis noted that irrigation 24 to 35 hours prior to an extreme heat event proved to be effective for many vineyards, and that controlling excess cover crop helped reduce water stress. These repeated heat waves were detrimental not only to fruit quantity, but fruit quality as well. Many vineyards suffered from a lack of physiological maturity, as their fruit never truly achieved its varietal character. Davis reported that 2017 Chardonnay wines had very little aroma, heightened astringency, and high bitterness while Cabernets showed high red fruit, more bitter tannins, and elevated levels of methoxypyrazines. Many winemakers struggled to mask the problems that arose in the vineyard during the 2017 vintage. In response to this, Davis noted that cutting presses early and removing lees from ferments early helped to reduce bitter characters in many finished wines. Looking forward to the 2018 vintage, Davis imparted the symposium with a pressing question: was 2017 an anomaly, or is it indicative of what we can come to expect for future vintages in the face of a changing climate?



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Weather Impacts on the 2017 Vintage: Thibaut Scholash & Mark Greenspan

During the course of the 2017 Sonoma Vintage Report **Dr. Thibaut Scholash**, co-Founder of Fruition Sciences, examined trends in vineyard data and provided context to the various presentations delivered by the symposium's speakers. Scholash discussed some new scientific findings and their implications within the context of the growing season. Those inputs aim at providing practical insight on how to leverage scientific and technological advances to keep optimizing vineyard management decisions even under uncertain growing seasons. To begin the day's events, Thibaut delivered a discussion in conjunction with **Dr. Mark Greenspan**, President of Advanced Viticulture, Inc. Both presenters discussed the growing season in the context of the five-period timeline. This five-period framework can be described as the following:

Period One: spans from leaf fall until budburst;

1. Period Two: from budburst to the end of grand growth;
2. Period Three: from grand growth to veraison;
3. Period Four: from veraison to the end of sugar loading;
4. Period Five: from the end of sugar loading until harvest.

The following will be analyzed in the context of these growing stages.

Periods One and Two: Early Season Trends

During the 2017 season, Period One was characterized mostly by the high levels of rain that were experienced by much of Sonoma County. During this first period of the season there was a high degree of heterogeneity between appellations in total rainfall, but overall it was a notably wet year for the county. Regions with notably high levels of rainfall included Alexander Valley and Dry Creek, while Chalk Hill and Sonoma Coast experienced some of the lowest levels of rainfall. As a result of the high level of rainfall, a large amount of water was made available for Period Two, which extends from budburst until the end of grand growth. Due to high water availability during Period Two, shoot elongation was limited mainly by temperature, nitrogen availability, and disease pressure and not so much water deficit. **Greenspan** built onto this notion of non-limiting water supply during the early spring season by discussing the high levels of rainfall and subsequent soil water availability. He demonstrated that during the month of April, rainfall totaled 55" in comparison to just 30" the year before. As a result, many vineyards were able to maintain a higher overall relative soil water content through Period Two, where high rates of shoot elongation, dense canopies, and high mildew pressure were commonplace. Greenspan continued to note that this perceived high mildew pressure was likely caused in large part by fungicide resistance rather than seasonal conditions, as 2017 showed one of the lowest monthly average mildew indexes in recent years.



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Early Growing Conditions and Practical Takeaways

Before continuing into Period Three, Thibaut Scholasch delivered a presentation designed to provide practical take-home solutions to the growing conditions and associated problems that arose during the early growing season. To begin, the discussion moved toward the vintage effect on basal crop coefficient (K_{cb}) and how leaf area development interacts with nitrogen uptake dynamics in the vineyard. Basal Crop Coefficient (K_{cb}) is used to describe a plant's ability to transpire in a given climate. It accounts for plant water use only and excludes water losses from cover crop or soil. Basal Crop coefficient determines amount of daily water use, yield potential, and susceptibility to water deficit at a plant-scale. Growing conditions such as those in the early periods of 2017 tend to result in higher K_{cb} by fostering high levels of vegetative growth, which increases the amount of water that can be transpired per vine. During the 2017 vintage Sonoma County saw an average increase in K_{cb} of approximately 20% over 2016, which in the face of a non-limiting water and nitrogen supply sets the stage to reach higher berry volume and higher sugar per berry. In addition to discussing vintage effects on K_{cb} , the impact of the season on Nitrogen uptake time profile was also analyzed. On average, peak leaf nitrogen value is lower than 2016 while the "peak" value is reached earlier. Because of the uncertain evolution of nitrogen uptake dynamics in the context of warmer temperatures, Scholasch encouraged winegrowers to analyze leaf nitrogen variations as a time profile instead of using one single point. Understanding the dynamics of Nitrogen uptake will bring more clarity as far as when and how much Nitrogen a vine needs to accumulate in order to function in a sustainable fashion. As a result, vine nitrogen needs assessment will improve, which will in turn allow a more precise management of fertilization practices.

Period Three and Implications for Late-Season Trends

Continuing forward through period three, Scholasch proceeded to analyze environmental conditions and their subsequent effects in the vineyard. During the 2017 vintage, Sonoma County experienced the warmest Period Three on record. Between June 21st and July 21st of 2017, the average maximum temperature for the Dry Creek Valley was more than 3 degrees Fahrenheit higher than 2016. Period Three was characterized by frequent and brutal heat spells, with the most occurrences in Dry Creek, Alexander Valley, and Knight's Valley appellations. In contrast, Bennett Valley, Green Valley, and Carneros had some of the lowest rates of occurrence for heat spells during the same time period. Scholasch asked: "What are the implications of these extreme heat events? Can high levels of atmospheric demand disrupt ripening and reduce sugar accumulation rates?"

To provide insight into these questions, Mark Greenspan took the stage to discuss environmental influences on berry shrivel and ripening kinetics. Greenspan emphasized that after veraison, berries are fed primarily by phloem sap and that water loss can occur in berries via "backflow" into the vine. At the same time, high fruit exposure during high heat periods has a much larger effect in berry shrivel. While these negative effects towards the end of the ripening can be somewhat reduced by irrigating before a heat wave event, they cannot be eliminated entirely by water. Scholasch concluded that it is important to revisit canopy management practices for the future as heat waves, like those observed in 2017, are predicted to become more frequent.



2017 Ripening Dynamics in Sonoma: Nicolas Bernard (Presented by Thibaut Scholash)

Nicolas Bernard, Research and Development Manager with Vivelys, was slated to present his report on the dynamics of active sugar loading, berry volume evolution, harvest timing, and wine profiles during the 2017 vintage. At the last minute, Nicolas Bernard was unable to attend and Thibaut Scholash presented the main findings of Bernard's work.

Berry active sugar loading can be defined as the evolution of the level of sugar per berry from veraison onwards to the end of the season. As such, sugar per berry is composed of two factors: sugar concentration, and average berry volume. Although sugar loading is composed of two factors, a total of five characteristics can be accounted for to fully characterize and understand trends in sugar loading: loading duration, loading end date, rate of loading, maximum sugar per berry, and Brix at the end of loading. During the 2017 season, Sonoma County, Cabernet Sauvignon displayed a high level of departure from the sugar loading trends observed during the 2015 and 2016 vintages. On average, Sonoma County saw a shorter period of sugar loading, but at a much higher rate. The loading period was 31 days for 2017 compared to 36 for the two previous years, with a loading rate of 5.3 mg/berry/day in comparison to 3.1 mg/berry/day. Ultimately, the result of this short and fast sugar loading was a 25% higher level of sugar per berry for 2017 contrasted with the two previous years.

Additionally, 2017 saw a 1.6 degree Brix increase at the end of sugar loading over past seasons. Discussion was continued by analyzing trends in berry volume throughout Sonoma County. Over an average of nearly 900 analyses, berry volume saw a 30% increase in 2017 compared to 2016/2015. Despite these gains in total berry volume for the season, there was also a higher final loss of volume in the fruit by harvest time. Overall berry volume dropped 22% from maximum volume to final harvest volume in comparison to 11% for the previous two years. Interestingly, Pinot noir did not suffer the same fate of high deviation from norms that Cabernet did. During the 2017 Vintage, Pinot noir reflected a "classical" sugar loading curve with little difference from five-year averages. Max sugar per berry, loading rates, loading duration, and all other factors of sugar loading were representative of the 5-year averages. For Pinot noir's berry volume trends throughout Sonoma county, there was a higher degree of deviation from past years: 2017 saw a 20% increase in berry volume compared to 2016, with only a slightly higher than average final volume loss of 13% vs 10% the previous year.

Extreme Heat and the Impact on Ripening Dynamics

As illustrated in the 2018 Sonoma Vintage Report, heat waves and other weather anomalies can have far-reaching effects on sugar accumulation trends. Those effects are different for different varieties which ripen at different rate and periods throughout the year. In a follow up to these phenomenon, Scholasch asked: *“Are these effects isolated to only sugar accumulation? Do heat waves affect color accumulation, and if so how?”*. To provide insight for these questions, Scholasch presented scientific findings reported by Lecourieux and her research team in 2017. Their results examined the relationship between berry-level heat events and ripening dynamics. To investigate this relationship further, researchers applied heat treatments of +8°C to clusters starting 30 days after fruit set, continuing for 14 days. Berry exposure to higher temperatures resulted in **delaying the start of berry sugar accumulation along with an overall decrease in anthocyanin content compared to control treatments**. Furthermore, while sugar concentration was delayed due to the heat event, color accumulation was delayed even more dramatically. **Exposure to high temperature resulted in a wider “waiting” period between peak sugar and peak color**. Scholasch concluded that a delay in the start of sugar accumulation also reflect further delay in the accumulation of other grape compounds including acids, flavonols, and anthocyanins.

So what does this mean for winegrowers?

Overall, heightened temperatures during heat waves like those observed during the 2017 season, can result in a greater delay between peak sugar and peak color. Such delay enhances the decoupling between sugar and total anthocyanins accumulation. For some winemakers, such changes in berry ripening time profiles may delay further the timing of picking decision, particularly in situations where flavonoids- like anthocyanins- matter more than sugar. This insight will be helpful in adapting future growing and picking practices to a higher frequency of extreme heat events.



Winery Byproducts and a Nuanced Application of Wine-Based Flavonoids: Torey Arvik

Torey Arvik, PhD, of Sonomaceuticals and Whole Vine Products gave an “out of the box” presentation discussing wine flavonols and their possible uses outside of the wine industry. Arvik began by stating that typically, pomace is treated as a waste product and discarded or otherwise used for low-return purposes. However, many phytonutrients that are readily available in pomace are highly valuable for both nutrition and food industry applications. It has been well documented that chronic disease is often caused by dietary gaps, while developed societies tend to have lower dietary diversity and higher rates of those chronic diseases. Dietary polyphenols are an often understated key to good health, and grapes pomace is rich in these substances. Polyphenols in grapes vary widely, with different classes including anthocyanins, tannins, flavonols, and others. Of the flavonols, Arvik discussed kaempferol, which as a bioavailable phytonutrient has been shown to have antioxidant and anti-inflammatory properties. In addition to the nutritive value found in grape polyphenols, there is a high degree of value in their utility as food additives. Despite the more obvious value as natural red food coloring, grape phytonutrients have also shown promise in shelf life extension of food products. In one example, phytonutrients added to basic white bread were shown to increase the shelf life by up to three days. This could potentially lead to a substantial reduction in food waste if such measures were imposed by a major manufacturer. At the end of the discussion, Arvik delivered his take-home message: phenolics found in pomace are immensely valuable for variable uses, but are often discarded due to the winemaking process. Finding a way to utilize a product that is otherwise treated as waste can have far-reaching impacts with many different applications.

Notes from the field and cellar: Byron Kosuge

Byron Kosuge, a Sonoma County consultant and esteemed pinot noir grower, delivered a presentation discussing his observations and practices throughout the challenging 2017 growing season. Kosuge began by outlining his remarks from the field: early in the growing season, there was a notable high level of vigor compared to normal conditions. The early season vigor resulted in large, difficult to manage canopies throughout many vineyards. However, pinot noir fared well in Byron’s expertise: a relatively mild August resulted in nearly ideal ripening conditions for early-ripening varieties. For later ripening varieties, the season did not fare as well. He proposed that 2017 wines sorted themselves into three distinct groups. First, early-harvested fruit that was removed before September 2nd experienced near-ideal growing conditions, with smooth and gradual sugar accumulation and slower accumulation of secondary metabolites. The wines produced from that fruit were notable in their fresh flavors and balance, with only a few samples showing a slight indication of under-ripe tannins. The second group, fruit harvested between September 2nd and 10th experienced physical damage characteristics such as berry shrivel and dehydration, without much notable degradation to the fruit flavor. Finally, fruit harvested after September 10th typically had higher levels of physiological damage, without as many indicators of physical damage. **These vineyards showed higher effects of delayed ripening, with an evident decoupling between sugar and color.** In many cases dehydration was evident due to delayed harvest decisions in favor of flavor ripeness, but overall results varied.



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Smoke Taint in Grapes and Wine

A vintage consistently challenged by extreme weather events, the 2017 vintage in Sonoma County will most certainly be remembered by the historically destructive wildfires which flurried through the region in early October. As the final presenter of the 2017 Sonoma Vintage Report, Dr. Eric Hervé, PhD. of ETS Laboratories, presented on his latest work, on smoke taint studies carried out by the ETS team since the California fires of 2008.

Research on smoke taint in grapes began in both Australia and British Columbia after a series of fires impacted the 2003 vintage. The research done from 2003 to 2007 revealed that volatile smoke compounds were indeed absorbed by grapes and leaves, and eventually became in a large part bound to sugars (they become “glycosylated”). The main issues with glycosylated compounds is that they are odorless and easily evade sensory detection. During fermentation, however, they are partially hydrolyzed (freed from their sugar moiety), which can cause smoke taint to appear in wine. For this reason, the industry needed markers for grapes that could be analyzed in the lab to estimate the risk of final wine smoke taint. These marker compounds that can be analyzed, by labs such as ETS Laboratories, are guaiacol and 4-methylguaiacol. To the experience of ETS Laboratories, reportable levels of free guaiacol in most grapes indicate some absorption of smoke volatile compounds, with higher levels meaning an increased risk of smoke taint materializing in wine.

Analyses run after fires in California during the 2015 vintage confirmed the empirical guidelines for interpreting grape tests outlined in 2008, and revealed guaiacol concentrations in final wines that were 3 to 5 times higher than the concentration measured in the original grapes.

Results from the 2018 vintage showed that, probably due to the late timing of the fires and less glycosylation happening inside senescent grapes, final concentrations of free guaiacol in wines were only on average 1.6 times higher than the concentrations measured in grapes at harvest. In other words, the risk of smoke taint appearing in wine appeared lower than would be the case when fire events happen earlier in the season.

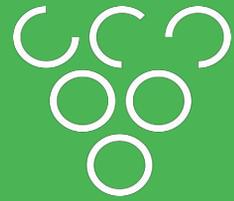
With regard to mitigation of smoke taint, Dr. Hervé highlighted that data showed washing the grapes and reducing the maceration time for red wines did not help reduce smoke taint. For future events involving smoke, two actions to try and mitigate smoke effects include limiting the number of leaves that make it through sorting, and keeping grapes separated into small lots through fermentation. Unfortunately, once smoke taint appears in wine, there is no exact remediation option available. Vintners across the world will continue to face the challenges of what to do with smoke tainted wine. Dr. Herve’s presentation ended with the concept that there is no perfect solution to this issue.



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In Conclusion

The 2017 Sonoma Vintage Report followed the growing year from budbreak through harvest. Discussions during the day covered topics from technical presentations from the region's top scientific minds and anecdotal experiences of growing grapes and making wines from some of Sonoma County's most respected practitioners. Additionally the symposium covered a broad range of topics including the scientific discussion surrounding the alternative uses for grape pomace and analytical results of smoke taint from the October firestorms. Overall, the 2017 vintage in Sonoma County was characterized by heavy rainfall in the winter months, followed by a dry late spring and summer alongside a high frequency of extreme heat events which occurred throughout the summer. High rainfall during the early season led to high levels of soil water availability, driving higher crop coefficients, more sugar per berry, and earlier water stress. Fruit ripening dynamics were likely slowed by the extreme temperature conditions during the middle of active sugar accumulation, and for many growers this delay in sugar and color accumulation resulted in a delayed harvest date. Moving into 2018 vintners across Sonoma County will continue to monitor the effects of smoke exposure on 2017 wines. Additionally it will be essential to further adapt practices to mitigate the effects of possible frequent and extreme heat events.

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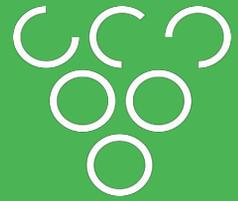
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What is the Vintage Report?

The Vintage Report brings together scientists, winemakers and industry leaders from all over the world to produce a one-day seminar that engages open minds within the industry to discuss the previous harvest in light of the most recent scientific findings and newly available data.

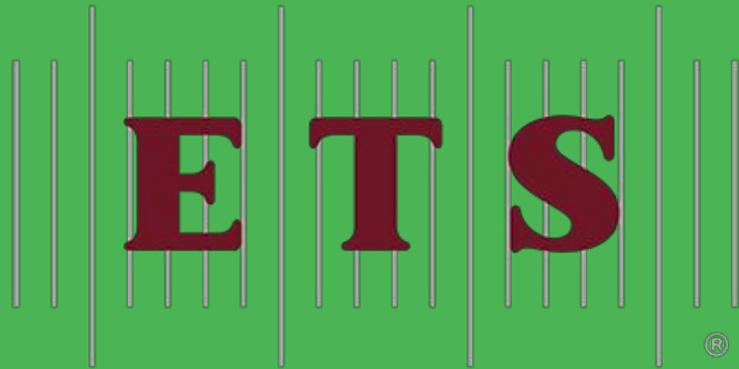
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