JULY 2022 WINE BUSINESS MONTHLY TASTING ROOM STUDY + AUTOMATION IN VINEYARD

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Automation in the Vineyard and Technology in the Tasting Room

T.J. ROGERS, FOUNDER AND CEO of Cypress Semiconductor, operates Clos de la Tech Winery in the Santa Cruz Mountains with his wife Valeta Massey. Long time *WBM* readers may remember that Rogers helped design, build and pay for the wireless fermentation system over at the UC Davis Experimental Winery. It's an ideal system for trials with 200-liter electro-polished, stainless steel fermenters, automated temperature control, a built-in system handling pump-overs, and sensors transmitting data every 15 minutes.

Rogers has a similar rig over at Clos de la Tech, where he specializes in Pinot Noir. Now a trial being conducted at Clos de la Tech is looking at a drone's ability to spray a vineyard autonomously. Drones have their limitations but in tests, the drone spray concept was viable, and provided better coverage than traditional backpack spraying where vineyard workers walk the rows of vines, manually spraying them. In one test, a drone was able to spray half an acre in 15 minutes on a single set of batteries, using a three-person crew.

Is drone technology ready to replace manual spraying and save on labor costs?

Mark Greenspan discusses a variety of plant stress measurement devises and soil moisture measurement devices this month. Will practitioners ultimately phase out the use of pressure bombs and porometers in favor of the microtensiometer for plant stress?

And, speaking of plant stress, it's been hot—really hot. In this issue, Christopher Chen, newly appointed integrated vineyard systems advisor for the University of California Agricultural & Natural Resources Extension program, discusses extreme heat events, and—thankfully—strategies for mitigating the effects of heat waves.

On the winemaking side, molecular-imprinted polymers are a new tool for dealing with smoke-exposed grapes, although they're still being used on an experimental basis. This issue also includes winemakers discussing barrel régimes for small lots in possibly smoke-exposed grapes.

Last but certainly not least, we present results of *WBM*'s 2022 Tasting Room Survey, which shows that a focus on technology has paid off with an increase in online website sales, virtual tastings and tasting room visitation. Wine club attrition remained historically low, reflecting positive attitudes toward supporting smaller businesses and finding small luxuries. How long this lasts is anyone's guess, but the industry is enjoying it while it lasts.

Cyril Penn – editor

WINE BUSINESS MONTHLY
July 2022 • Volume XXIX No. 7

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Wine Business Monthly is distributed through an audited circulation. Those interested in subscribing for $39/year, or $58 for 2 years, call 800-895-9463 or subscribe online at *subs.winebusiness.com*. You may also fill out the card in this magazine and send it in.

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COVER PHOTO: Jordan Vineyard & Winery
COVER DESIGN: Joan Olson

Wine Business Monthly (ISSN 1075-7058) is published monthly by Wine Communications Group, Inc., 584 First St. E, Sonoma, CA 95476. Subscription rates are $39 for domestic; US$49 for Canadian and US$89 for foreign subscribers. Periodicals Postage Paid at Sonoma, CA, and at additional mailing offices. POSTMASTER: Send address changes to: Wine Business Monthly, 584 First St. E, Sonoma, CA, 95476.

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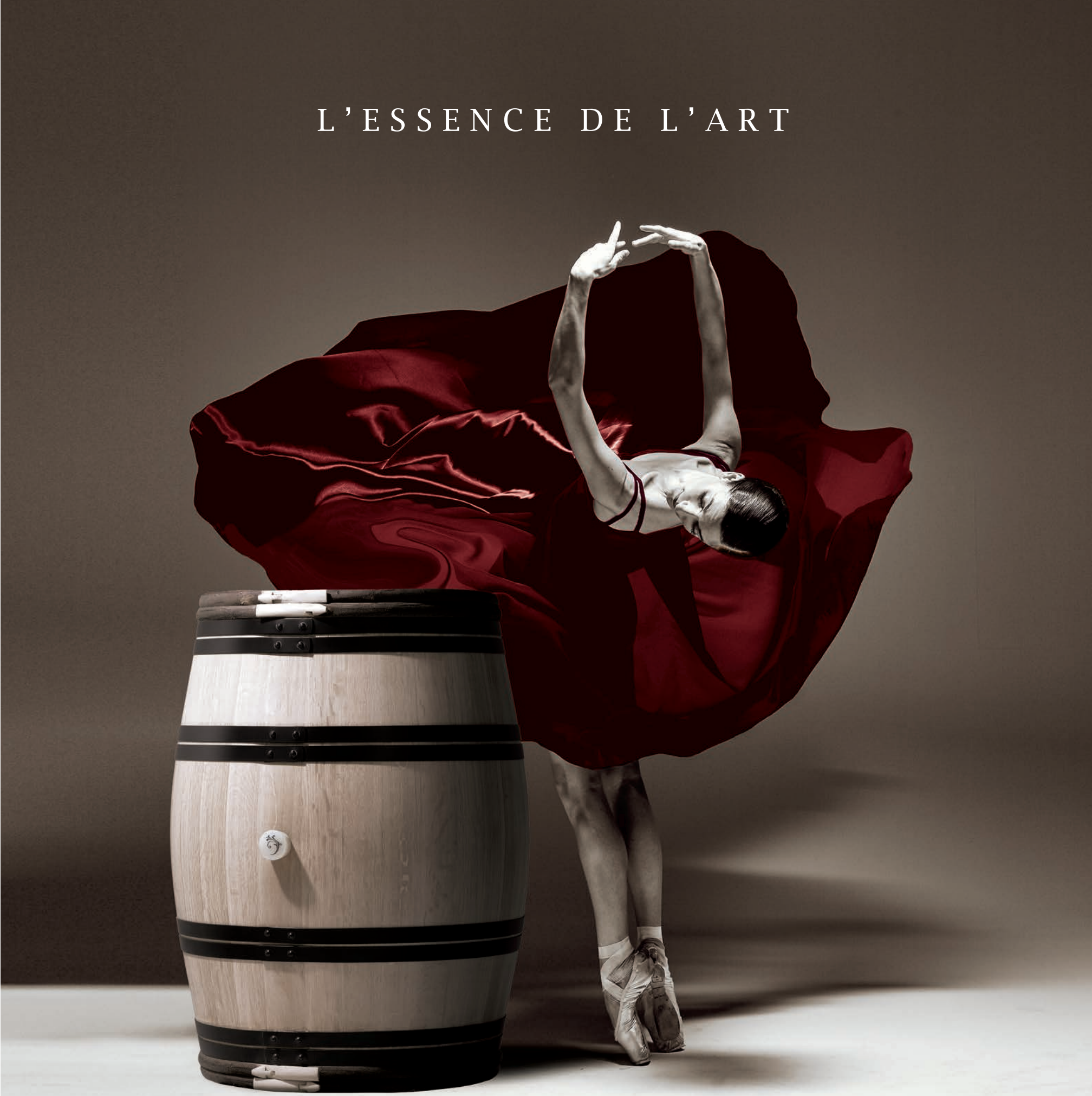

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Top Stories from WINE BUSINESS.com – In Case You Missed It

UC Davis to Build New, $5.25M Greenhouse to Protect Grapevine Collection from Red Blotch

A new, $5.25 million greenhouse is being built on the University of California, Davis, campus to safeguard grapevines from red blotch disease and other pathogens. The 14,400-square-foot greenhouse will have a vestibuled entry, be insect-proof and provide another level of disease protection. It is being spearheaded by Foundation Plant Services (FPS) which provides the industry with virus-tested grapevine plant material. FPS has maintained healthy grapevine planting stock on the UC Davis campus for more than 70 years in open fields at the Classic and Russell Ranch foundation vineyards. FPS scientists first detected grapevine red blotch virus at Russell Ranch in 2017. By 2021, an estimated 51.6 percent of the crop there was infected. Material from that vineyard is not being sold, and the site is now part of an epidemiological study to try to pinpoint how the disease is transmitted. FPS pathologists have detected red blotch on less than 1 percent of the Classic vineyard crop. But it may not always be that way in the future.

Once the greenhouse is operating, grapevines propagated from plant material from the Classic vineyard will be moved into the greenhouse, tested and verified as clean from disease. From there it will be sold to nurseries, which will grow additional plants to sell to growers. FPS plans to build another greenhouse in the next two to three years to increase capacity. Industry groups and FPS identified greenhouses as the best way to protect the plants from red blotch and other pathogens transmitted by insects. They are also consulting with those same people on the grape varieties to include in the greenhouse. The first greenhouse is expected to be finished by the end of 2023.

Washington Wine Industry Launches Sustainable WA Certification Program

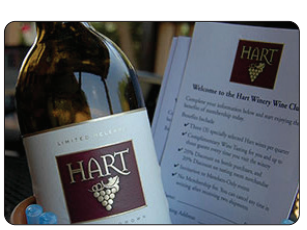
The Washington wine industry launched the state's first statewide certified sustainability program for winegrapes. Sustainable WA will begin certifying vineyards this summer. To achieve certification, growers must commit to sustainable vineyard practices and pass a third-party audit to ensure operations meet established standards. After initial certification, Sustainable WA vineyards require an audit every three years during which continual improvement must be shown. The program offers certification for vineyards with plans to add certification for wineries in the future. Wineries may utilize the Sustainable WA logo on wine labels to signify the wine is made with certified grapes.

TTB Approves West Sonoma Coast AVA

The West Sonoma Coast Vintners hailed TTB's approval of the newly established West Sonoma Coast American Viticultural Area (AVA). The West Sonoma Coast AVA is located within the westernmost portion of Sonoma County, holding approximately 50 vineyards planted with varieties ranging from Pinot Noir and Chardonnay to Syrah. West Sonoma Coast is the 19th AVA in Sonoma County. The AVA is located on the furthest western sliver of Sonoma County encompassing the steep, mountainous terrain along the Pacific Ocean coast. The AVA comprises three sub regions from north to south: Annapolis, the Fort Ross-Seaview AVA and Freestone-Occidental. The Pacific Ocean forms the western boundary of the AVA, and the shared Sonoma-Mendocino County line forms the northern boundary. The eastern boundary follows a series of elevation contours within 5 to 7 miles of the Pacific Ocean while the southern boundary is marked by the northern boundary of the Petaluma Gap AVA.

Rippey Family Purchases Clarksburg Winery and 100-acre Vineyard

The Rippey family, owners of Carneros Vintners, Lodi Vintners and Rippey Family Vineyards, announced the acquisition of a winery facility and 100-acre vineyard in the Clarksburg area of California. The property was previously owned by another Napa winemaking family, The Baldacci family, and was home to California Cellars. The vineyards are planted to Chardonnay and Pinot Noir. With this investment, the Rippey family has further expanded their portfolio of vineyards and wineries in Northern California, adding to holdings in the Lodi, Napa and Sonoma areas.



Halter Ranch Announces Acquisition of Hart Winery

Halter Ranch Vineyard and Winery in Paso Robles, California announced the acquisition of Hart Winery in Temecula, California. The sale includes its 8-acre vineyard, winery, and tasting room located in the Temecula Valley Wine Country AVA. The winery was founded in 1973 by Temecula Valley wine pioneers, Joe and Nancy Hart. The estate-grown vineyard includes grape varieties of Sauvignon Blanc, Roussanne, Syrah, Cabernet Franc, Cabernet Sauvignon, Merlot and Tempranillo. Halter Ranch is a vineyard and winery situated on the west-side of Paso Robles on California's Central Coast. Founded in 2000, the ranch spans over 2,700 acres, with 200 acres of winegrapes, 15 acres of walnuts, and 17 acres of organically certified olives. **WBM**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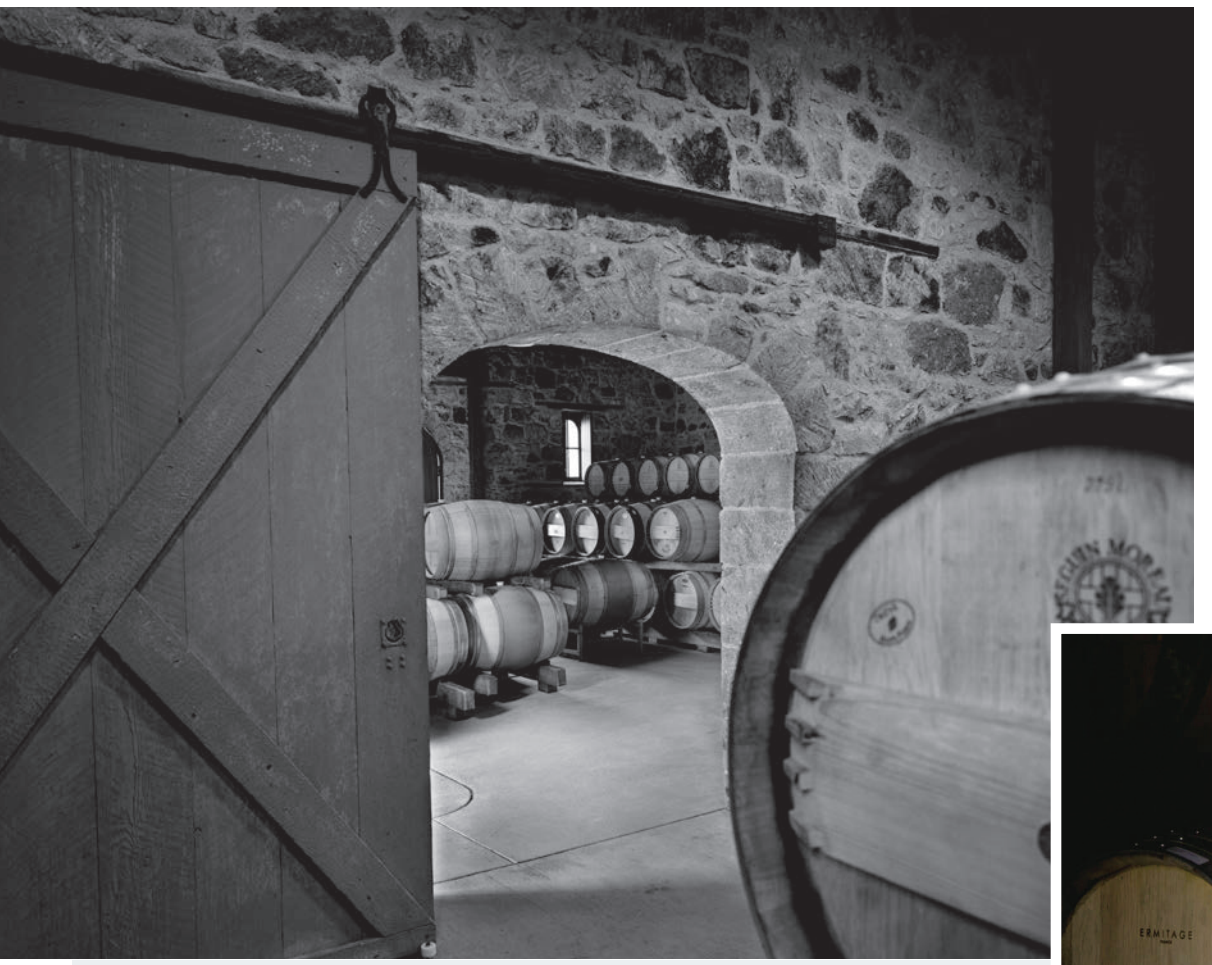
Ultra-Premium Winemaking: Barrel Regimens End Up Just as Nuanced as the Wine Inside

W. Blake Gray



Kraft Cellar Barrel Room, Spottswoode Winery

THERE IS NO UNIVERSAL theory right now for high-end wineries' barrel regimens. Shafer Vineyards and Spottswoode Winery are proof of that.

Shafer and Spottswoode are Napa Valley royalty: both make consistently great wines, both get high scores, and until February, when Shafer was sold, both were run by their founding families. Their winemakers are highly respected. Any serious Napa Valley Cabernet fan has had both.

But when it comes to barrels, they could not be more different.

Elias Fernandez, winemaker at Shafer since 1994, has gone all-in on modern barrel technology. He is one of the best customers of a cooperage that purports to eliminate barrel-to-barrel variation by computer-controlling the toasting temperature. Fernandez wants his barrels to be uniform, the better to let the wine tell its own story.

Aron Weinkauf, winemaker at Spottswoode since 2011, buys barrels from more than 20 cooperages, both because he likes variation and he likes supporting small artisanal producers. He buys in advance and ends up using the barrels that he thinks will best supplement what the vineyard gives him each vintage.

"Isn't it the normal joke: you ask six winemakers how to make wine, and you get six answers," Weinkauf quipped.

Wine Business Monthly wanted to discern what trends there are in barrel regimens. We learned that there are a lot of improvements in the barrel industry, giving wineries more and better choices than ever. Heavy toast is out of favor with many high-end wineries. But otherwise, there

ROBB MCDONOUGH

Aron Weinkauf, Spottswoode winemaker and vineyard manager

It's one thing to be able to accurately taste and identify flavors in a heady glass of wine. It's another thing altogether to deliberately put them there to begin with. StaVin's vast array of barrel alternatives give the discerning winemaker a veritable mixing board of subtle flavor controls. With lusciously abundant savings in operating costs.

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does not appear to be one universal philosophy for the simplest reason of all: wines are different from place to place.

For example, Chris Peterson is the winemaker for three high-end wineries in Washington: Avennia, Passing Time and Liminal. Avennia makes Bordeaux- and Rhône-style wines from vineyards around Washington. Passing Time, the brainchild of retired NFL quarterbacks Dan Marino and Damon Huard, is mostly a Cabernet house. Liminal makes mostly Rhône-style wines from a windswept vineyard at the top of Red Mountain.

"We use a lot of Ermitage and Gamba (cooperages) for Avennia," Peterson added. "There's some Gamba in Passing Time too. Some people think it's high impact. But we use a little less new oak than other places, so it works for us. Gamba the first year is just brutal: the tannins it brings. And then the second year, it just sings. Every time I did the trial, the G7 from Gamba tasted perfect for Passing Time. It's hedonistic; it has flashy fruit and structure. But when I tried it for Avennia, I didn't like it at all. A lot of what we do (at Avennia) is old-vine, not warmer sites."

Changing Times, Toasts

Peterson is one of many high-end winemakers who has moved away from heavy toast levels.

"A couple friends recommended heavy toast as a spice," Peterson said. "I just declassified it every time because of the mouthfeel. You think of it as a little bit of smoke and spice. But the texture was all wrong. It's like the fruit is not as generous. Medium-plus is our go-to. It keeps the fruit in, but it really gives you that rich oak flavor that's delicious."

We were interested in learning if winemakers are changing their barrel choices because of the threat of smoke taint. If they are, they aren't talking about it. Other changes to high-end wines may happen because of the threat of smoke: it will be interesting to see how many wineries harvest earlier. But so far no one has demonstrated a way to use barrels to minimize the impact.

"We haven't taken fire into account in terms of our barrel purchasing," explained John Conover, managing partner of PlumpJack, Cade and Odette Estate wineries in Napa Valley. "Maybe we're the ultimate optimist. Some people made 2020s. We just chose not to. For us, it was the right decision. A barrel is smokey by nature, especially the ones we buy that are bent using fire. But with smoke in the barrels, it's very controlled. There is always a smokey character in a good bottle of wine. From a wildfire, though ... that smoke character from a fire and a barn burning and a house and a car burning is very different from the smokey character of a barrel."

Conover said that his wineries' barrel use has changed immensely in the last 25 years. Like Peterson, he buys different barrels for the different wineries even though they're all in Napa Valley and primarily Cabernet houses. But Cade is on Howell Mountain while PlumpJack is in Oakville, and Odette Estate is in Stags Leap District.

ROBB MCDONOUGH

Spottswoode Winery with CCOF sign in vineyard

"If you look at Cade, which is naturally more tannic and has more natural grape tannin, we generally use barrels that have a lower tannin profile and more aromatics," Conover told *Wine Business Monthly*. "PlumpJack is a 32-acre estate. We pick the estate 18 different times, so there's 18 different vineyards within a 32-acre estate. We're on an alluvial fan. The east side is very different from the west: the east has a lot more rock while the west has a lot loamier soils. They take dramatically different barrels."

Conover said that it's necessary to learn the different styles of each cooperage.

"One woman's medium toast is another's light is another's heavy," Conover noted. "You have to get to know them."

Cory Empting, director of winemaking for Harlan Estate and BOND in Napa Valley, said that when he also started working on the Harland family's Promontory Winery, he learned that the different site required a very different approach.

"Promontory doesn't go in barriques and 60-gallon barrels," Empting told *Wine Business Monthly*. "It ends up in much larger casks for the vast majority of its aging. It's quite different, but that's the difference in the soils we have there. It's a wine that has so much structure that we felt like we didn't want to have any influence of the barrels. We just needed time."

Promontory is released after four and a half years of aging, a full year later than Harlan Estate, which is now made in lighter toast barrels than in its early years.

"The biggest change for us has been moving more and more toward dry-farming," Empting said. "The wines themselves started to evolve. When you're dry-farming and you're not cultivating, you end up with higher natural acidity. You end up with lower accumulation of Brix. You're not extracting as much from the barrel. When one thing changes like that, you need to address everything. (The wine is) both grounded and at the same time graceful from a very young age. The need to age longer isn't really there. There's plenty of concentration that comes from these east-facing slopes. We don't really need the barrel to bring a lot of texture and tannin."

THOMAS HEINSER

Spottswoode estate house

Which is More Important: Variety or Forest?

Grape variety plays a huge role in which barrels are selected. Dave Lattin is winemaker at Emeritus Vineyards in Sonoma County's Sebastopol, where he mainly makes Pinot Noir.

"Our style is not an oaky style of Pinot Noir," Lattin told *WBM*. "We're 100 percent estate. We're dry-farmed. We harvest at lower sugar so we have lower alcohol. What we look to our wood for is to provide additional tension but not to be overt. We don't want vanilla character or smoke. We're trending toward lighter and lighter toasting."

According to Lattin, there's a difference in barrels that are bent with fire and barrels bent with water; he says the water-bent barrels impart less oak character.

"We have two fire-bent coopers and one water-bent," Lattin stated. "With the water-bent, the purity of aroma and flavor from each of the forests is very clear and precise."

Some high-end wineries are moving away from choosing barrels based on the forest of origin, but Lattin likes the forest specificity.

"We are huge fans of the forest Vosges," Lattin said. "Because of the style of wine we're making here, we night pick, we native ferment, we're really dialed into each pick. The Vosges provides structural concentration without overwhelming the fruit. That's a trend: Less Allier, more Vosges. Over the years, we've gotten lighter and lighter toast. We just keep pushing the envelope lighter and lighter. The coopers are surprised at how well it works for the wines we're making: providing midpalate structure and concentration, but without overt woodiness. It might provide a sappy resin but not an oaky, smokey, caramel kind of thing."

Lattin noted that when he made Cabernet Sauvignon in 2011, he used heavier toast barrels to neutralize some of the pyrazines from a cool, rainy vintage.

"A heavy toast barrel is a little sweeter. There's a remedial feel to it," Lattin said. "But I wouldn't go there because of our style. We don't look at our barrels as a remedial tool. We're 100 percent estate, so presumably, our fruit is as perfect as we could get it. If we were making wine from a lot of purchased fruit, I would want more medium-toast and heavier-toast barrels in our arsenal."

Getting to Know Your Cooper

Lattin buys 150 barrels a year but has stayed with the same three family-owned cooperages.

"Every now and then we're tasting with the coopers themselves, and they'll say, 'This can't be our barrel.' But it is," Lattin said. "You think about how many pieces of wood go into a barrel. There's species diversity within each stand of trees in the forest. You're going to get the occasional barrel, even if it's from Tronçais or the Vosges, that's uncharacteristically high in tannin. I think there's less variability at the lighter end of toasting. It's the reaction of each stave to heat that might overreact. One stave might char and give you more vanilla and char character."

Variability in barrels is something Shafer's Fernandez does not want. With so many environmental factors essentially uncontrollable, barrels are something he can control.

"Coopers are like winemakers. They all have their own idea of what a barrel should be like," Fernandez observed. "During the 2000s to around 2010 on, there was more work being done on individual stave selection by tannin. One company that I'm particularly high on is Vicard Generation7. They're computerized-made barrels. They have selected staves by tannin. They're doing it with controls and measurements versus the human factor of looking at the toasting process and trying to measure the heat from the outside. It's like what happened with cork. There's a lot of variability, doing it the old-fashioned way. Today they have technology to get the tannin level fine-tuned. You can buy a barrel with high tannin level and choose the temperature you want it made at.

"Tannin level in the barrel obviously impacts the wine tannins," Fernandez added. "In some cases, it can slow the oxidation process down. In other cases, it can expand the body. Not every tree is the same, and not every vintage of tree being harvested is the same. They can fine-tune it with technology. It's much more fine-tuned than the human eye."

Christy Thomas, business development manager for Vicard Generation 7, said Fernandez is one of the cooperage's best customers because he appreciated the idea of reducing barrel-to-barrel variation right away.

"Once we figure out what somebody wants, it's easy to make them every barrel the same," Thomas explained. "Barrels are called the spice cabinet. My boss was in Argentina, and he was working with a winery that said, 'I need barrel variation. My wine is monolithic, and we need the barrel variation to make it more interesting.' I had one winery tell me our barrels are boring because they never vary."

Thomas said that in France, Domaine Romanée-Conti, Château Latour and Château d'Yquem all now buy their barrels based on tannin selection.

She said that the French National Forest Office (ONF) has discovered that different compounds are found at different levels for wood from the same forests.

"We sort our wood by low, medium and high tannin," Thomas continued. "Imagine if you were buying barrels by grain selection and both barrels were high grain, but one had a low tannin load, and one had a high tannin load. The winemaker will ask, 'Why are these barrels so different?' By controlling the tannins, we're controlling the toasted notes. We're also controlling the lactones, which contribute fruity notes in wine. If I said to most winemakers, 'You're going to age your Cabernet in wood for a long time: what kind of barrel do you want?' most might say very fine-grain wood. Very fine-grain wood has almost no tannin. You need the opposite. You need those tannins there for freshness and vibrancy."

Spottswoode's Weinkauf believes that the cooperage industry has improved from top to bottom over the past 15 years, and that has led to him buying from more coopers.

"We believe in having multiple cooperages for the spice rack in the winery," Weinkauf told *WBM*. "Being a small winery, I did not want to put all of our money into the larger entities. We wanted to put some money into small businesses to help keep them alive. We wanted to have 12 to 15 cooperages. But we ended up liking everything, so we have more than 20 cooperages. It is a lot to manage. But I'm going to find whatever I think for my style is the best barrel from each producer."

Weinkauf said he has evolved from buying multiple types of barrels from fewer cooperages, to buying one type of barrel each from many cooperages.

"I always liked the old Heitz model of buying your barrels after your vintage," Weinkauf explained. "But we don't do that. We put our orders in at

the start of the year before bud break. There's enough consistency and reliability that we can match everything up. I always keep extra new wood and extra old wood. If we want to be higher in new oak percentage or lower one year, we can do it. Most of the time the focus on reds is medium to medium longs. I definitely like a slightly lower temperature flame and a slightly longer toasting, but I'm never 100 percent in on anything. I like the spectrum. Some years your core wine has less structure, less mid-palate. Maybe you have a year where it's big, thick, concentrated, and the wine is going to be more robust and overshadow the barrel. Then you have some barrels that extract out slowly or integrate slowly."

In Virginia, Rutger deVink is 15 years into his project of trying to build the state's first great estate winery at RdV Vineyards.

"At the very beginning, the learning curves were steep and fun," deVink admitted. "As we get more familiar with our site, we get more nuanced with the details. We replicated the Bordeaux model when we started. I had worked at Bordeaux and so had (winemaker) Josh (Grainer). We copied what they did. What we are doing now is working with a number of cooperages to get barrels that are more appropriate for us."

Grainer and deVink have settled into telling the cooperages what kind of effect they want to see on the wine and letting the cooperages choose how to do it.

"You have to get to a common language," Grainer said. "That's one of my caveats: how well do I communicate with the cooperage? When we talk about linearity versus breadth in the wine, or bringing more austerity or bringing more sweetness, or different tannin profiles, or how the fruit is displayed in the body of the wine and on the finish, we don't tell the cooper, 'We want the medium long-toast.' We let the cooper come up with that. It's their craft: this kind of stave or this kind of toast level. When we talk about aromatic profiles, we want it to be underneath the fruit.

"We want to bring a little bit more austerity to our wines," Grainer added. "The Bordelais traditionally have pretty austere fruit character compared to California or the West Coast. What we've found with our fruit in Virginia is we have a little more fruit-forwardness than Bordeaux but less than California so how do we steer that ship? Do we want more body in the mid-palate or do we want it more coiled for the finish? We've built relationships based on our trips to the cooperages and to Bordeaux. Now they come to our cellars, and we do tastings. There's no magic barrel. There's not one best one. It's how they complement each other."

The focus on results rather than the components of the barrels themselves is also something winemaker David Ramey has come around to after four decades in the business. He said the biggest change he has made is using less and less new oak, especially for his Chardonnays. And about that new oak, he defers to the experts.

"I am, in many cases, a contrarian," Ramey admitted. "I don't talk about toast levels. I deal with two coopers that I have dealt with for 40 years: François Frères and Taransaud. I tell them what the wine going into the barrel is. I don't tell the coopers how to make barrels. They have been making barrels their entire lives. Jean Francois makes all the barrels for DRC. Jean Francois doesn't tell me how to make wine, and I don't tell him how to make barrels. When the barrels are delivered, the winemaker can't tell by looking at the barrel. It's based on trust. It's the cooper that matters. If you find a cooper that you like, stick with it." *WBM*Production. Springer Science & Business Media. **WBM**

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Understanding the Complex Relationship of Smoke, Grapes and Wine: An Update

Richard Carey

WITH THE POSSIBILITY OF up to 500 individual added compounds being dropped in on the thousands of compounds already in wine, the influence of smoke on grapes and wine is one more example of the beauty and the curse of wine enjoyment and its production. The interrelationship of these elements in the production process may be one of the more difficult processes, with the resultant chemical reactions, to control. However, it is similar to other processes and chemical reactions that we have dealt with in the past. We all know about the subtlety of oxidative and reductive reactions in wine when threshold levels are involved. At times, the levels of the reactions add complexity, but with increased activity or concentration, they are defects. These compounds are part of wine at all times, and the thousands of compounds of wine work synergistically with one another. Our job, as winemakers, is careful management.

Key researchers around the world are working at top speed to understand these fire, smoke, vine and wine interrelationships to develop plans and procedures for mitigation, prevention and control of unwanted levels of the degradation products from combustion. A wide variety of data is available from around the world, from South Africa's Stellenbosch University, to the Australian Wine Research Institute (AWRI), which is working on fire issues with respect to grapes and wine, as well as universities all over Europe. Each of these institutions has valuable information on their research results.

In this country, three universities are conducting the majority of research on smoke in grapes and wine: University of California Davis, Viticulture and Enology Department; Oregon State University's Department of Horticulture's Viticulture and Enology Program; and Washington State University. Each of these universities has content about these issues on their respective websites. There are links to these websites in the reference section at the end of this article. There are also a number of local community colleges in fire-impacted areas that are involved as well.

At the Unified Symposium last January, there were two sessions on smoke and grapes, one focusing on the impact of fire and smoke on the vineyard that was moderated by Alisa Jacobson from Turning Tide Wines, with panel members Elizabeth Tomasino and D. Cole Cerrato Ph.D. from Oregon State University, and Tom Collins from Washington State University. The panel for the winery portion was moderated by John Trinidad of Dickenson Peatman & Fogarty, with panel members Mike Boer of Grow West California, Kristine Fox from Pan American Insurance Services and Cooperative Extension Specialist Anita Oberholster Ph.D. from UC Davis.

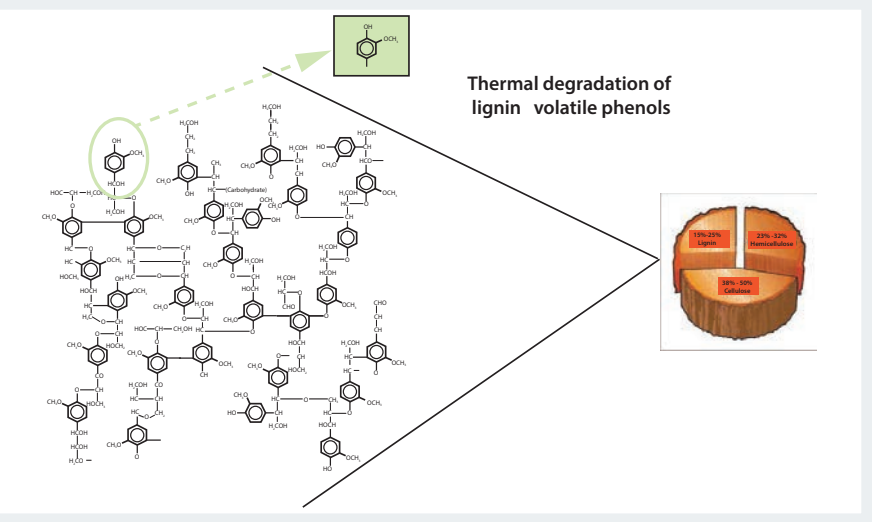
In April, there was a symposium at the University of California Davis titled Evaluating Impact of Grape Smoke Exposure: Best Practices that was moderated by Oberholster. Panelists included: Alisa Jacobson, Turning Tide Wines; Kristin Belair and Ashley Egelhoff of Honig Vineyard & Winery; and Bertus van Zyl, Belong Wine Co.

This article is a compilation of these recent presentations.

Aerial View

To understand the problems and processes involved with fire and smoke impact on grapevines, it is important to start with the environment that produces the unwanted effects on the vines: the aerial space around the vines.

Woody plants in the path of forest fires near vineyards are composed of 20 to 25 percent lignin. The pyrolysis of the lignin is the source of the volatile phenols (VPs) that enter into the grapes when smoke reaches the vineyards. Other components of wood may contribute to the ash particles that are part of smoke's impact on the grapevines, but researchers are still unsure about their impact on the atmosphere around the grape bunches (**FIGURE 1**).



ANITA OBERHOLSTER

FIGURE 1 Lignin is a major source of the volatile phenols found in grapes from the smoke produced by fires in the area of vineyards. Lignin is about 20 to 25 percent of the wood.

Aerial Transport

In the gas phase, smoke contains liquid and particulate components. Smoke and ash can be carried into a vineyard's spatial environment. The closer in proximity of a smoke event to vineyards, the greater the impact will be on vines. It was stated that the "fresher" the smoke, the greater the impact on the vines/fruit. Photolysis of the smoke compounds begins as soon as smoke is produced by a fire. For example, *0*-cresol in the gas phase degrades in three to

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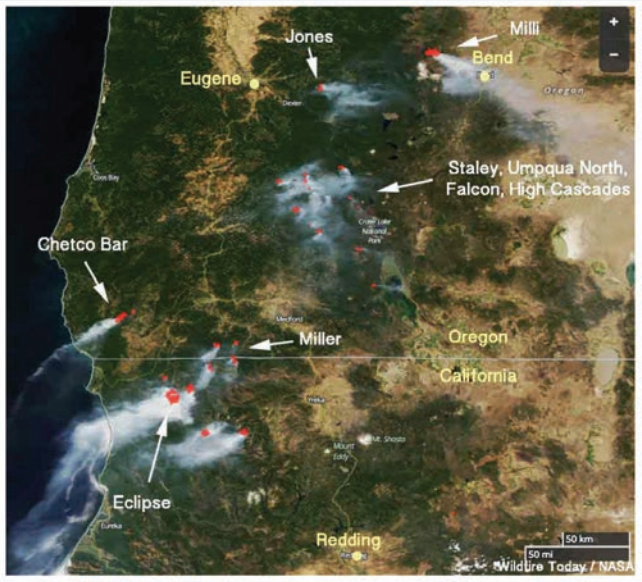

TOM COLLINS

FIGURE 2 Smoke ages as it is carried from the fire to the vineyard. It is modified by atmospheric reactions and the deposition of particles. The further from the source, the more dilute the smoke is, reducing its effect.

four hours during the daylight and as quickly as an hour at night (**FIGURE 2**).

Droplets and solid particles are impactful in combination with oxidative reactions that can change the initial compound composition, but in general, these materials do not pose as great a threat of damage as the molecules that are in the gas phase.

Mitigation of Smoke/Ash on Grapes

From the inputs coming from the fire, it is obvious that a lot of physical changes and chemical reactions are taking place in the air prior to reaching the vines that can help to shape the steps for smoke damage mitigation to the vines. In order to create mitigation plans, it is important to understand the mechanism by which volatile phenols cross into the grapes in the first place.

BARRIER SPRAYS

Kaolin and bentonite were sprayed onto vines in a trial to determine their effectiveness for reducing uptake of smoke compounds. The sprays were applied a day before an expected exposure and then rinsed off seven days later. The results showed a significant reduction in the uptake of smoke taint compounds (**FIGURE 3**). After the vines were rinsed off, there was still some material on the leaves and fruit. Other studies have compared kaolin and biofilms and found similar variable results.[1]

A larger study was conducted in 2021 where 12 different barrier sprays were analyzed, including kaolin, bentonite, Parka, carbon, EMP and more. The results of the study showed positive results in the sprays' ability to lower VPs in grapes.

PARTICULATE REMOVAL

Ash particulates are also a significant part of the aerial component when it comes to smoke damage in that the ash acts as the carrier. Volatile phenols adsorb onto the solid parts of the ash, only to be released once wetted or in contact with grape skins.

Early in their studies of smoke impact on grapevines, Hoj et al.[2] found that a wide range of mitigation treatments could remove ash. They treated vines and grapes with everything from warm to cold water, wetting agents, ethanol and hexanol. No treatment reduced either guaiacol or 4-methyl guaiacol in fruit. However, it was noted that ash on the vines or on the ground can release volatile phenols for up to a week.

To test the effect of physically removing ash from vines and berries, the researchers conducted fermentations where freshly prepared ash was added to a fermentation. They found guaiacol and 4-methyl guaiacol to be present; however, if the ash was "aged" for 24 hours, the concentration of those phenols was reduced by 64 percent (**FIGURE 4**). In 2008, Kenninson[3] determined that to reduce smoke compounds in the fruit, one had to remove the leaves as well.

How VPs Get into the Berry

Just washing ash off the vines and berries was not effective in reducing VPs to a low enough level to be a useful treatment.

The next step was to define how quickly and into which tissues of the berries VPs enter. In **FIGURE 5**, the grape berry is pictured with its different tissue layers. Research has shown that when smoke is in contact with the cuticle of the berry skin, volatile phenols penetrate within about an hour. Interestingly, there do not appear to be increases in free volatile phenols in any other part of the berry. That is because of an enzyme, guaiacol-transferase, which converts

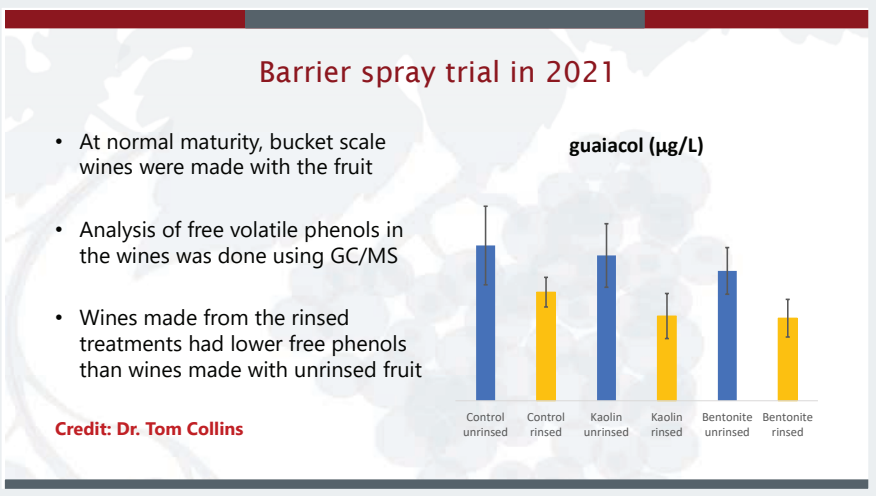

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FIGURE 3 This graph represents relative changes to barrier sprays. The bars show the range of sample data for each treatment. Normal maturity grapes were sprayed with kaolin and bentonite one day prior to exposure, bucket fermented and then analyzed by GC/MS.

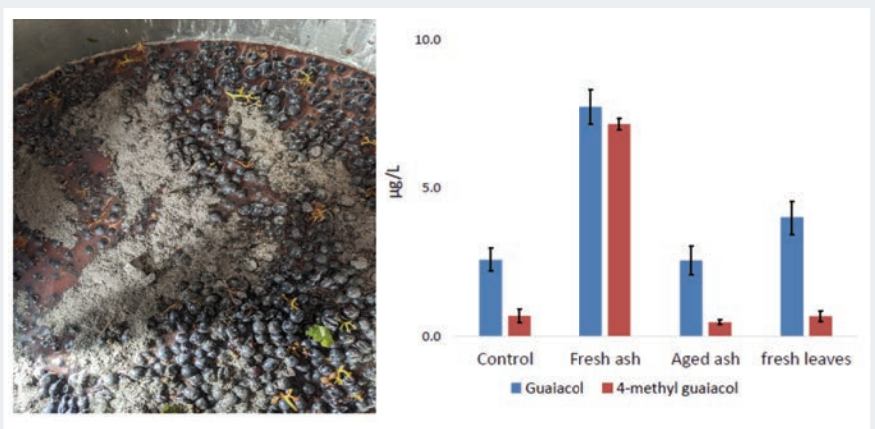

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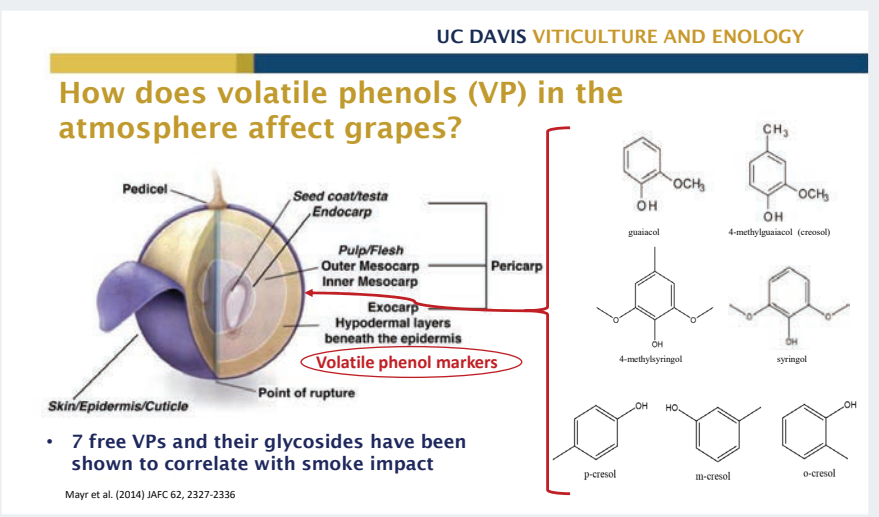
FIGURE 4 The figure shows the measuring of phenols in freshly prepared ash. Both guaiacol and 4-methyl guaiacol were present, but after 24 hours concentrations decreased by 64%. Fresh leaves only increased guaiacol.



ANITA OBERHOLSTER

FIGURE 5 The seven most common volatile phenols that enter grapes from smoke are shown in this figure. The phenols enter quickly through the skin where within hours they are enzymatically converted from free form to a bound form of sugar. There can be up to three sugars attached.

the free volatile phenols into their bound form by adding one to three sugar molecules to the volatile phenol.[4,5] They also found that the waxy bloom does seem to reduce the degree of assimilation of smoke taint compounds.

The quality of the smoke plays a significant role in the degree of damage to grapes. There is still no safe distance from the smoke source to avoid smoke damage. From a grape development standpoint, VPs have been found in grapes from pea-size to mature. The severity of early incidence is not known at this time. The conventional thought is that the severity of effect increases after veraison. If fresh ash deposits happen during harvest, growers should not wet the vines, as has been suggested, since that can release volatile phenols into the atmosphere around grapes. In looking at season over season data, there does not appear to be a carryover of VPs in ash from a previous season. The ash ages quickly and VP are shown at this stage to only absorb significantly into the leaves and berries and they do not over winter.

Capturing Data During the Season

Many, but not all, smoke compounds are already in wines, naturally. Each varietal has different levels of these compounds, which complicates the difficult job of trying to understand the effect of smoke compounds in wine. The consensus is that the grape and wine industry should develop a database of baseline levels for these compounds in all grape varietals so that one can then identify when compounds are above naturally occurring levels in grapes or wine. It is advisable for a vineyard to begin collecting samples for every varietal throughout the season and freeze them. A suggested sample size is a 300 berry or 300 g sample from each varietal block, starting at pea-size berries. VPs will vary in concentration throughout the season. Having these samples will provide a baseline for determining if the vines have been compromised by smoke compounds.

When harvest is near, it is wise to conduct bucket fermentations to determine whether there is smoke present or not. Again, this is all about collecting baseline data for comparison to a future smoke event. If there is time, before a smoke event arrives, collect 30 to 40 bunches from different vines and ferment them to establish a baseline for that event. If there is not enough time, collect the fruit and freeze it. The grapes can always be fermented later and then analyzed.

Another technique that can be used is nano-fermentations. In this case, large Mason-type jars were used to control fermentation in a water bath

regulated by a sous vide temperature controller. For a small sum, a water bath fermentation could regulate 10 to 20 fermentations at 1 to 2 liters per fermentation. These fermentations can provide valuable insight into the immediate issues of smoke impact.

Training Your Crew to Identify Smoke Taint

The first defense against wine defects has historically been in the cellar with the expertise of winemaking staff to pick out, for further review, wines that may have a problem. The introduction of smoke taint is causing this template to be revised.

A recently released paper by Fryer and Tomasino[6] at Oregon State University has laid out the difficulties when it comes to smoke taint organoleptic analysis. Anyone who has worries about how to evaluate smoke taint should read this paper, which is available as an MDPI open-access article. To identify lots of grapes that may have smoke taint, an organization must have a crew with the training to identify samples with potential problems. This is not a winetasting exercise. Everyone needs to know that 20 to 25 percent of the population does not sense smoke compounds. The focus of identification is on the retronasal olfaction process for determining the smell/taste aspect of a food as opposed to only the orthonasal smell.

Fryer found that even after pre-clearing participants, a few had to be removed from panels since they could not distinguish smoky aromas in the tasting setting. A concerted effort needs to be made to identify those who are not sensitive to these compounds.

Attribute	Definition	Samples
Ashy	Dry, dusty, dirty aroma associated with the residual of burnt products, e.g., a day-old campfire[a]	20% v/v ash solution in water 15% v/v ash solution in water* 10% v/v ash solution in water
Floral	Sweet, light, slightly perfumy impression associated with all flowers[b]	0.06% v/v violet extract[c] in floral solution 0.03% v/v violet extract[c] in floral solution Floral solution*
Mixed Berry	Sweet, sour, sometimes dark aromatics associated with a variety of berries such as blackberries, strawberries, raspberries, currants, etc.[b]	35% w/v mixed berry preserves in water 30% w/v mixed berry preserves in water* 25% w/v mixed berry preserves in water
Smokey	Sweet, brown, pungent, acrid, slighty charred/burnt aroma associated with woodfire smoke[a]	7% v/v whiskey in water 6% v/v whiskey in water 5% v/v whiskey in water*

*Sample defined as optimal for training
a) [20]
b) [21]
c) All Star Extracts, Inverness, FL

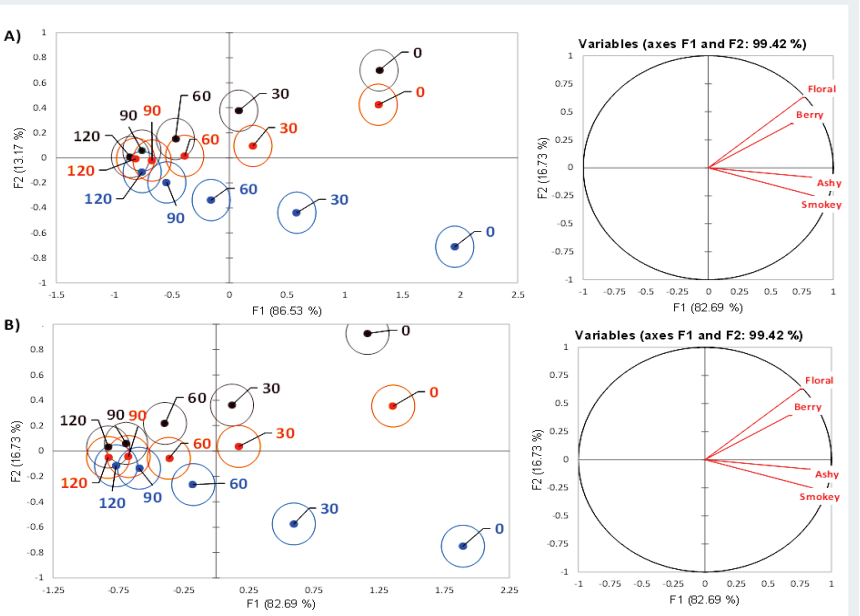
ELIZABETH TOMASINO

TABLE 1 The text in red in this table identifies the working sample solution used to train their evaluators for determining a minimum time it takes to reduce the carryover effect in tasting smoke tainted wine. These are simple solutions that can easily be prepared for training purposes.

The paper suggests simple, easily prepared testing materials to train a panel on how to taste these types of wines (**TABLE 1**). The table identifies solutions that ultimately were chosen as optimal sample concentrations for testing panel subjects on the four organoleptic characteristics to be compared. The article has good instructions on how to train panelists to make the discriminations necessary to identify if smokiness is elevated in a wine.

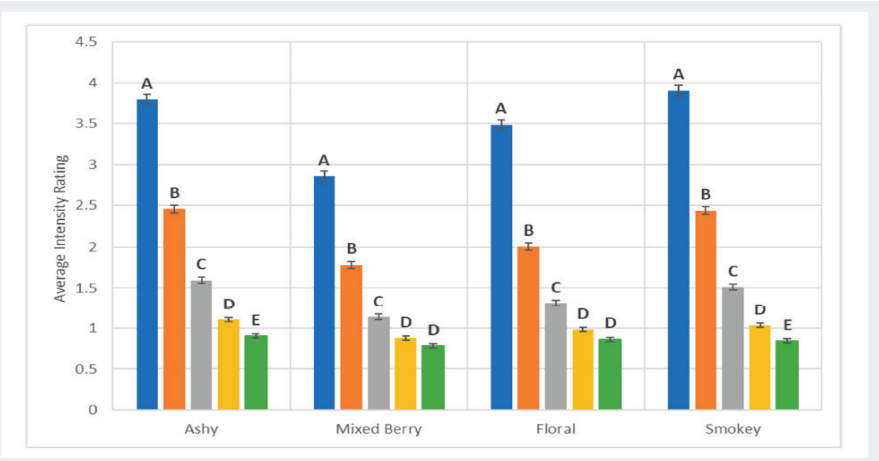
The results of their work showed that when a 4 g/L glucose solution was used as a rinse, followed by water, panelists could then distinguish the next sample as being statistically different from the first in 90 seconds. This is 30 seconds faster than the previous work that used pectin as the rinse solution (**FIGURE 6**).

The second most important factor to consider is the speed at which smoke taint analysis is conducted. Without special efforts being undertaken, such as a sample "cut out" for identifying smoke-tainted wine, a wine that is elevated



ELIZABETH TOMASINO

FIGURE 6 Separation of high-smoke-exposure (blue), moderate-smoke-exposure (orange), and no-smoke-exposure (grey) wines at 30 second intervals, based on DA (degrees agreement) for the pectin (A) and glucose (B) rinse systems. Ellipses represent a 95% confidence interval around the means.



ELIZABETH TOMASINO

FIGURE 7 The average intensity of all wines and rinses at 0 seconds (blue), 30 s (orange), 60 s (grey), 90 s (yellow), and 120 s (green). The same letter above the bars indicates no statistical difference ($\alpha = 0.05$) between average intensity ratings at each time point within each attribute, as determined by Tukey HSD comparison of means. Error bars represent standard error of the means.

in smoke taint will have a carryover effect into subsequent wines that likely will contaminate the results of every wine that follows the suspect wine (**FIGURE 7**).

Of the three other rinse materials, glucose most likely competes for the enzymes in the buccal cavity that contain the microorganisms for releasing bound VPs in the mouth. This possibility could enhance the smokiness of a wine and cause a lingering smoky impression that carries over to the next sample.

The goal for the training is to establish a consistent evaluation of the degree and quality of smoke taint so that comparisons can be tabulated against the analytical results of trial fermentations and the actual wines that were made.

Analysis of Smoke Taint Compounds

One of the more confounding issues of smoke taint analysis is the comparison of smoke compounds between laboratories. It is important to understand why this has become an issue, but variance is not unheard of, and there should be guidance provided on how to reduce the anxiety that these variances can present.

Each of the following steps adds to the potential for variances in the final results of any service laboratory:

1. Research and production analysis of compounds are slightly different between laboratories. Smoke can contain hundreds of compounds, and laboratories can select those components that they want to analyze. It is impractical to analyze for all compounds on a production basis.
2. A set of about seven of the most prominent and active compounds have been generally agreed as the focus for commercial laboratories for analysis.
3. The commercial laboratory services use similar protocols for these analytical steps.
4. The compounds that are being analyzed are in very small concentrations in wine, which can translate into small changes in a protocol that can increase variability in the results.
5. The person running the test is unique to a given laboratory, and their actions add to the nuanced differences between laboratories.
6. Smoke taint has impacted the overall capacity of the service providers maximum production volume for a sustained time period that systemically can add small amounts of variance to the final result with clerical errors and other unintended actions.

Individual vineyards or wineries want immediate information about potential smoke taint in their grapes and wine. When a vineyard or winery's chosen laboratory can't produce quick results, they will seek other alternatives. As a consequence, the vineyard or winery may see differences that are greater than they had with previous samples, and that can be either better or worse. Which is right? The answer is that both can be right, within the margin of error. This can be unsettling to the winery or vineyard and is the main reason for the recommendation to stick with one laboratory and one set of analyses. Staying with one laboratory sets the vineyard and winery's data variability within the error range of that one lab.

When a vineyard or winery needs to change laboratories for analysis, it is important to collect enough data about how one laboratory analyzes versus another. For example, one laboratory may be 2 percent higher on a certain analysis consistently in comparison with the results from that analysis at another laboratory. This allows evaluation of the data so the vineyard or winery can understand whether it is or is not consistent with the original laboratory.

Often, changing laboratories will show a wider variance in the results. Every now and then, laboratory customers should send, in under different IDs, the same wine on different days. This can provide guidance on the lab's reliability. The results should be within the statistical variance of that test virtually every time.

Another standardization that vineyards and wineries should implement is the type of analyses. More confusion can occur when on one occasion a winery requests that VPs should be analyzed; then the next time the same winery requests that bound VPs be analyzed. The best solution is to pick the procedure that gives the most data and fits into the winery's analytical budget. The ideal is to standardize testing on the seven most frequent compounds and run both free and bound VPs. If, for budgetary reasons, one needs to choose one analytical set, that should be your standard. It becomes increasingly difficult to make sense of the treatment options when trying to understand trends that come from different analytical methodologies. Furthermore, for this to produce predictive results, when different laboratories are involved, a system of standardization needs to be developed that makes an accurate adjustment to the data between laboratories. That requires multiple tests between the laboratories to establish accuracy to that process.

Methods of Analysis for Smoke Compounds

There are very robust methods of analysis for smoke compounds. Over the years of trying to identify the compounds, two primary instruments are used for these analyses. For free VPs, the analysis uses a gas chromatograph coupled to a mass spectrometer. The compounds are first separated into discrete peaks, where each compound exits the gas chromatograph and is injected into the mass spectrometer. The volatile phenols are analyzed this way because they generally behave well in this environment and a lot of analytical information is known about them. The mass spectrometer confirms the identification between the two data points and the mass of the compound.

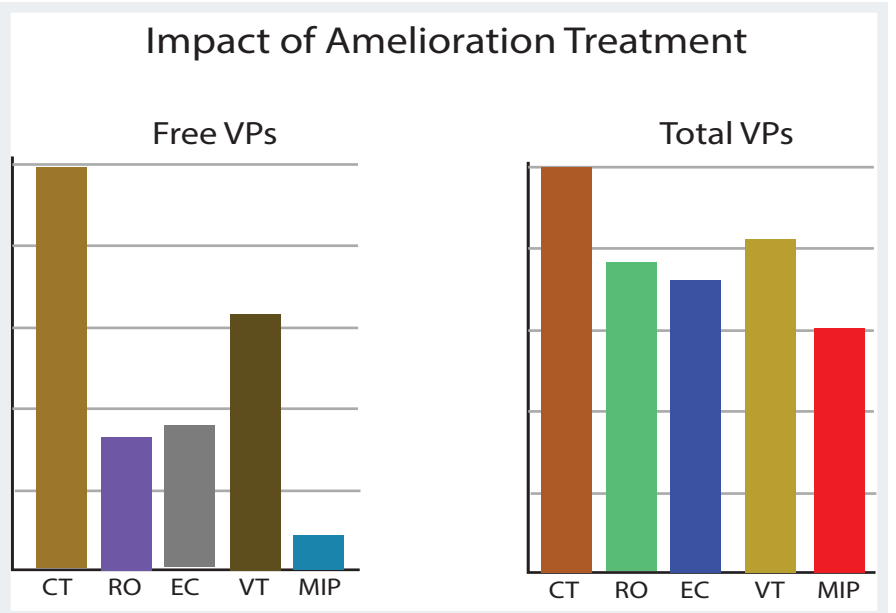
The second instrument, a high-pressure liquid chromatograph, is used to identify the bound volatile phenols. The principle of the instrument is similar to gas chromatography with the exception that the separation medium is a solvent of some sort that is selected to help the compounds separate in the column, with detection on exit from the column.

All of these analytical procedures may sound straightforward—and, in general, they are—with the caveats discussed above. There are multiple manufacturers of these instruments that are used by many people who make choices in how the methodology is implemented. These choices are myriad. As long as the lab complies with the protocols and consistently shows no greater variance than 5 percent on a duplicate sample run, the winery can trust that lab's results.

Removal of Smoke Compounds

Over the many years that smoke taint has been a problem for our industry, there have been many attempts to develop methods to remove the offending compounds. There are currently several methods in use and another method that is not yet approved for general use in the wine industry. In order of effectiveness for the removal of smoke compounds from wine, the methods include: Molecular Imprinted Polymers (MIPs), a treatment that is awaiting approval and may provide the most efficient removal option; Reverse Osmosis; and Enzyme/Activated Carbon. Several laboratories have research projects underway to develop production methods for the use of new polymers. (For a review on their method of operation, see the January 2021 issue of *WBM*.)

Oberholster's lab at the University of California, Davis has provided much of the initial academic research in this country to show the efficacy of MIP polymers. **FIGURE 8** is a generalization of unpublished work by Oberholster that will be published soon, with many more details to be discussed. MIPs



PERSONAL COMMUNICATION WITH OBERHOLSTER

FIGURE 8 All treatments reduced VP significantly. Removal success somewhat matrix dependent. Relative removal efficiency: MIP>/RO>EC>/VT (Molecular Imprinted Polymers, Reverse Osmosis, Enzyme + Activated Charcoal, Spinning Cone)
Absolute quantities are relative and measure in μg/L. Free VPs are about 5 times lower than Total VPs.

act as a hand-and-glove positioning of molecules such that the target molecules are uniquely attracted to a mirror of either a charged state or a physical "entrapment" on the surface of the MIP. In **FIGURE 8**, the free VPs are reduced most effectively by MIPs to very low levels in comparison to other methods. However, the difference is not as great when it comes to bound VPs.

Even though these polymers have been in use in the food, medical and pharmaceutical industries, FDA has not given a green light for their use in wine, and the TTB is deferring action on their approval until the FDA signs off. Ligar in New Zealand is one of the more active companies that is working to get through the red tape for these materials' approval.

For now, we have the other methods for ameliorating VPs. There are companies, such as Wine Secrets, that provide smoke taint removal services with their loose RO system.

Conclusion

The large amount of work on smoke compounds and wine has revealed a need for data that can build an understanding how these compounds interact in a wine medium. We are faced with a suite of compounds that are naturally occurring in wine, with only a few of them that are truly noxious. A large number of similar compounds are found in wine that, if removed, cause the wine to lose those characteristics that winemakers want, such as the compounds that come from oak barrels. The three labs (Davis, OSU, Washington State) are working together to create a database that will contain information on naturally occurring smoke compounds in wines by varietal. While it will take years to gather this data, the rudiments are being collected now.

As we get more information and potentially improve the analytical and production tools we have, amelioration of these compounds will allow winemakers to target problems and improve the treatment of their wines. The ultimate goal is to produce higher quality products than we have today. Unfortunately, wildfires are not going away. **WBM**

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Automating Plant Stress Measurement

Or how I hate the pressure bomb

Mark Greenspan

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IT'S BEEN A YEAR of warm winter temperatures, spring frosts, sleet and hail. And I thought I'd write about plant moisture stress measurement? Well, it's also a year of drought nestled within a prolonged trend of drought, so yes, I'll write about moisture stress measurement. No doubt, if you've heard me speak or you've read any of my previous dozens of articles on water management, irrigation, soil and plant moisture, and that genre of topics, you've heard me praise the pressure chamber and the porometer as the two standard and best ways to assess vine stress. I continue to feel love and affection for those two beautiful instruments, both of which have been around for about as long as I have: the '60s. Yet, why are we still using devices that were popular well before orange shag carpet? Because they work and they work well. While they came into use a long time ago, they were primarily used as research tools until academics, farm advisors and guys like me started promoting their use to the industry as part of an irrigation management arsenal of tools.

Water Management Using Water Stress Indicators

I've spoken and written about how important it is to measure plant water stress for winegrapes. For true moisture management of winegrapes, we aim to manage their water stress levels during the growing season: keeping them unstressed during the initial vegetative cycle and through fruit set and gradually inducing water stress at lag phase and through veraison, then relaxing

the stress during ripening and removing the stress after harvest. This is true for any winegrape: only the intensity of the stress needs to be modulated for different varieties (especially white and red grapes) and for the goals of the vineyard (production versus high quality).

As you should know, unless you are reading me for the first time, I am completely satisfied using soil moisture profile probes to monitor what happens below the soil surface: identifying root activity, depth of irrigation percolation, retention of moisture in the soil between irrigations and determining how much and how often to irrigate. The beautiful thing about soil moisture probes is that their information can easily be monitored continuously and delivered to the user in near real-time by using telemetry devices that are becoming more common and, I hesitate to say in the current supply chain crisis, less expensive.

But we have this pressure bomb problem. The pressure chamber (a.k.a. pressure bomb) may be the best way to assess plant water stress, but it's a beast of an instrument: heavy, bulky and time-consuming. And it needs to be transported from place to place to make measurements during the small window of time we call midday (or during the darkness to make pre-dawn measurements). Not to mention the current fuel prices, shlepping of ATVs from place to place, safety and now even intern shortages. It's gotten to be too expensive to measure plant stress with a pressure bomb! How nice it would be to have the plant stress measurement automated, like we're able to do with our soil moisture measurements.

Shrinking, Swelling and Flow

There have been numerous devices developed over the decades that, if proven to work, could have been or could still be automated. Dendrometers or displacement transducers that measure the tiny shrinking and swelling of plant parts (often trunks) have been used to show responses to water stress. These devices are still used, and one company, Phytech, has adopted the dendrometer as their basis for automated water stress sensing. In my opinion, I've seen these devices work and have been intrigued by them for a long time, but I have yet to see evidence that they can be ground-truthed to something like the pressure chamber. While this may be possible on one plant, it doesn't seem to be universal across all plants of varying sizes and thicknesses.

There are growers I've spoken with who like the dendrometer-based approach, but I have yet to be convinced that it is an acceptable alternative to the tried and true.

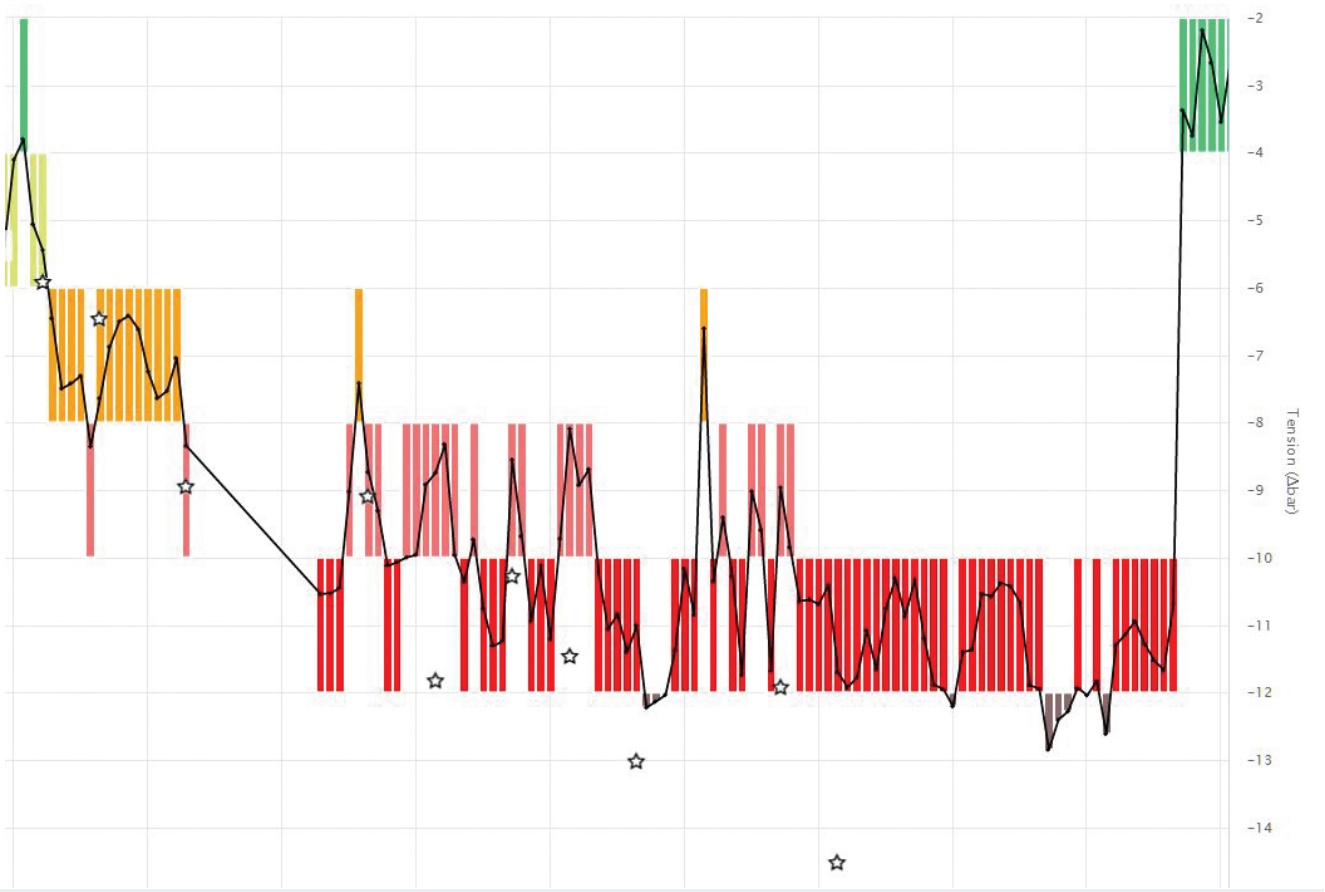
Sap flow sensors have been also used to measure plant stress automatically, most popularly (at least locally) by Fruition Sciences, which use measured sap flow relative to unstressed expected sap flow that is estimated using evapotranspiration and canopy characteristics. I don't have a lot of experience with it, so I can't effectively critique it, but I find that its primary deterrent has been its cost, not to mention the maintenance of the devices on the vines. Their sensor is a heat balance model, which applies heat to the trunk and measures sap flow by how much energy is dissipated by sap moving along the plant's trunk or stem to remove the applied heat.

Another type of sap flow technology is the heat pulse sensor, where heat is applied to a spot in the trunk and then sensors on both sides of the heating element determine how long it takes for the sap to travel that distance by looking for the temperature spike. Those devices measure sap velocity, and flow can be determined by estimating the cross-sectional area of the sap-conducting tissue in the plant part. Those devices are less expensive than the heat balance type but, again, are not really measuring plant stress, so a model needs to be developed to create a stress index. Therefore, I'm still not convinced that sap flow technology is a suitable replacement for my pressure bomb.

Remote Sensing

I have been interested in the remote sensing of water stress for decades and actually did my Ph.D. research on the subject, looking for a pressure bomb substitute back in the '90s.[1] The most common tool for water stress remote sensing has been the infrared sensor. Plant leaves close stomatal pores when they are under water stress (though they also close stomata during the night and under high evaporative demand conditions). When the stomata close (during the day, that is), their temperature rises because their evaporative cooling slows. Infrared sensors can sense those changes in temperature because infrared radiation rises when surface temperature does (infrared radiation is proportional to the surface temperature to the fourth power). So, we can sense the stomatal closure using an infrared sensor or infrared camera.

But infrared radiation is complicated and not easily ground-truthed to plant-based instrumentation. Thermal radiation arises not only from leaves but from other objects, most notably the soil, which is much warmer than the leaves during the daytime. While focusing our sensing field to a single leaf eliminates non-plant influences, it also reduces the sample size to only that single leaf. Whole canopy or field-scale sensing is much more desirable but is also much noisier from a thermal standpoint. And that is why I'm not jumping on any thermal remote sensing bandwagons right now.



2021 WT Lower Chart
Trunk water potential output from a FloraPulse system in a Sonoma County vineyard. The data are shown as a differential of daily midday/maximum stem water potential relative to an unstressed water potential for each day. The color bars indicate relative stress level. The stars represent our midday leaf water potential measurements, which will not coincide with the FloraPulse data shown because it is not a differential measurement and it is measured in the leaves, not the trunk.

Remote sensing using aerial sensing has some promise, and there are two companies doing this to my knowledge. CERES Imaging uses thermal radiation sensors to map water stress levels, and VineView Imaging uses a visible light band that is sensitive to water for mapping the canopy's water content. Both seem to have promise. The one downside to aerial remote sensing is that it is not really automated but is sensed only when the images are captured. From an economic feasibility standpoint, this means that measurements more frequent than once per week are unlikely.

Micro Tensiometer

This brings me to the technology with which I have the most hope. I first learned about the development of the microtensiometer about two decades ago from Alan Lakso, professor emeritus at Cornell University. More recently but still over a decade ago, I visited Lakso to speak to his students, and he introduced me to Vinay Pagay, then a Ph.D. candidate and currently a senior lecturer at the University of Adelaide. Pagay was further developing this sensor, along with a team of university engineers. At that time, it was being tested in soils with the hope that it could eventually be installed into woody plants to measure water potential electronically.

Even more recently, this technology is being shepherded forward by a company called FloraPulse, now based in Davis, Calif. Florapulse has continued the development of this sensor for tree and vine crops; and while the device is still evolving, it has shown promise to me as a device that could be the pressure bomb killer. The reason I like it more than the other sensors I spoke about above is that it is measuring water potential directly. It's not trying to measure something else to correlate to water potential: it's a direct measurement.

The difficulty has been in the practicality of mounting the device on the trunk of a tree or vine and having it measure consistently and stay that way over a growing season or more. FloraPulse seems to have worked out many of the issues and has a mounting system that is not only easy to use but is robust and repeatable. The main problem in vines has been in using it in smaller trunks, such as younger vines less than 1.5 inches in diameter. They've been working on this; and as FloraPulse's CEO Michael Santiago told me, they believe they can get them to work in smaller vines now, which is welcome news to those of us who are working with recently replanted vineyards.

The sensors measure continuously (actually, like every 15 minutes) and provide not only midday water potential readings, but pre-dawn water potential and, uh, all times in-between. We've been testing them out for two straight years—2022 will be our third year testing them. While they are not perfect, we've seen improvements from 2020 into 2021 and have seen all our sensors remain functional through one growing season and still work into the next. Correlating the microtensiometer readings to pressure bomb readings is prone to error. The FloraPulse daily readings are the daily maximum stress readings, and our pressure chamber readings are made midday, which is not necessarily the peak stress time. And we measure leaf water potential with the pressure bomb while the microtensiometers measure stem, or trunk, water potential. So while we're not comparing apples to oranges, we are looking at different shades of apples in a sense.

So, what I'm saying is that when we try and ground-truth the microtensiometer with the pressure bomb, we can accept some discrepancies between the two readings. We've had some good correlations between the two and some that are less than ideal. But regardless, we have seen patterns in the readings that make sense in response to irrigations, and the readings are usually in the range of what we would expect the plant water potential to be.

Going forward as a company, we are phasing out our pressure bombs and porometers in favor of these devices. We simply can no longer afford to do the field measurements in a cost-effective manner, and we seemingly now have a tool that we can employ to eliminate the need for them. I don't really hate the pressure bomb. But I hate using it! We'll still be using "the bomb" and porometer for spot checking of vine stress but will be looking forward to using these new devices to do the heavy lifting for plant stress measurements. **WBM**

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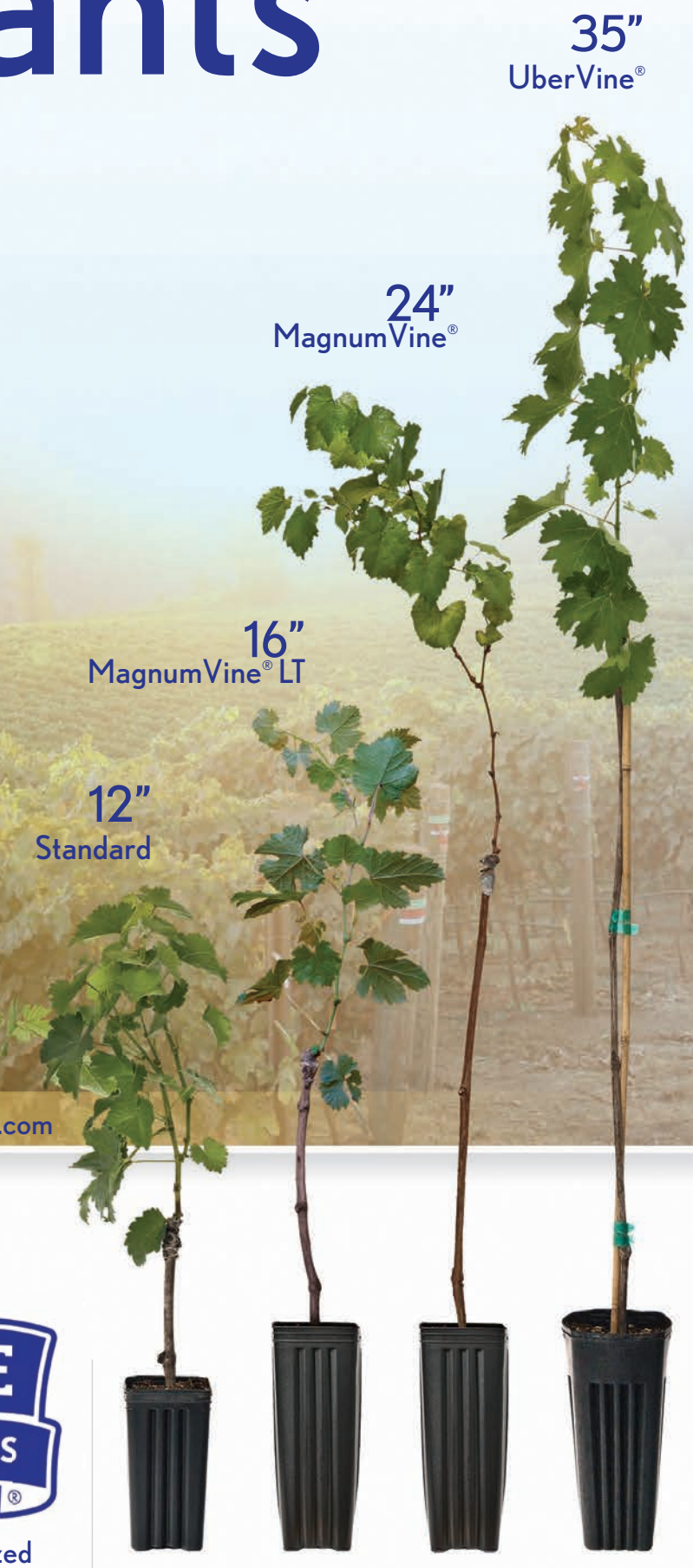

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PRACTICAL Winery & Vineyard JOURNAL

LAURA BREYER

An example of poor budbreak due to heat damage, as seen in 2021.

Heatwave Damage in Vineyards

Christopher Chen

Christopher Chen was recently hired as the integrated vineyard systems advisor for the University of California Agricultural & Natural Resources Extension program. He covers the North Coast counties of Sonoma, Mendocino and Lake. Chen's background in viticulture includes research on drought, heat and salinity damage in vineyards, as well as earning his doctoral degree from UC Davis with a focus on viticulture. Chen values outward-facing, grower-focused research and believes the accessibility of information will be a major aid to growers as they modify their practices to adapt to changing climates.

KEY POINTS:

- Consolidation of planted grape varieties has limited the potential for vineyard adaptation to climate change.
- Average air temperatures are rising in California and have shifted key events in the vineyard earlier in the season than historically recorded.
- Changes in the timing of bud burst, flowering and harvest have put a strain on vineyard management operations.
- Unexpected, extreme heatwave events are occurring more frequently as average temperatures rise and may have a larger impact on coastal regions than inland.
- Heat waves that occur later in the growing season can damage clusters, berry phenolic profiles and foliage, leading to a decline in vine health without proper management practices.
- Specific management strategies to mitigate the effects of heatwaves include:
  - Changes in varieties.
  - Pruning as late as possible delays the post-veraison period later to reduce the exposure of ripening fruit to extreme heat.
  - Shade cloths to reduce sunburn damage.
  - Irrigation volume and timing.
  - Changes in vine row orientation.

A WIDE VARIETY OF *Vitis vinifera* cultivars planted around the world suggests that grape cultivation has the potential to be one of the most resilient cropping systems to climate change. Within the single species of grapevine, unique varieties have been shown to be distinctly acclimated to a range of environmental conditions.[1,2,3]

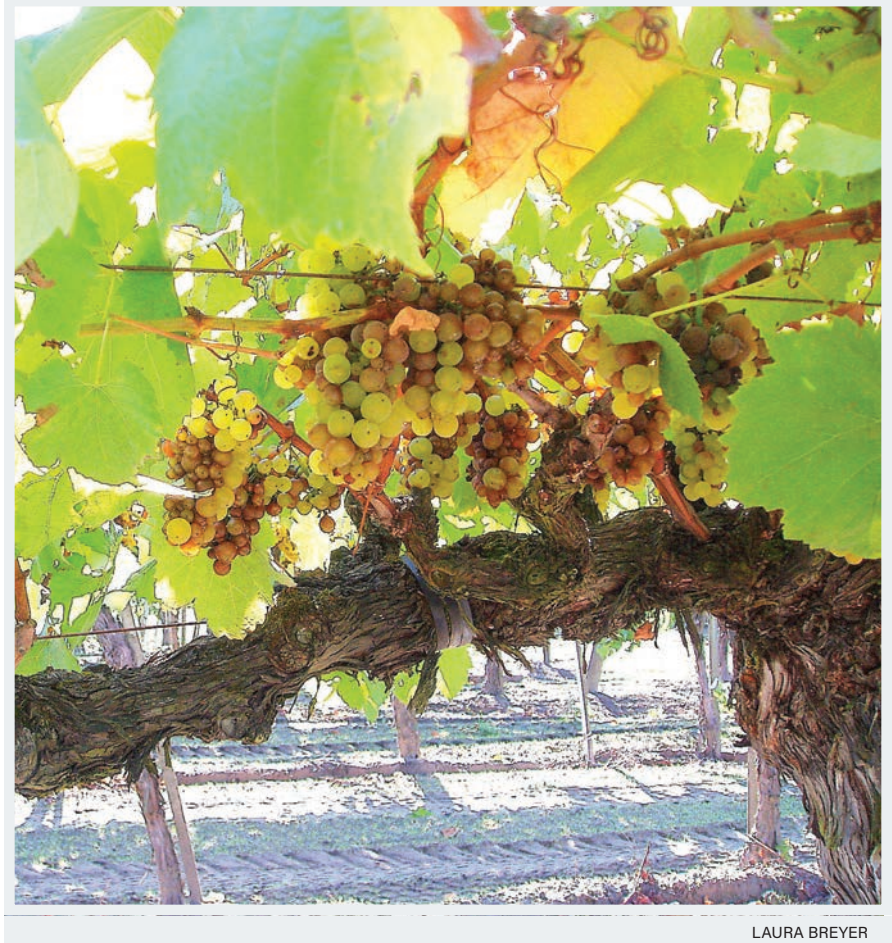
Since the start of the 20th century, average temperatures around the world have risen by at least 1.3ºF. Individual scion varieties can be better suited to extreme heat, drought, poor soil conditions and more.[3] However, a consolidation of opinion and consumer preference has resulted in a few scion cultivars which dominate North American markets and vineyards.[4]

Often in response to market demands, California grape growers have preferred to retain acreage of varieties, such as Cabernet Sauvignon and Chardonnay.[5] This convergent selection has had the unintended effect of limiting both public opinion on other grape varieties and the potential for vineyard adaptation to changing climates.

As a result, winegrapes are considered one of the most climate-sensitive crops today.[33] Demand for classic Bordeaux and Burgundy varieties has driven growers' planting decisions for the past 40+ years to the detriment of other possibly more heat- and drought-tolerant, but also perfectly quaffable, varieties.

Winegrapes grown from *V. vinifera,* while resilient to heat and drought, are limited in range to Mediterranean climates.[7] The production range of *V. vinifera* has influenced the development of great winegrape producing regions of the world, such as Australia, Mediterranean Europe, South Africa, South America and the western United States.

Classically characterized in the Winkler Index, grape producing regions are often differentiated today by their accumulated annual heat hours.[8] While not a rigid restriction, the separation of regions by how much heat they receive throughout the growing season is a useful tool for rootstock and scion selection. Most varieties of *V. vinifera* have been grouped into hot, moderate or cool climate cultivars and are preferentially planted in the region(s) best suited to their behaviors and performance under different climates.



LAURA BREYER

Botrytis Rot can spread in a cluster like a virus – Chardonnay 2011.

However, as average temperatures rise, areas previously classified as moderate are likely to be reclassified as hot climates. This presents a challenge for growers who made their income on one or two varieties that traditionally performed well in the historical climate conditions of the region. Heat has become an overwhelming factor in viticulture, and damage to the vines and fruit is becoming more frequent as unexpected heatwaves occur and grapevine phenology shifts earlier in the season.[9,10]

Shifts in Timing of Seasonal Development

Among the heat risk posed to vineyards is the observed shift in annual grapevine development, or phenology.[10] Higher average temperatures throughout the year have shifted bud burst through to harvest earlier in the year and posed challenges for vineyard logistics.[11,12] While phenological events, such as flowering and harvest, have occurred predictably sooner than historic records, the timing of bud burst has become much more difficult to estimate regionally.[13]

The signal for grapevines to push buds starts in winter and has a chilling requirement. Some research in "Perlette" table grapes has shown that dormant buds require winter temperatures between 32 and 50°F for at least 200 hours total to reach 50 percent bud burst at an industry acceptable rate in spring.[14] This metric is likely to change by scion variety but illustrates the need for cool winter temperatures in the growth cycle of a vine.

Over the past four decades average winter temperatures in California have increased by 2°F.[15] In some regions of California this temperature change has been higher. While 2°F seems like a small increase in winter temperatures, this shift in climate could have an impact on the release of winter dormancy in vineyards by reducing the number of cooling hours a vine receives.[16] Possibly due to higher winter temperatures, bud burst has become one of the least predictable phenological events for vineyards in recent years.[17]

Annual growth of grapevines is highly dependent on the temperature of the surrounding environment.[10,18] Key phenological events can be "kick-started" through the vine's ability to sense the air and soil temperature conditions around them. As climates change and average temperatures rise, these events will begin earlier in the year than previously observed.[19] Although some temporal shifts in phenological events have been somewhat predicted through scientific modeling,[20] the amount of time key events occurs is not uniform between separate events.

Recently in California, while veraison and harvest have been observed to occur one to two weeks earlier than expected, flowering has shifted earlier in the growing season by only half that amount.[11,12] This development has the effect of shortening the length of the growing season in vineyards, potentially increasing labor demands in a shorter window of time and altering the berry phenolic profiles by harvest.

Impact of Heatwave in Vineyards

Heatwave events can be separated into dry hot daytime or humid evening heatwaves with the latter expected to become more common as climates change.[21] In California, heatwave events in desert-like regions, such as the San Joaquin Valley of California, are expected to decline in intensity while coastal heatwaves are expected to get worse.[21]

Regional heatwaves that occur late in the growing season are also a concern. Associated with rising average temperatures, heatwaves have become more frequent occurrences as temperatures steadily increase on an annual basis.[9] As grapes near full maturation, the composition of their phenolic compounds becomes more sensitive to environmental conditions.[22]

CHRISTOPHER CHEN

These grapes burned during an extended heat event.

Extreme heat events late in the growing season could promote degradation of anthocyanins in the skin of red winegrapes and reduce the depth of color associated with their resulting wines.[22] The impacts of high temperatures and increased CO_2 levels on other berry characteristics are also in the balance. Berry sugar accumulation and ripening rates are directly related to the vine's average photosynthetic rate. Photosynthetic rates have been shown to be greatly increased by elevated CO_2 and temperatures that increased the rate of ripening in Tempranillo clusters.[24]

In Australia, regional heatwaves were related to losses in vineyard crop yields in 2009 and reduced total production by about 7 percent between the 2007–2008 and 2008–2009 seasons.[25]

Damage from heatwaves can be visually drastic. Burnt shoot tips and leaf margins are common. Sunburn on white wine berries and shriveling or desiccation of grapes can also be consequences of a major heatwave.[25] Such responses in grapevines to extreme heatwaves late in the growing season can contribute to yield losses from such events and can be made worse by a lack of access to supplementary irrigation water.

Management Strategies for Heatwaves

Because recent heatwaves have occurred at such an unexpected intensity and are often considered "unprecedented" in many regions, management decisions can be insufficient to prepare for extreme temperatures. Berry shriveling and desiccation associated with sudden high temperatures can be partially mitigated through the application of supplemental irrigation.[26]

High temperatures promote increases in plant transpiration and increase the amount of water needed by the vine to reduce risk of heat-related stress.[16] Heat stress under water-deficient conditions can result in declining yields, berry size and berry quality.[27,28] However, a lack of available water in drought-affected regions can limit the viability of this management strategy.

While moderating late-season irrigation is currently the most applied approach for managing grapevines in a heatwave event, other actions can be taken to mitigate the damage heatwaves present to vineyards. A grower's understanding of the heat-tolerance of their scion varieties is essential to mitigating heatwave damage.

Planting varieties that are known to perform better in hotter climates is a useful preventative approach to take if heatwave events are expected in a vineyard's lifetime. Limiting crop exposure to direct sunlight could also be a viable approach through site-specific vine row orientation. Northeast-southwest row orientations have been shown to reduce temperatures under grapevine canopies.[29,30]

By reducing exposure to direct solar radiation, the fruit zone of a vine will not heat up as much as a directly exposed cluster during a heatwave, reducing losses to heat-related damage.[25,30,3] Cover crops could reduce temperatures through increasing the soil surface reflectivity but also increase water demand in the vineyard.[32] Application of shade nets over the fruiting zone can drastically decrease instances of berry sun damage and reduce temperatures in the canopy by several degrees.[23]

Adjusting to New Conditions

As climates change, adjusting to inconsistent weather patterns and making preemptive management decisions will likely become valued skill sets for the success of a vineyard. Using available data from climate models and current trends in temperature and precipitation will inform growers who are seeking to plant new grapevine blocks.

The diversity within the many varieties of *V. vinifera* will be a valuable tool for growers. Changes in varieties for new plantings will depend largely on the regional impact of climate change. If we are mostly worried about heatwaves, it would benefit us to have red wine cultivars that are more adapted to growing in hot regions. A good example would be Tempranillo. However, if bud burst is unpredictable and spring frost is a concern, then a variety like Sémillon, which leafs out late and matures before heatwaves hit, would be beneficial.

Another concern is inherent vigor. Varieties with more leaf area require more water for transpiration. Large canopies would lead to higher water demand and/or more time and money spent on canopy management. A moderately vigorous cultivar that leafs out late and matures early would be ideal as growers observe unpredictable bud burst and late season heatwaves.

Vine row orientation is an important factor growers can consider before planting a block. Many vine rows in California are oriented parallel or perpendicular to the closest road. However, this orientation is not necessarily the best for equal distribution of light throughout the day. Achieving a more equal exposure to solar radiation on both sides of the canopy helps reduce

CHRISTOPHER CHEN
These overripe grapes also experienced some sunburn.

the incidence of overexposure on one side of the fruit zone and poor ripening on the other. In California, northeast–southwest vine rows have been shown to better distribute light throughout a given day in summer.[30]

Trellis choice can also greatly impact sun exposure on fruit. Vertical shoot position trellises are beneficial for mechanization, exposure and air flow, but regions with extreme heat can have cluster sunburn problems.[23] A trellis that allows the canopy to weep over, like California Sprawl, helps the vine shade its own fruit while still promoting even ripening. Applying shade nets can be used for the same result; however, the cost of materials and labor required to install shade nets should be considered first. Decreasing the intensity of leaf removal can also shade fruit zones but may increase pathogen pressure from Botrytis Bunch Rot or other pests or pathogens as pesticide spray penetration is reduced.

Seasonal decisions can alter the impact of heatwaves. Pruning late can push bud burst later in the spring. However, heat hours are accumulating more rapidly than previously observed and effectively shortening the growing season. Late bud burst would limit the risk of damage from late spring frost events but is unlikely to reduce exposure of ripening fruit to summer heatwaves. Timing irrigation to correspond with large heatwave events can provide the water needed to satisfy increases in vine transpiration and reduce vine over-heating. However, water availability post-veraison can be scarce and limits this practice to those that have access to water throughout the growing season.

Although extreme heatwave events are likely to continue in grape growing regions around the world, the proper management and preventive planning of vineyards will be essential to preserving viticulture as we know it today. Adjusting to new timing of phenological events, planting heat-tolerant cultivars, adjusting vine row orientation and exploring new methods of heat reduction are just a handful of ways growers can adapt to new climate conditions.

Existing and future studies are poised to examine the responses available to vineyard managers as temperatures continue to rise and heatwaves become more frequent or intense. **WMB**

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Spray Drift Impacts Vineyards from Pennsylvania to Texas

Linda Jones McKee

WHEN LARRY SHRAWDER, OWNER of Stony Run Winery in Kempton, PA, first started planting grapes in 2013, he never dreamed he would have to become proficient on the subject of herbicides. Located in southeastern Pennsylvania's gently rolling hills, his 50 acres of vineyard are surrounded by crop farms growing corn and soybeans, and those farmers used 2,4-D or dicamba herbicides to control weeds in their fields. In some cases, the spray can volatilize, and the vapor cloud can be blown for long distances. Over the past six years, droplets and vapor drift have caused extensive damage to Shrawder's vineyards. His grape harvest has been reduced, vines have been killed outright and crop has been lost.

"I've found drift damage in virtually every vineyard in Pennsylvania I've been in," he commented. "Many vineyard owners don't know their problems are being caused by herbicide drift, blaming instead unusual cold, trunk disease, or insect infestations for their losses. In part, that is because the classic symptoms of spray drifts—leaves curling upward into a cup-like shape or the strapping the leaf veins—are caused predominantly by droplet drift (FIGURES 1 and 2). Vines affected by vapor drift have symptoms that are less obvious but still may cause high levels of damage, depending on the growth stage of the vine."

Galen Troxell, co-owner of Galen Glen Winery in Andreas, PA, agrees that most grape growers in Pennsylvania don't understand the subtilties of vapor drift, and that vines can have "damage without all that symptomology." He added, "There are certain applications, anywhere near bloom where it just melts your clusters off. They don't pollinate – they turn brown and then fall off, and it's another year of trying to grow grapevines without any crop to pay the bills."

The most critical time for damage to grapevines is between bud break and fruit set, which in Pennsylvania occurs from mid-April to mid-June. If the spray drift happens at bloom, it can kill the clusters; if it occurs after fruit set, the vines can be severely stunted, with small leaves and short shoots (**FIGURE 3**). According to Dr. Bruce Bordelon, professor emeritus at Purdue University's College of Agriculture, warm, dry air probably causes the highest volatility of herbicide sprays, and under those conditions, the herbicide vapor disperses widely. Under warm, moist conditions (frequently involving temperature inversions), the vapor stays low to the ground and can move considerable distances, often settling into low spots.

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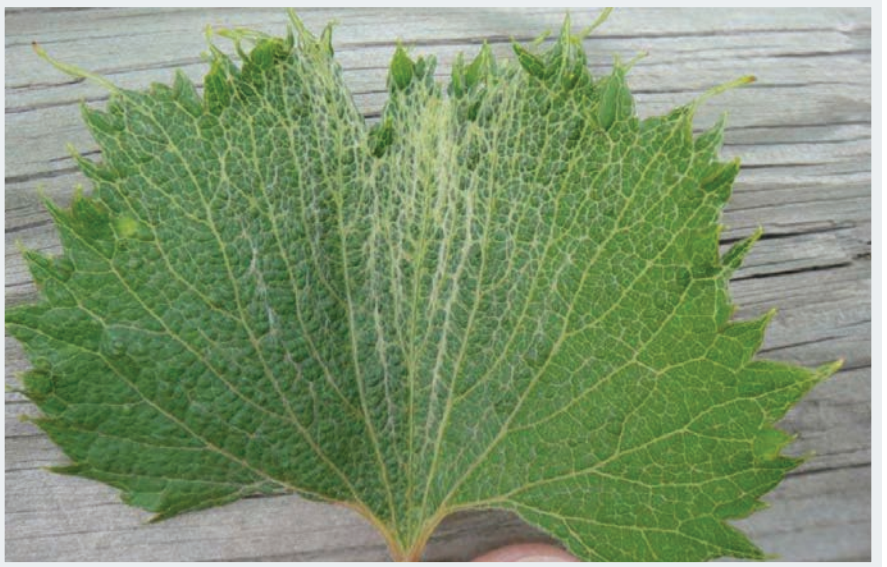
FIGURE 1. Dicamba spray drift caused leaves to curl into a cup shape and poor fruit set.



BRUCE BORDELON

FIGURE 2. 2,4-D spray drift can cause strapping of the leaf veins and a fan-like shape of the leaf.

What Counts as "Pesticide Spray Drift?"

The Environmental Protection Agency's (EPA) definition states that "pesticide spray drift is the movement of pesticide dust or droplets through the air at the time of application, or soon after, to any site other than the area intended." This definition does not include vapor movement; most "drift" is relatively short range, going hundreds of feet at the maximum. If those pesticide droplets volatilize after application and then the wind carries them to another property, that is not droplet drift according to the EPA.

The legal situation in Pennsylvania is somewhat different. Pennsylvania's legislature passed the Pennsylvania Pesticide Control Act of 1973 which stated

that "A person may not use a pesticide in a manner which results in unwanted residues on the property of another." The applicator can spray what they want on their property, but it can't affect another's property.

Awareness by farmers of the problem of pesticide drift increased significantly in many states in 2020 when a peach farmer in Missouri sued Monsanto and BASF for dicamba drift damages to his orchard. He won the case and received $15 million for dicamba drift damage and an additional $250 million in punitive damages. That award was eventually reduced to $75 million, but other farmers sued Bayer-Monsanto for similar damage, and the company had to pay $300 million to settle those suits.

Both Troxell and Shrawder are getting good cooperation from their neighbors in Pennsylvania after they sent letters to their neighbors explaining the

BRUCE BORDELON

FIGURE 3. Much of the active leaf area of these Marquette vines was lost during their active growth phase after being damaged by dicamba spray drift.

pesticide drift issue. Most changed their pesticide programs immediately upon learning of the problem. Others did so after educating themselves on the topic, and a rare few only after they were put on notice of their damage by legal counsel.

Shrawder has noticed that spray drift has dramatically decreased with better communication, an awareness of the problem, and a willingness to work together to make sure everyone is able to farm the crops of their choice. "We still receive some spray drift," he said, "but the problem is manageable. We remain diligent, as more operators move into the area, to educate them about the issues they will face when farming next to sensitive crops such as grapes."

Penn State Webinar on Vineyard Herbicide Drift

Because of the increasing concern among grape growers in Pennsylvania, Penn State Extension held a virtual webinar on March 30, 2022, entitled "Vineyard Herbicide Drift Concerns and Considerations." Dr. Cain Hickey, viticulture extension educator at Penn State Extension, hosted the webinar and presented the first session on why pesticide drift occurs and what vineyard managers can do about it.

Hickey explained that there are numerous factors that cause pesticides to drift, sometimes for distances as long as several miles. The chemistry of the

Spray Drift Impacts Vineyards from Pennsylvania to Texas

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FIGURE 4. This Baco Noir vine in western New York shows the damage caused by 2,4-D after fruit set.

spray is a major factor, and so is the method by which that spray is applied. Weather patterns, especially wind direction and wind speed, are very important, as are temperature and the potential issue of temperature inversions. Sometimes drift is unintentional; occasionally it can be malicious.

Some classes of post emergent herbicides, specifically auxins, act as plant growth regulators (PGR) and are effective at controlling broad-leaf plants without injuring grasses and grass relatives. Plant growth regulators are used to manage row crops, roadsides and wood-lines, and dicamba is used on lawns, landscapes, pasturelands and against Ailanthus (tree of heaven), the preferred host of the invasive spotted lanternfly. Hickey noted that grapes are at the extreme end of the spectrum in their sensitivity to herbicides—especially to dicamba—and are most sensitive during rapid shoot growth, between bud break and fruit set. Bloom, which usually occurs in Pennsylvania between the third and fourth week in May and the first and second week in June, coincides with a period of herbicide application to other crops (**FIGURE 4**).

"The level of exposure matters," Hickey stated, "as higher concentrations of growth regulator herbicides or repeated exposure can cause more injury. All grapes are susceptible, but some varieties are more sensitive than others."

What can growers do? First, learn about herbicides and weed management nuances across nearby production systems. That will help the grower communicate with neighbors managing different production systems about the growth stages of grapes, that grapevines are at a critical point at fruit set but are still sensitive to herbicides after that stage.

BRUCE BORDELON

FIGURE 5. These vines show damage from dicamba spray 24 hours post-treatment.

Hickey encouraged growers to scout their vineyards on a regular basis, but especially from mid-April to mid-June, a time period that coincides with pre-plant burndown and in-crop herbicide applications on other crops. Growers should document what is happening in the vineyard with photos, dates and growth stages, and conduct residue testing. It also can be helpful to contact Penn State Extension personnel, call the Pennsylvania Department of Agriculture and crop insurers, talk with near-by farm owners, and to register with DriftWatch, an online site that "enables crop producers, beekeepers and pesticide applicators to work together to protect specialty crops and apiaries through use of mapping programs."

Pennsylvania and East Coast vineyards are small in scale and in the number of acres relative to other systems managed with herbicides, both agricultural and non-agricultural, but one acre of grapes turned into wine and sold can equate to approximately $55-65,000 in revenue. Hickey noted that an economic impact study of the Pennsylvania wine and grape industries prepared for the Pennsylvania Wine Association in 2018 by John Dunham and Associates showed that the industry was responsible for 9,677 jobs, $391,621,747 in wages, and $1,423,950,178 output (including agri-tourism impact).

In concluding his presentation, Hickey commented that a grant from the Pennsylvania Wine Marketing Research Board will allow Penn State Extension to assess and address vineyard herbicide drift challenges in Pennsylvania during 2022-2023. The objectives of the grant are to:

- Survey herbicide applicators and vineyard owners (Spring 2022);
- Develop extension products such as a field guide and a poster (2023);
- Research PGR herbicide effect on the responses of various grapevine cultivars (research starting in Spring 2022).

"We don't know the extent of herbicide drift and damage in Pennsylvania vineyards," Hickey said. "It's complicated. Vineyard managers/owners need to scout often and effectively to detect damage. Symptoms can be nuanced; it's difficult to prove the symptoms are caused by herbicide drift from another site and sometimes can be caused by in-vineyard application."

The second session of the webinar was presented by Dwight Lingenfelter, extension associate for weed science at Penn State Extension. He started his talk with the comment that, overall, most complaints about drift were from

the Midwest and the South, with relatively few from the Mid-Atlantic region, and that what is considered "bad" in one cropping system—grapes, vegetables, orchards—is good in another, like soybeans, corn and pastures, or on right-of-ways (**FIGURE 5**).

He noted that there really have been no new herbicide products, and no new modes of action, for 30 years. "New" herbicides have mostly been pre-mixed or revised formulations, in part because more funding goes to biotechnology, not pesticide discovery projects, which are more expensive. Currently, the main auxin type herbicides in use (with some of their brand names) are:

- 2,4-D (Weedar, Weedone, Enlist)
- Dicamba (Banvel, Clarity, Status, Engenia, Xtenimax)
- Triclopyr (Garlon, Crossbow)
- Clopyralid (Stinger, Spur)

Next, he defined the two types of drift. With physical (particle) drift, spray droplets physically move after leaving the spray nozzle, but before reaching the intended target can travel long distances, and the distance is impacted by wind and temperature inversions. Vapor drift (volatility) moves as vapor, after the herbicide is applied, in an unpredictable manner for as long as 3+ days post application, and the risk increases with higher temperatures, especially above 80° F. (**FIGURE 6**)

There are numerous ways to reduce drift, including:

BRUCE BORDELON

FIGURE 6. Several new formulations of dicamba based herbicides were released after 2016. The fruit set on this cluster was damaged by dicamba spray drift.

- Use low-volatile formulations of herbicides; nozzles that produce larger droplets for lower drift; a lower boom height.
- Use proper adjuvants (drift reducing agents, volatility reducing agents).
- Monitor wind and environmental factors, and spray on calm days or in the early mornings/evenings.
- Be aware of overnight temperature inversions. When warm air is kept above cooler air, small droplets remain suspended in the air and move great distances horizontally for as long as the inversion lasts. The direction and distance of movement is unpredictable. No applications should be made when an inversion exists at the field level.
- Don't spray during high humidity, or when humidity plus air temperature totals more than 125.
- Time application of sprays during the season.
- Maintain buffers.
- Properly clean equipment, especially the sprayer tank and the booms.

Lingenfelter also looked at several different herbicides and their relative volatility. Since grapes are very susceptible to damage from dicamba, he noted that there are three different salts of dicamba, each with a different volatility

level: DMA (Banvel) is 100 percent volatile; DGA (Clarity) is approximately 28 percent volatile; and BAPMA (Engenia) is less than 10 percent volatile. For the 2,4-D formulations, 2,4-D ester is more volatile; 2,4-D amine is somewhat volatile; and 2,4-D choline is much less volatile.

There are other alternatives to PGRs to use to control resistant weeds, but those herbicides often are less effective and more expensive.

During the third session, Jackie Schweichler, staff attorney at Penn State Law's Center for Agricultural and Shale Law, addressed the legal issues surrounding off-target pesticide movement (for legal issues, pesticides and herbicides are considered the same). She noted that products liability are claims against the manufacturers, that the product itself has caused an injury. Applicator legal liability is different: if you, as a grower, suffer damage to your crops, you can sue for: 1. strict liability, 2. trespass; 3. nuisance; and 4. negligence.

Under strict liability, a person who engages in an "ultra-hazardous activity" or "abnormally dangerous activities" is strictly liable for injuries proximately caused by the activity.

Trespass is intentionally interfering physically with the person or property of the plaintiff, or intentionally causing something to enter the plaintiff's land. In other words, if a pesticide lands on someone else's property, the applicator could be liable for the damage it causes.

Nuisance is the interference or disruption of a person's private use (that includes the loss of crops) and enjoyment of their land.

Negligence, the failure to act as a reasonable person would act under similar circumstances or acting with carelessness, thoughtlessness, or oversight, is the primary theory in applicator legal liability.

Strict liability, trespass, and nuisance are generally "tack-on-claims."

According to Schweichler, for a grower to win a suit, they would have to prove four factors: Duty; Breach of duty, or did the applicator fail to act in a reasonable manner to prevent damage from the pesticide/herbicide; Proximate causation; and Actual damages. She then looked at the case from the applicator's point of view and discussed what that applicator should do to protect against lawsuits, including complying with laws, regulations and best practices as well as acquiring insurance and liability coverage.

Schweichler concluded her presentation with the comment that while pesticides are a USDA-related issue, non-USDA issues include farmer-neighbor disputes. She noted that the Pennsylvania Agricultural Mediation Program (where she is the program coordinator) offers third-party mediation for disputes.

Pesticide Drift on a Larger Scale

Grape growers in other states have had pesticide drift issues in their vineyards for numerous years. The Northern Grapes Project, under the leadership of Dr. Tim Martinson, senior extension associate at Cornell University, held an herbicide drift seminar and webinar in Lincoln, Nebraska, in 2012 because of the concern about drift problems in states such as Iowa and Nebraska more than 10 years ago.

That concern has continued to increase, as herbicide tolerant varieties of crops such as soybeans have been developed. Dr. Bruce Bordelon participated in a webinar conducted by Penn State Extension in 2020 and spoke about the fundamentals of herbicide drift in vineyards. He noted that while the use of dicamba on soybeans is not a nationwide problem, the number of dicamba drift incidents have increased significantly since 2017 in the major soybean-producing states across the Midwest, from North Dakota to Kansas and east to Ohio (**FIGURE 7**).

BRUCE BORDELON

FIGURE 7. Dicamba spray drift caused the loss of active leaf area on some of these Marquette vines during the active growth phase and, as a result, will have low pruning weights.

Another state with vapor drift issues is Texas. The wine industry across that state has grown dramatically in the past 30 years, and Texas currently has 511 wineries, according to Wines Vines Analytics. Only California, Washington and Oregon have more wineries. Texas has eight American Viticultural Areas, which is not surprising given the diversity of climates from the Gulf Coast to the High Plains. There are now more than 5,000 acres of vineyard statewide, and the High Plains has about 60 percent of those vineyards.

However, the High Plains region is also the location of about 3 million acres of cotton, and about two-thirds of those acres are now planted with dicamba-tolerant cotton. The EPA in 2016 granted Bayer and BASF permission to market a new formulation of the highly volatile herbicide dicamba that contained a chemical additive that was supposed to reduce volatility. Cotton farmers in Texas started to use it in the middle of the growing season. Dicamba has drifted onto vineyards across the region and caused extensive vine damage, from reduced yields to poor-quality grapes and, in some cases, dead vines.

The drift situation has become so serious in Texas vineyards that in June 2021, 57 Texas vineyards and processors filed a suit seeking $560 million in damages from Bayer-Monsanto Company and BASF Corporation in Jefferson County District Court in Beaumont, Texas. While most of the growers are in the High Plains region of Texas, the suit was filed in Jefferson County because that is where the herbicide, dicamba, is made. Monsanto, originally founded in Missouri, was acquired by Bayer in 2018. As of May 1, no resolution to this case had occurred.

Conclusion

Despite all the issues and concerns about herbicide spray drift, Shrawder in Pennsylvania is optimistic about the situation and that spray drift doesn't have to be a long-term problem.

In summary, both state extension programs and farmers need to recognize that vapor drift is damaging other crops, and that management of spray programs is essential. State legislation that allows sprays on a farmer's property so long as they do not impact another farmer would help to alleviate much of the problem—as long as there are "teeth" in the enforcement of those laws. **WBM**

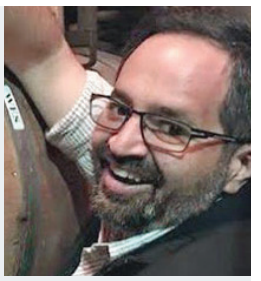
GRAPEGROWER TRIAL

Drone Tanker System Brings Labor Savings of 90 Percent Over Spraying

Santa Cruz vintner and tech trailblazer evaluates proof of concept by using a dual drone system to spray Pinot Noir vines versus manual application with backpack sprayers on sloped vineyards.

Bryan Avila

FIGURE 1. Tanker drone spraying Clos de la Tech Vinyard.



Bryan Avila is a formally trained enologist, seasoned commercial winemaker, ACUE-Credentialed Educator and Co-Founder of the Vintners Institute. The Vintners Institute is a grassroots, next-gen effort to bring wine industry producers and allies together, online and in-person, to innovate with nature, educate the workforce and inspire good leaders. A freelance writer for *WBM*'s Winemaker Trials, Bryan would love to hear what you are doing in your vineyard and winery to overcome challenges, grow better grapes and make better wine. Contact: *bryan@vintnersinstitute.com*

Trial Lead: T.J. Rodgers, chief winemaking officer, Clos de la Tech

Thurman John "T.J." Rodgers is a Silicon Valley entrepreneur. He was a founder of Cypress Semiconductor Corporation and served 34 years as the company's CEO. Rodgers received 20 U.S. patents and has been inducted into the Silicon Valley Hall of Fame.

Rodgers was chairman of solar power stalwart SunPower at its IPO when the company was still a Cypress subsidiary. He also serves currently on the board of several high-tech companies in the areas of high-performance residential solar systems, utility-scale solar power plants, solar energy electronics, gallium nitride power transistors, advanced lithium-ion batteries and precision agriculture used at his three Clos de la Tech vineyards, where he has made wine since 1996.

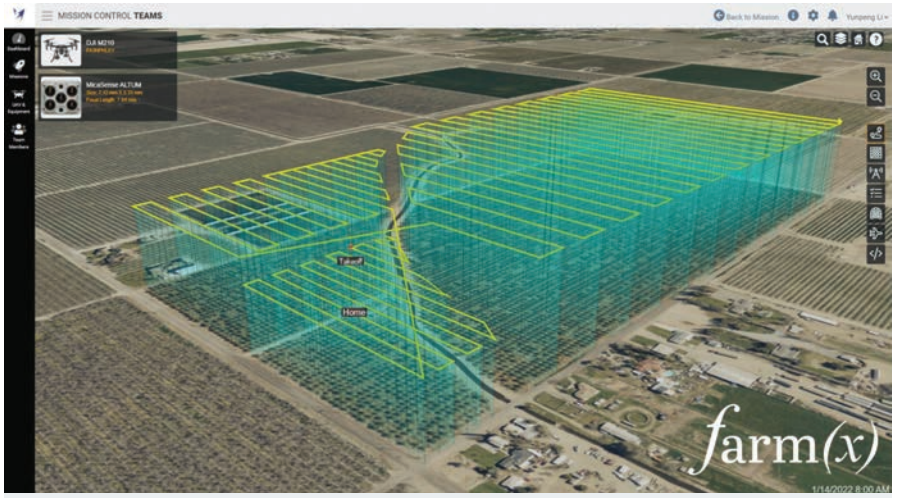


FIGURE 2. Drone follows flight path with no operator.

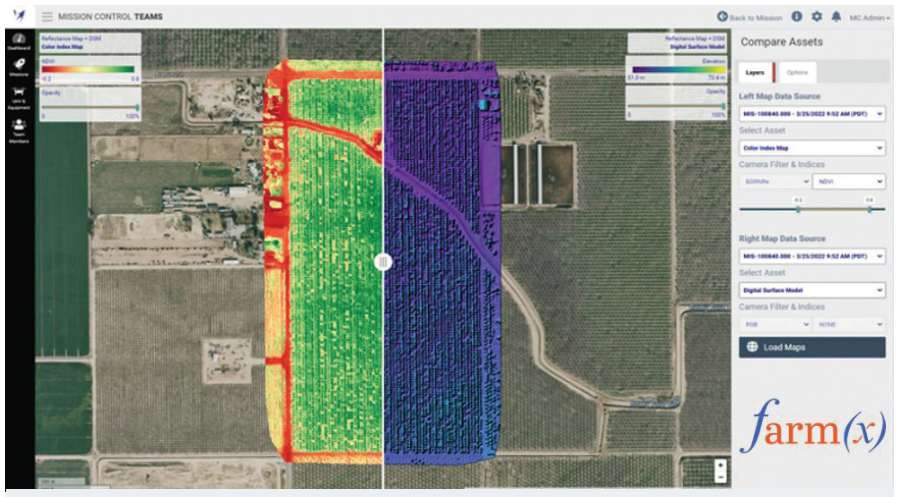


FIGURE 3. Resolution is significantly higher than satellite leading to plant-level, ai-based analytical models.

Background:

A strained labor force, coupled with the West Coast's need to ration water, has ushered grape growers toward adoption of more automated and remote sensing technologies. Now, thanks to continued advancements in drone sensing, data analytics and management, drone technology is developing rapidly over its satellite and aerial alternatives. After all, drones fly closer to the surface, and present much less expensive and more site-specific results with better resolution. Their imaging capabilities put farming individual vines and locating weeds on the table. Working through some of the regulatory and economic challenges involved with drone farming could turn this space-age technology into best practice.

While this trial evaluates a drone's ability to spray a vineyard autonomously, other AI-farming applications are being added to their capability, such as irrigation automation, weed removal and crop quality monitoring.

Tushar Dave, CEO of Farm(X), whose company has now acquired drone AI-robotics company, AutoModality, said, "Autonomous drones have become one of the most significant new developments in agriculture intelligence and efficiency. . . . Farm(X) has turned drones into another pair of eyes for the grower." Just by flying over the vineyard, these autonomous drones can essentially see, process and control vineyard activities, using "sensors and micro-valve technologies to transform viticulture, enabling vintners to manage vineyard irrigation, spraying and yields in ways never before possible in the industry . . . eliminating the need for growers to fly drones."

Last August, wine journalist Kerana Todorov reported on "Drone Technology to Spray Vineyards Gains Popularity" in Wine Business Monthly. The article covered this same vineyard at Clos de la Tech located in the Santa Cruz Mountains. We now discuss the results of that trial.

Trial Objective:

Clos de La Tech's interest in autonomous drone spraying is based on their plans to decrease their dependence on labor. The goal of this proof of concept was to see if drone technology was ready to replace manual spraying by observing the performance of a drone spray application within one battery life.

Trial Description:

The Domaine Lois Louise vineyard totals 250 acres, 35 of which are planted in the sloped terrain of the Santa Cruz Mountains. This trial compares the time it takes to spray this vineyard by hand versus a tethered drone-based system. The average number of man-hours required to spray the entire vineyard has already been collected over several years, with manual spraying ultimately the preferred option up to now. Since this was their first run with the drone, it recognized that drone flights are broken into battery life-sized runs, from take-off to touch-down. This means that the performance of the drone could be broken into a measurable amount of vineyard area sprayed per run. This result could then be scaled to estimate how long it would take to spray the rest of the vineyard. For a successful trial T.J. insisted that the drones should be able to handle the toughest block of his vineyard with the massive downhill slope, block 27B.

The tethered drone tanker system employs two drones: one drone to do the spraying and another to hold the hose. For this proof of concept, another drone was required to shoot the video for observing where adjustments needed to be made before recording the time of the final battery life spray "sortie" for the books. The units observed are reported in total hours worked.

Manual Spraying (Control): Manual Spraying effort that requires 17 people working three eight-hour days to spray the block by hand.

Drone Spraying (Treatment): Dual Drone proof of concept run.

JAVIER CAMPOS, POLYTECHNIC UNIVERSITY OF CATALONIA, SPAIN

FIGURE 4. Manual spraying.

FIGURE 5. Dual drones spraying whole vineyard in tandem.

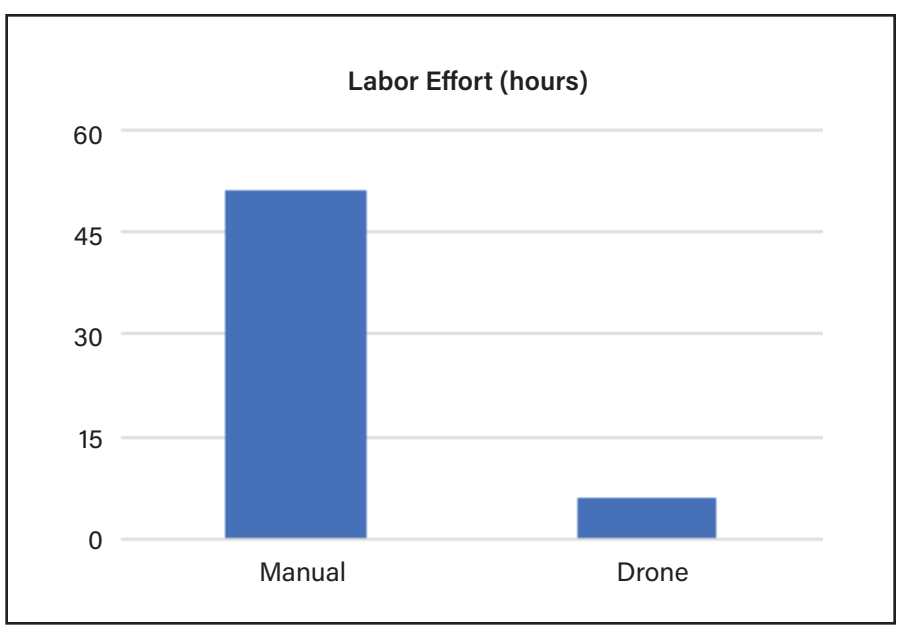
Conclusions:

The Domaine Lois Louise Vineyard is 35 acres and takes an average of 17 vineyard workers three days to complete a thorough spraying of the vineyard.

The results of this proof of concept showed that on one set of batteries, the tethered drone spraying system took 16 minutes to spray 0.50 acres of block 27B, which was approximately 75 percent of that block from take-off to touch-down. During that time, it delivered 50 gallons of liquid. Given these numbers, we calculated the time it took to complete the rest of that vineyard at 16 hours with three people over the course of two eight-hour workdays, resulting in an almost 90 percent reduction in effort versus manual.

	Number of workers per 8-hour workday	Total Days per spray	Total Effort (h)
Manual	17	3	51
Drone	3	2	6

T.J. hopes to improve specifications for the drone production system in 2022 to 10 hours, using only two people, which would result in a 95 percent reduction in effort versus manual, using a fully autonomous, coordinated two-drone navigation system.



What was the motivation to conduct this trial? Why were you interested in using drone technology to farm your grapes?

Rodgers: The motivation was push and pull. On the pull side, my vineyard is super hard to farm, so the efficiency angle brought about by clones was huge. We first started farming our vineyard with a custom tractor similar to the ones they use in the Mosel region in Germany that I bought for $50k to tackle the hill, and I've modified it several times since then. This system required a guy on the tractor, who also controlled the trolley which descended into the rows. But the tractor has to move super slow for safety reasons. Even with the tractor, we found that humans are still faster, so at Clos de la Tech we spray by hand. They wear cleats and carry sprayers on backpacks to climb the hill.

The push was that I had invested in a startup that was exemplary in using drones. AutoModality had drones that demonstrated such great flight. I even saw a demonstration of them landing one on a moving pick-up truck. The idea that we could spray with a drone made all the difference in the world.

These hills are also full of critters, mildew, etc. The only way to farm it well is by doing up-close inspections of vines, and you have to look at 100 percent of the vineyard. This is especially helpful with the mildew, where it is very localized and intense. If we don't catch problems early, then we risk losing a lot of fruit very fast. The drones have really good cameras, so remote observation is possible without having to descend each row manually just to take a look. Drones can do that. They have so much agility, especially without the spray rig attached.

How did you design your experiment? What parameters did you measure?

Rodgers: I'm a philosophical junkie when it comes to wine. I get the *American Journal of Enology and Viticulture,* the Australian journal, etc. I used to read every relevant journal to understand winemaking. To learn to farm my own vineyards, I even got involved with the design of the tractor in Germany—flew to Germany three times. I understand the winemaking, but the greatest challenges come from my vineyard. We had some higher yield years around 2006, but my favorite is the 2002 vintage. It requires a lot of time to keep things dialed in while the ROI remains a big negative compared to the other stuff. When I got hit up by the AutoModality guys, I'll admit: I was a demanding and somewhat aloof customer. I figured that they would probably get in their trucks and never come back. I laid down my challenge, and they met it. The experimental design was simple: they had to beat my current farming costs, using drones without compromising quality.

Who else worked with you on this trial?

Rodgers: AutoModality invented the tanker concept where you have the tanker drone take off first; then the spray drone does the spraying. We had three drones, working at once: two doing the vineyard application and one shooting the video.

FIGURE 6. Caption?

What were you and your team's initial hypotheses before beginning the experiment?

Rodgers: Drones have their limitations. Their constraints are limited to the payload that they can carry, the battery life, their camera and even the hose that can get snagged onto things. It's a lot of moving parts that we knew we would have to contend with. We knew it would work but were not sure exactly just how much tinkering would be needed to finish the job to make an adequate comparison to the manual spray application.

Did you encounter any difficulties during the trial? If so, how did you address these complications?

Rodgers: Me, the demanding customer, expected the AutoModality guys to do very hard things. The real breakthrough here was to have a flying tanker in the vineyard. Sure enough, it took a fair bit of tinkering to get our flying tanker into the air and deliver the spray where it was supposed to go.

They did it. In fact, now I'm on the board for Farm(X) and worked with them to acquire AutoModality. Now it's one of my companies.

What was the most important outcome of the trial that growers/winemakers can use?

Rodgers: In tests at the CDLT vineyards, the drone spray had better coverage than traditional backpack spraying (where vineyard workers walk the rows of vines, manually spraying them). In one recent test, a drone was able to spray just over half an acre in 15 minutes on a single set of batteries, using a three-person crew.

Were the results as you predicted or did anything unexpected occur?

Rodgers: Yes, the way this thing works is it's either going to run, or it's not going to run. It did what we needed it to do. Because it was an engineering experiment, a proof of concept, they still had to bring it down to make slight adjustments, so there is still a lot of learning going on. The method still needs to be fully validated, but they proved that it could be done. We ran this trial on a large section of the vineyard, which was the toughest part of the vineyard to farm.

What was your and your team's impression of the resulting wines, following the drone trial? Were you able to evaluate and measure the effectiveness of the applications, manual versus drone?

Rodgers: The proof of concept here was our method of application. While we did not keep the wine separate, the grapes looked great, and the resulting wines are in barrel, looking good and will ultimately be part of the 2021 Clos de la Tech Domaine Lois Louise Vineyard Pinot Noir.

Our key measurements were aimed at capturing the difference in labor savings between manual- and drone-sprayed. Our tethered drone spraying proof of concept sprayed 75 percent of our half-acre 27B block, delivering 50 gallons of liquid on one set of batteries in 16 minutes from take-off to touch-down. We calculated that the time required to spray our entire 35-acre estate, using the numbers generated from our proof of concept, would be 16 hours, using 3 people versus about 17 people, spraying manually over the course of three days. This equates to roughly a 90 percent reduction in effort versus manual.

Do you plan to conduct a follow-up trial to re-test these results?

Rodgers: Proving that the concept works is significant, but it is only the beginning. The technology will only get better. Our team is continuing to refine the technology to adapt to their vineyards' extreme slopes and to perfecting the drone's spray height above the vines to insure maximum efficiency and optimal coverage.

What are your next steps with the technology?

Rodgers: We need more validation on it to turn it loose. We are spraying this year on a controlled acreage. People always talk about spraying, but observation is the most important. When you walk the vineyard, there is no substitute for being able to attack problems early. Using drones at CDLT also helps monitor the irrigation of the vineyards, crop management and pest control. The drones are helping to make the vineyards more efficient as well as safer. The goal is to have a fully autonomous drone, or fleet of drones, which removes the burden of manually scouting and spraying. **WBM**

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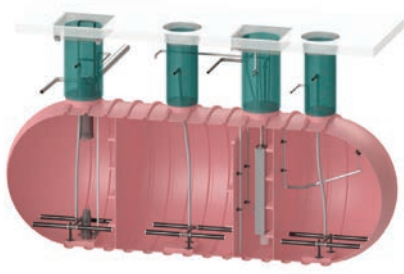

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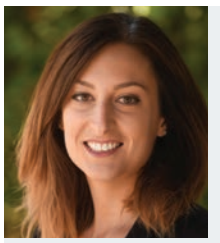
TASTING ROOM STUDY REPORT

Wineries Fare Well in 2021, See Gains in Wine Clubs, Digital Space

While it was a stellar year for wine clubs, pandemic-boosted metrics are unlikely to last into 2022.

Erin Kirschenmann

At Corner 103, guests are treated to a formal tasting with one-on-one interaction with a host.



Erin Kirschenmann is the managing editor for *Wine Business Monthly* and has been with the company since 2012. In addition to production responsibilities for the monthly trade magazine, she writes about business, technology, sales and marketing, and also oversees content and programming for *WBM*'s symposiums. She speaks on wine industry trends at numerous conferences, including the Unified Wine & Grape Symposium and the World Bulk Wine Exhibition, and guest lectures on wine, media and public relations. In 2022, she joined the Napa Valley Wine Academy as a WSET Level 1 and Level 2 instructor. Erin has served as a judge in the international Concours Mondial de Bruxelles wine competition since 2016 and at several regional competitions. She earned her Bachelor of Arts in communications with a journalism emphasis from Sonoma State University and is a WSET Diploma candidate. Find her online via her Instagram, *@erinakirsch*.

IF THERE IS ANY positive news to come from a global pandemic, it would be that wineries across the United States have taken the lessons learned to heart, and adjusted practices not only in the tasting room, but in the digital direct-to-consumer realm as well. The results of the 2021 *Wine Business Monthly* Tasting Room Study show that the majority of wineries have fully embraced website and virtual sales, and see continued growth in the channels.

That said, the study also demonstrates the detrimental effects of a nationwide talent war, spurred on by The Great Reshuffling. Previously considered to be a "Great Resignation" we're now learning that most of those individuals who resigned their posts did so to job jump: either for a higher salary, to find a better work/life balance, to pursue interests or even return to school. The hospitality industry has been one of the hardest hit, as workers report they are unwilling to work long, hard hours for low, or inconsistent, pay.

While the latest Tasting Room Study shows what happened in the tasting room and direct-to-consumer space in 2021, soaring inflation in the first half of 2022 is likely to accelerate many of these trends, particularly in the labor market. It's currently unknown just how much of an impact this could have, but economists predict that there will be more job jumping and some companies are even showing signs of downsizing, freeing up more candidates.

It paints a bleak picture, to be sure, but the data in the Tasting Room Study shows that not only were wineries able to react well to a pandemic, they have seen positive gains in a number of areas.

Overall, the annual percent change in direct-to-consumer sales in 2021 was up 30 percent in both value and volume. In the Pacific Northwest, wineries saw gains of 37 percent in the number of cases sold and 38 percent in the average value; California wineries were up 27 percent in volume and 28 percent in value, and wineries across the rest of the United States were up 25 percent in volume and 21 percent in value in the channel.

Driving Digital

In 2020, the biggest story in the direct-to-consumer channel was the rise in digital sales. Stuck at home, bored and often worried, many adults turned to wine to soothe their fears and pass the time, often choosing to support local and small businesses in the process. Website sales soared.

Would the trend last in 2021, as the world opened back up and everyone left their homes?

It was a resounding yes for wineries across the country. Fifty-seven percent of wineries reported gains on 2020 website sales—which were astronomically high, as 50 percent of wineries saw increases of 20 percent or more, and 82 percent of all wineries saw any kind of growth in online sales.

Whether gains like this continue through 2022 is up in the air—inflation could hinder discretionary purchasing, or rising gas prices could stifle travel and spur online shopping—the big lesson is that investments into the digital space have paid off. Wine Business Monthly's 2021 Technology Survey, published in the September 2021 issue, revealed that 39 percent of wineries planned to upgrade e-commerce capabilities in the coming year, 37 percent wanted to improve the mobile shopping experience on their website, and 29 percent looked to provide better sales analytics, web analytics and customer analytics to the direct-to-consumer team.

Quick website upgrades and major discounts were common in 2020 and helped drive online purchasing; but in 2021, many DTC teams took the time to re-evaluate their entire online strategy and build a strong web presence, optimizing website and shopping cart experiences to improve sales, and that shows in the study.

Importantly, website sales still account for just 14 percent of overall DTC sales—though it could actually be higher since some organizations may count wine club member website purchases as wine club sales, rather than online.

Q15 How did your online DTC business change in 2021 compared to 2020?

	Average
Increased > 20%	24%
Increased by 10-20%	19%
Increased by 0-10%	14%
Stayed the same	19%
Decreased by 0-10%	10%
Decreased by 10-20%	6%
Decreased by more than 20%	8%
Total	100%

This implies a lot of room to grow. In 2021, the average dollar value of a website sale was $165, down from $192 in 2020, and last year 17 percent of direct-to-consumer sales were recorded as coming from the channel. These numbers may seem low, however recent investments in upgraded shopping carts, mobile experiences, digital advertising, SEO management and targeted email management are becoming more commonplace and, in theory, could drive that number higher over the long term.

Q6 What percentage of your direct-to-consumer sales in 2021 were made through these channels? (total must equal 100%)

Geo/Size		Avg
All	Visitor Center/Tasting Room	52%
All	Wine Club/Loyalty Members	32%
All	Telesales	10%
All	Winery Website	11%
CA	Visitor Center/Tasting Room	42%
CA	Wine Club/Loyalty Members	40%
CA	Telesales	16%
CA	Winery Website	14%
PAC NW	Visitor Center/Tasting Room	46%
PAC NW	Wine Club/Loyalty Members	41%
PAC NW	Telesales	4%
PAC NW	Winery Website	11%
REST OF US	Visitor Center/Tasting Room	69%
REST OF US	Wine Club/Loyalty Members	16%
REST OF US	Telesales	3%
REST OF US	Winery Website	6%

Wine Lovers Flock Back to Tasting Rooms

As restrictions lifted, the world rejoiced and readily came back into the tasting room—but what they found was a very different type of experience.

Prior to the pandemic, DTC and tasting room managers were already shifting practices to include more sit down experiences. Some were more casual, others more formal. Either way, wineries were realizing higher bottle sales and wine club conversions from the format, as it allowed hosts and pourers more quality time with the guests. Reservations for these types of experiences were or not required, depending on the business or the technology available to them.

COVID essentially forced all those who weren't in the seated, reservation-only game to move to the format, and a talent war ensured it would survive even as businesses returned to "normal." Back in 2019, 27 percent of respondents accepted reservations; in 2021 that number rose to 50 percent.

Wine Business Monthly asked respondents how much of their business was conducted in these styles. Casual seated tastings were the most common, with an average of 57 percent of tastings held in this style. Next was formal seated, accounting for 35 percent of tastings, then standing at a tasting bar (28 percent), sitting at a tasting bar (18 percent) and finally a facility tour with tasting (15 percent).

What does this mean? Average dollar value of orders through the visitor center/tasting room reached $130, and conversion of customers to sales reached 74 percent and even higher for small wineries and those outside the West Coast.

Visitation was also up, about 59 percent over 2020. This shouldn't be too much of a surprise, as most of the country was under lockdown and foreign visitation was blocked. When comparing the average number of visitors in 2021 to pre-pandemic years, however, the number of visitors was down: just 1,124 average monthly visitors in 2021 compared to 1,520 in 2019.

This makes sense, knowing that most tasting rooms were required to take reservations, do seated tastings and maintain at least 6-foot spacing between parties. There was no bellying up to the bar and cramming as many guests as possible into a single room. Pre-pandemic, tasting rooms in Oregon, Washington and New York were seeing big increases to the number of visitors, while those in Napa and Sonoma were flat or down, even, prompting many to wonder whether it was a move to pricey experiences, seated tastings

Q5 How many total tasting room visitors did you have:		
Geo/All		**Avg**
All	between Jan 1 2021 and Dec 31 2021	13,488
All	between Jan 1 2020 and Dec 31 2020	8,486
All	% Growth	59%
CA	between Jan 1 2021 and Dec 31 2021	12,870
CA	between Jan 1 2020 and Dec 31 2020	7,995
CA	% Growth	61%
PAC NW	between Jan 1 2021 and Dec 31 2021	10,611
PAC NW	between Jan 1 2020 and Dec 31 2020	7,418
PAC NW	% Growth	43%
REST OF US	between Jan 1 2021 and Dec 31 2021	21,759
REST OF US	between Jan 1 2020 and Dec 31 2020	12,940
REST OF US	% Growth	68%

or high bottle prices and tasting fees (or some combination thereof) pushing people away. It will be interesting to compare the 2021 visitor numbers to those in 2022—many wineries have not given up reservations, but are allocating a few tables each day to accommodate walk-ins.

Bellying up to the bar is still a limited option for walk-ins at some tasting rooms, though most wineries have moved toward seated appointments.

Reservations Help Tasting Rooms Staff, but Compensation is Still Paramount

It is no secret that the "Great Resignation", or as it is coming to be called, "The Great Reshuffling", has made hiring enough staff difficult in every industry and every type of position. But the hospitality space has been particularly hard, as those who dealt with customers angry over mask requirements, long hours, low pay and little job security took advantage of using emergency unemployment payouts to find a new line of work, one that more aligned with their interests or paid better.

As a result, the number of winejobs.com postings that included signing bonuses—some as high as $5,000—rose significantly, as did the number of postings that included compensation.

The *Wine Business Monthly* Tasting Room Study has tracked hourly wages for tasting room staff and in 2021, the average hourly wage rose to $17, with an average of $15 paid out in bonuses for each wine club sign-up. In

Q8 In 2021, what was your conversion rate of tasting room visits to:		
Geo/All		**Avg**
All	Wine club	13%
All	Sales	74%
All	Mailing list	34%
CA	Wine club	17%
CA	Sales	70%
CA	Mailing list	44%
PAC NW	Wine club	12%
PAC NW	Sales	69%
PAC NW	Mailing list	31%
REST OF US	Wine club	7%
REST OF US	Sales	84%
REST OF US	Mailing list	17%
50,000-499,000	Wine club	10%
50,000-499,000	Sales	60%
50,000-499,000	Mailing list	48%
5,000-49,999	Wine club	13%
5,000-49,999	Sales	71%
5,000-49,999	Mailing list	29%
1,000-4,999	Wine club	14%
1,000-4,999	Sales	77%
1,000-4,999	Mailing list	36%
< 1,000	Wine club	15%
< 1,000	Sales	79%
< 1,000	Mailing list	30%

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Wineries Fare Well in 2021, See Gains in Wine Clubs, Digital Space

GINA DEGIROLAMO

DAOU tasting room

Q4 How many active club/loyalty members did you:

Geo		Avg
All	Have at the beginning of 2022	1,709
All	Acquire in 2021	418
All	Lose in 2021	179
All	Have at the beginning of 2021	1,470
All	Acquisition Rate	28%
All	Attrition Rate	12%
CA	Have at the beginning of 2022	2,205
CA	Acquire in 2021	516
CA	Lose in 2021	224
CA	Have at the beginning of 2021	1,913
CA	Acquisition Rate	27%
CA	Attrition Rate	12%
PAC NW	Have at the beginning of 2022	1,094
PAC NW	Acquire in 2021	326
PAC NW	Lose in 2021	182
PAC NW	Have at the beginning of 2021	950
PAC NW	Acquisition Rate	34%
PAC NW	Attrition Rate	19%
REST OF US	Have at the beginning of 2022	818
REST OF US	Acquire in 2021	175
REST OF US	Lose in 2021	97
REST OF US	Have at the beginning of 2021	740
REST OF US	Acquisition Rate	24%
REST OF US	Attrition Rate	13%

California, where the cost of living is much higher, wages averaged $19 per hour with $20 for every club conversion. The Pacific Northwest did not lag far behind, at $18 per hour with a $15 club sign-on payout. Outside the West Coast, wineries paid an average of $14 per hour with $6 for every new club member.

Wages, both fixed and incentive, have steadily increased over the years, reflecting higher minimum wages (as is the case in California) and intense focus on building the direct-to-consumer channel to benefit from higher margins. It could be said that in 2021 compensation alone was not enough to entice candidates, and wineries reacted by relying on reservations to appropriately staff guest facilities, ensuring the proper host to guest ratios.

Club Attrition Rates Remain Shockingly Low

Unprecedentedly low attrition rates continued again in 2021, as the average attrition rate ran at just 12 percent—normally this figure is anywhere from 20 to 25 percent, what we would consider a healthy attrition rate. Attrition rates have been on a steady decline since 2019's 20 percent average, and 2020 saw just a 15 percent average.

The likelihood that this attrition rate will hold, as we are still seeing the effects of a COVID-induced "bubble". Businesses had, for the most part, fully reopened in 2021 and travel resumed. Neither are back to pre-pandemic levels, but as more "normal" patterns start to return, we can expect attrition rates to do so as well.

Looming over all of this is discussion of inflation, lay-offs at some of the larger tech and manufacturing companies and the potential for an economic downturn. In the last financial crisis, the wine industry saw club attrition rates hover around 40 to 45 percent.

Happily though, member acquisition rates inched closer to pre-pandemic levels, with an average of 28 percent compared to 2020's 21 percent. In 2019, clubs increased about 42 percent on average.

Wine club remains an important direct-to-consumer channel. Thirty-two percent of winery DTC sales were made in this manner, accounting for an average order value of $219 in 2021. Tasting rooms, by comparison, accounted for 52 percent of winery DTC sales, but the lowest average order value ($130).

Conversions of tasting room guests to wine club members are up—hosts are converting 13 percent of visitors on average—because of COVID and the move to reservations, and private, seated experiences (see table on page 56).

The Future

Results of the *WBM* Tasting Room Study reflect the start of the return to "business as usual" with important adjustments and practices acquired during the pandemic spurring new investment and better operating procedures. It's still too early to fully compare results to pre-pandemic numbers, but the results of 2023's Tasting Room Study, which will track activity in 2022 will give us a better picture of how those lessons translated into dollars.**WBM**

Methodology

2022 *Wine Business Monthly* Tasting Room and Wine Club Study.

The *WBM* study was conducted between March 15 and April 18, 2022.

For a subset of questions, the sample results were blended with anonymized data from Community Benchmark.

The survey participants include tasting room and direct to consumer management, as well as owners and marketing management at wineries with tasting rooms throughout the U.S. from a total universe of 11,000 wineries.

The responses were structured to enable reporting by winery size (annual production) and geographic location, allowing us to accurately report activities of the total market. Accepted statistical techniques are employed to allow segmentation as indicated in the data presented.

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DTC Spotlight: Jordan Vineyard & Winery Celebrates 50 Years of Hospitality

L.M. Archer

JORDAN VINEYARD & WINERY celebrates their 50th anniversary in 2022 with a robust DTC program and revamped Healdsburg estate.

Named the most popular wine brand and number one Cabernet Sauvignon in the Wine & Spirits' 31st annual Restaurant Poll of 2020, Jordan Vineyard & Winery focuses on three things: Cabernet Sauvignon, Chardonnay and hospitality. They also operate one of the wine world's most innovative direct-to-consumer (DTC) programs.

The multi-faceted Jordan Winery Rewards Program combines old world standards, new world innovations, sustainability, social responsibility and a strong digital presence to craft world-class food and wine experiences for loyal members.

Old World Standards

Founded in 1972 by Tom and Sally Jordan, the winery estate comprises 1,200 acres. Estate vineyards total one-tenth of the estate, 120 acres planted to Bordeaux grapes delineated within 20 individual blocks. Varieties include about 88 acres of Cabernet Sauvignon, 24 acres of Petit Verdot, 4 acres of Merlot and 3 acres of Malbec.

A portion of the estate vineyard soils resembles those of Bordeaux's clay-rich Right Bank. Other mineral-rich parcels located mid-slope resemble the well-draining soils of Bordeaux's Left Bank. Christened "Côte de Jordan," these vineyard slopes and benchlands produce red wines reminiscent of Bordeaux Grand Cru Classé blends in balance, complexity and composition. Jordan also sources Chardonnay from Sonoma's Russian River Valley AVA to craft Burgundy-style Chardonnay wines.

With this emphasis on rigorous French standards, Jordan Winery enlisted legendary winemaker André Tchelistcheff in 1974. Top UC Davis grad Rob Davis joined the winemaking team in 1976, taking over from his mentor when Tchelistcheff died in 1992. After 43 harvests, Davis appointed Maggie Kruse head winemaker in 2019 but he still consults for the winery.

"Although we've focused on making just one white wine and one red wine since the 1970s, we believe every vintage should be better than the last, and we spare no expense in that pursuit," said Kruse, who joined Jordan Winery in 2006. "Finding new ways to improve our wines year after year, while maintaining our signature style, is quite the challenge and keeps things fresh and interesting."

Innovation

While Jordan Winery honors old world methods, they also embrace innovation. In 1972, the Jordans purchased land in Sonoma's Alexander Valley and planted vineyards. By 1974, they realized they wanted a winery too and purchased 1,200 acres that overlooked their new vineyard.

That same year, the Jordans hired Bay Area architect Bob Arrigoni to construct a state-of-the-art, 58,000-square-foot winemaking, warehouse, administration, culinary and hospitality château. (Arrigoni later constructed the family's estate residence in 1978.)

Under Tchelistcheff's guidance, the fledgling winery harvested its first vintage in 1979, releasing it in 1980. Kudos soon followed. Jordan Winery won a 1983 "Best Cabernet in America" award from the Beverage Tasting Institute in Hyde Park, New York for its 1979 Cabernet Sauvignon. Opened to international markets in 1984, it gained international renown in 1986 when the White House served Jordan wines at the Inaugural Anniversary Dinner Dance.

Yet despite its burgeoning prominence, Jordan Winery remained notoriously private. They rarely extended visitor invitations, except to a few members of the trade and media. This practice continued as wine clubs gained popularity throughout the 1990s and early 2000s, prompting area wineries to open their doors to the public. Jordan Winery did not.

"A lot of those wine clubs are really for wineries that make four or five different wines within their portfolio or vineyard designates," explained Maribel Soto, director of estate services and DTC for Jordan Vineyard & Winery. "Pulling from DTC to the wholesale market was not really an interest [at Jordan] and still continues to be that way."

Loyalty

In 2005, scion John Jordan assumed the helm of Jordan Winery as CEO. The trained attorney, aviator, Navy reservist and polyglot (Jordan speaks fluent German and Russian) fiercely maintains the family's focus on food, wine and hospitality. But he added a new dimension when he launched Jordan Winery's Rewards Program in 2008.

The rewards program pivots around loyalty. A soft launch initially drew from a mailing list that went back to 1995 (when the winery purchased its first computer) and contained over 20,000 long-time Jordan wine fans. Today, that mailing list exceeds 70,000 members.

The list included members who purchased wines directly from Jordan, as well as those living in states that prohibit wine shipments, who purchased Jordan wines at restaurants and stores. "We wanted to really capture and provide some additional content for all of those Jordan fans, [whether] they were buying direct or not," said Soto. "With that motto of "wherever you buy Jordan, we are happy, and we thank you!""

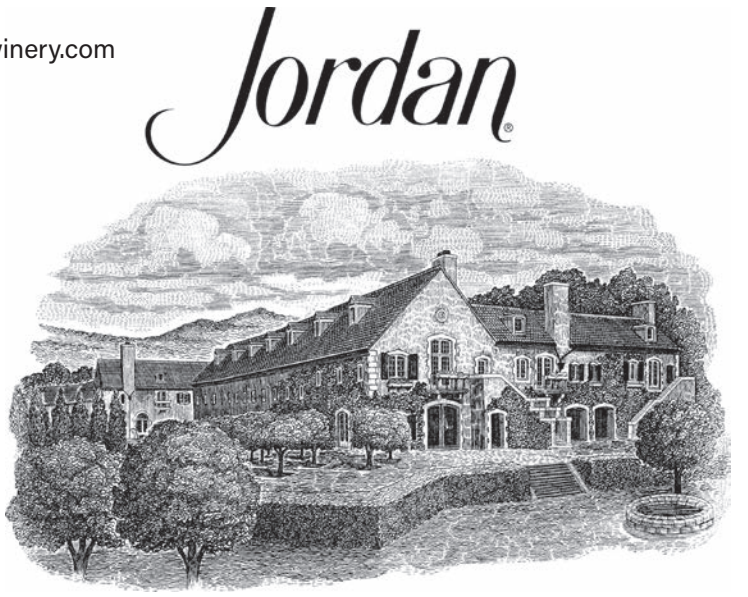
Unlike traditional wine club memberships, Jordan Winery's rewards program requires no signing fee nor minimum wine purchase. Instead, membership commences upon joining the winery mailing list and works on a point system. Members earn 3,000 points upon joining, then accrue three points per dollar for every purchase made at the winery, online or via phone. Accumulated points, which never expire, apply to elite rewards and perks, which vary according to membership levels.

Lifetime spending amounts determine inclusion into one of four membership levels: Bronze, Silver, Gold or Platinum. Members with a lifetime spending of less than $499 enter the Bronze level, thereby receiving a biweekly newsletter with perks, like reduced seasonal shipping or advanced notice of member events. A lifetime spending history of $500 or more earns Silver membership, a lifetime spending history of $2,500 merits Gold memberships, and a lifetime spending history of $5,000 offers Platinum membership.

To redeem points, members pay an introductory redemption fee, plus points. Redemption fees and points decrease with ascending membership levels. Thus, Silver member rewards fees start at $60 per person, plus 1,800 points, whereas Platinum members pay the lowest discount price with the fewest points: $30 redemption fee per person, plus 1,200 points.

JORDAN: 50 Years of Hospitality

Jordan Vineyard & Winery
1474 Alexander Valley Road Healdsburg, CA 95448 | 707.431.5250 | www.jordanwinery.com



Owners/Principals
John Jordan, owner and chief executive officer
Maggie Kruse

Director of Agricultural Operations:
Brent Young

Grower Relations Manager: Dana Grande

Executive Chef: Todd Knoll

Director of Estate Services & DTC: Maribel Soto

Year Bonded 1972

Winery Case Production 100,000

Average Bottle Price $40–$215

Direct-to-Consumer Sales 10%

LIGHTSPEED FILMS

HOSPITALITY SPACE

Year Built: 1978–1979
Size (square feet): 58,000

STRUCTURAL

Architect (1970s/original): Bob Arrigoni
Architect (2022-23/lobby remodel): Scott P. Bartley of Hall & Bartley
Interior design (2021-2023): Maria Haidamus
Landscape architect (2020-2023): Ann Rosmarin
Flooring (1970s/original): Hexagon terracotta imported from Southern France
Flooring: Library is still the original herringbone wood floors, restained in 2021

TASTING ROOM

Furniture (1970s/original): Personally sourced from antique dealers in France and the U.S.

Founder Sally Jordan's Louis XV chairs were painted by Willem Racké Studio and reupholstered in Panier de Fleurs Indigo by Le Gracieux

Custom trestle-style French farmhouse table made of Alder wood by Urban Wood Phoenix of Arizona found on Etsy

19th-century French press found on Chairish

French dough box buffet in the Directoire style (more than 200 years old) sourced from Inessa Stewart's Antiques of Louisiana

Louis XIII nail-head chairs by Dennis & Leen, upholstered in Majilite Satchel Black Emerald.

Furniture (2021-2022 remodel): French carved wall art sourced by Mrs. Jordan for the original chateau construction, depicting scenes of harvest.

A four-foot tall, silvered-bronze, 18-light, Rococo chandelier from France circa 1880; each arm depicting grapevines with clusters of grapes, leaves and flowers with each bobeche shaped like an opening flower with a light acting as its stigma; center post adorned with scrolling elements, acanthus leaves and swags of flowers; and a silvered-bronze, winged cherub of Bacchus flying among the vines. An exceptional example of French bronze work and of the opulence of the period.

Lighting Solutions (2021-2022 remodel): 19th-century French gothic iron chandeliers with Fleur de Lis crowns, sourced from Fireside Antiques of Louisiana via 1stdibs

Point of Purchase Display Materials: iPad

Stemware Washers: Hobart
Wine Dispensers: Subzero
Wine Glasses: Riedel Vinum Series

SOFTWARE

Accounting software: Navison
Business Intelligence: Salesforce
Club Management: Commerce 7
CMS & Website: WordPress
Compliance: ShipCompliant
CRM- Direct to Consumer: MailChimp
DTC Software Suite: WinePulse
Shopping Cart: Commerce 7
Tasting Room POS: Commerce 7
Tasting Room Reservations: Commerce 7
Website Design: Revel Design

All Photos Courtesy of Jordan Vineyard & Winery

Ultimately, the rewards program delivers Jordan's trademark exclusivity. "In 2008, we rolled out specific experiences that were only available when you visited the winery," explained Soto. "Jordan has always had a culinary program, so we've always had wine and food pairings. But it gave them access to book a four-course lunch or a five-course dinner privately at the Jordan Estate, and overnight stays." Ever-evolving rewards experiences range from coveted library wine access and special culinary events to overnight stays, private tours and tastings.

Food and Wine Pairing

Following European tradition, Francophiles Tom and Sally Jordan created wines designed to pair with food. To that end, they hired French-trained executive chef Henri Charvet from Aix-en-Provence in 1976. Chef Charvet brought with him classic French culinary training, laying the foundation for Jordan's gracious food and wine program. A fusion of French and California cuisine, menus celebrate the effortless art of entertaining à table.

Today, Jordan's executive chef Todd Knoll uses sustainable cooking methods in addition to traditional ones. These include growing, foraging and purveying local ingredients. Culinary staff use every part of the plants they grow, thus, pea tendrils and fava bean blossoms may garnish plates, or Japanese red shiso herb blossoms accent salads. Even kitchen scraps and harvest grape pumice play a part, returning as compost to the garden. The menu also features honey from an estate apiary adjacent to the kitchen garden.

Daily, members of Knoll's team forage estate-wide for emerging wild mushrooms, greens, herbs and berries, bursting with a "taste of place." Even floral

arrangements and table settings echo this natural aesthetic, such as artfully placed lichen-draped oak branches or unusually shaped stone found during these expeditions.

From "Private Tables" and "Seasonal Lunches," to "Culinary Events," Jordan's culinary rewards proffer a lavish "snapshot of Sonoma," infused with French flair.

Jordan Vineyard & Winery Celebrates 50 Years of Hospitality

A stand-out "private table" experience pairs ultra-luxe champagne and caviar. Jordan Winery introduced the Jordan Cuvée by Champagne AR Lenoble and Jordan Chef's Reserve Caviar by Tsar Nicoulai pairing in 2017. The impetus harkens back to 1987 when Tom Jordan founded a sparkling wine project christened "J." Daughter Judy Jordan later assumed full ownership of "J" Vineyards and Winery before selling it in 2015. To slake members' thirst for Jordan bubbles, the Jordan family partnered with Champagne's Malassagne family to create Jordan Cuvée by Champagne AR Lenoble.

Concurrently, Jordan partnered with Sacramento County-based Tsar Nicoulai to craft proprietary Jordan Chef's Reserve Caviar. As part of the collaboration, Jordan staff kayak along the Sonoma coast, collecting seawater and kombu kelp used to cure 100 percent, sustainably-harvested California white sturgeon roe.

Other sumptuous dining rewards include a "Casual" four-course paired luncheon on the terrace and a "Lavish" four-course paired luncheon served in either the French-themed dining room or on the terrace. The latter also concludes with a private tour of the winery château. A "Decadent" five-course dinner commences with a Champagne toast. Served in the dining room, limited seatings ensure intimacy.

Season-centric lunches and events add coloratura to dining choices. French-themed Epicurean Alfresco Luncheons run May through August while Harvest Luncheons span September through October. Menus rotate daily, both paired with Jordan wines served terrace-side. Harvest lunches, celebrating the end of grape harvest, date back to 1980 at Jordan.

Jordan Winery's annual Valentine's Day dinner proves the most popular seasonal event. "Valentine's only comes once a year," observed Soto. "Our Valentine's dinner fills up very quickly because our dining room is pretty small—30 guests max—and includes a seven-course, Michelin star-rated [dinner]. It sells out usually within 15 minutes, and gives our Gold and Platinum members that exclusivity of being able to sit alongside other Gold and Platinum members."

Jordan Winery also promotes regional wine and food events, including an inaugural Healdsburg Wine & Food Experience in May 2022. Attendees to this weekend gourmet extravaganza access participating wineries, restaurants and hotels that offer celebrity chef events, wine tastings and live entertainment. Jordan Winery hosts a five-course, VIP luncheon with winemaker Maggie Kruse and grower relations manager Dana Grande. A select group will also attend a VIP Magnum Party and 50th anniversary celebration at Jordan Club 50 lounge in Montage's courtyard to enjoy large-format library vintages, food pairings, Champagne and cake.

Overnight Stays

Luxury overnight rewards cater to out-of-state and local members alike. Accommodations include three recently-renovated, French-themed Château suites, updated during the pandemic, along with a library and cellar room for hosting members.

The retooled château suites offer rare Louis XIII-, XV- and XVI-period antiques, elegant French doors and windows, and sweeping, second-floor views of the estate. Additional appointments include a king-size bed, sitting area, fireplace and wet bar with mini-fridge.

"Because we already had many heritage pieces of historical and sentimental significance, the inspiration for the redesign projects was more about finding French styles that would complement the antiques John's parents acquired more than 40 years ago," noted Lisa Mattson, creative director at Jordan Winery. "Neoclassical pieces of the Louis XVI period, as well as barley twist elements from the Louis XIII period, were the two styles that Maria Haidamus and I both looked to bring the old antiques, new antiques and custom-made pieces together. The result is an interior design that blends two generations of both mother and son."

Pampering continues with a complimentary, culinary staff-crafted continental breakfast, served in-room with French press coffee or Jordan Estate-foraged tea. Most overnight guests prefer to schedule dinner in the estate dining room. However, for members opting to dine in downtown Healdsburg, the winery provides complimentary round-trip transportation. Staff may also arrange curated wine dinners at downtown restaurant partners upon request for an additional fee.

The Wildwood at Jordan guest cottage offers a more private lodging experience. The two-bedroom, two-story, craftsman-style retreat nestles atop a hillside, offering secluded mountain and woodland views. Downstairs

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fittings include a full kitchen, living room and master bedroom with en-suite bathroom downstairs. Upstairs offers a guest room and loft with queen bed, linens, separate full bath and two decks suitable for sunset sipping.

Tours and Tastings

Tours and tastings perks capitalize upon Jordan's expansive estate grounds. The "Winery Tour and Tasting" combines a tour of Jordan's château, a walking winery tour and tasting, and seated food and wine pairing. A "Vineyard Tasting" experience takes guests outdoors for a hilltop vineyard wine and local salumi tasting. An adventurous "Estate Tour and Tasting" traverses remote estate reaches, ending with a scenic repast of Jordan wines, olive oils and chef-prepared delights. During the holidays, Jordan's "Holiday Tour and Tasting" at Christmas adds a seated food and wine pairing with winter goodies.

Interestingly, Jordan Winery's outdoor tour model proved invaluable during the pandemic. "For us, it was actually very unique because we had an opportunity to open up a little bit sooner than some of our neighboring wineries," Soto explained. "We were actually the first winery to open under the first shutdown. And we were able to open in May [because] the first thing that opened up in our state, at least in Northern California, was parks and recreation." While other winery DTC programs struggled during the pandemic, Jordan Winery thrived.

Thanks to Jordan's astute marketing department, the winery developed public hiking experiences throughout the 1,200-acre estate as soon as regional parks and recreation areas re-opened. "We thought it would be a great opportunity to allow people to come to Jordan, enjoy the outdoors and focus on our sustainability efforts," Soto said. The 4-mile hike included a pre-existing map created for pre-pandemic guest experiences, plus food and wine to-go. "Grab and go" kits included locally-sourced charcuterie and cheese, estate-sourced salads and crudité, Jordan Winery extra virgin olive oil and a bottle of Jordan wine.

Eventually, as a result of relaxed statewide pandemic health and safety requirements, the winery ended public hiking experiences in 2022, with one exception: a series of three Earth Day excursions for a maximum of 18 guests. "Now that we're able to be open for some of the other beautiful experiences that we offer, like seven-course dinners, overnight stays and private lunches to our members," said Soto, "we really wanted to go back and focus on that area."

Sustainability and Green Business

From the start, sustainability and green business practices inform Jordan Winery's entire operations. This includes a water reclamation pond built when the winery was constructed in the early 1970s. "We have a beautiful water reclamation pond on the estate that goes into our lower lake, which is about 6 surface acres," noted Soto." The second lake is about 10 surface acres, but that lower lake recycles and reuses all the non-potable water throughout the winery."

Jordan uses the reclaimed water for tank and barrel sanitation, winery cleaning and grass irrigation. "We are very fortunate," acknowledged Soto. "We have a very large water supply on the Jordan estate, which tends to be a topic in California, with water being so scarce."

Remote monitoring systems maximize irrigation efficiencies and mitigate vehicle impacts upon the ecosystem. The monitoring tools track weather and water systems via iPhones, iPads and computers. Vineyard crews also practice selective no-till farming to reduce soil disturbances and tractor emissions. Additionally, the winery uses wind machines instead of water for frost protection.

Jordan also invests in efforts to reduce power consumption. "Everything, from redoing our roof to going to all LED lighting," explained Soto, "were some of the efforts— cutting our energy use at the winery, [installing] solar panels—2,000 solar panels on the estate that run the winery." During summer months, the solar panels produce over 100 percent needed energy, which Jordan sells back to Pacific Gas and Electric (PG&E).

Mindful conservation underpins other Jordan estate undertakings. During the 1990s, phylloxera destroyed the winery's original Alexander Valley vineyards. Jordan moved uphill to their estate property to replant. They also planted olive groves, a chef's garden and fruit trees to increase biodiversity, leaving wide swaths of open spaces, mature trees and buffer zones.

While vineyards don't need pollination, fruits and vegetables do. Besides a well-established apiary, the winery also supports bumblebee and Mason bee habitats. Moreover, since 1996, the winery has hosted local beekeepers' hives during winter. This pre-almond blossom season "staycation" allows guest bees time to fatten up on Jordan Estate's biodiverse bounty. Through an alliance with Pollinator.org, Jordan assists other pollinators, like Monarch butterflies, beetles and hummingbirds, by converting former pastures and open areas into native grass, wildflower and legume habitats.

"Responsible stewardship of our 1,200-acre estate is a significant focus for us at Jordan," said Brett Young, director of agricultural operations. "Our goal is to preserve and nurture the precious biodiversity as much as possible. Only about 10 percent of the estate is planted to vines; the rest is dedicated to natural spaces, including our native pollinator sanctuaries. Maintaining a balanced, thriving ecosystem allows us to apply the smallest human input to maintain our estate vines."

These accumulated efforts have earned Jordan Winery numerous sustainable certifications, including Sonoma Green Business Program, Bay Area Green Business Program, Fish Friendly Farming, Fish Friendly Farming Light Touch Award, Fish Friendly Ranching, Bee Friendly Farming, EverGreenSonoma Clean Power and Sonoma County Sustainable certification.

Most recently, the winery completed the California Sustainable Winegrowing Alliance's rigorous Certified California Sustainable

certification for both vineyard and winery in 2019. This statewide certification involves painstaking, third-party verification of required vineyard and winery sustainability practices.

Digital

Finally, an extensive online presence helps amplify Jordan Winery's multi-pronged DTC program. This includes the award-winning Jordan Winery blog, which shares winery news, vineyard and cellar updates, compelling photos and more, often directly from the winery principals themselves.

> *"Our goal is to preserve and nurture the precious biodiversity as much as possible. Only about 10 percent of the estate is planted to vines; the rest is dedicated to natural spaces, including our native pollinator sanctuaries."*
>
> **Brett Young**, director of agricultural operations

Jordan also publishes Jordan Wine Country Table print magazine, featuring food, wine, travel and entertaining tips and recipes. The online version also posts entertaining how-to demonstration videos, plus favorite appetizers, entrées and desserts to pair with Jordan wines.

While active across all social media sites, Jordan started a VIP Facebook page for Silver, Gold and Platinum Members. Here, members can connect with one another and provide valuable feedback, instrumental in perfecting rewards experiences.

E-commerce and virtual tastings also gained traction. "Virtual tastings became something that we were doing on a regular basis," stated Soto. "Hosting everything, from a small virtual tasting for two of our members to big corporate ones for 40 to 50, and sometimes even over 100 [people]."

Moving forward, Soto anticipates continuing across these digital platforms. As for other future improvements, the winery plans more multi-city "welcome experiences," plus lobby renovations to increase indoor entertaining areas for members, along with more first-rate food, wine and hospitality experiences. **WBM**

DTC Packaging is Costly Yet Valuable Marketing

Andrew Adams

Andrew Adams is the editor of the *Wine Analytics Report* and was a writer and editor at *Wines & Vines* magazine for nearly a decade. Adams grew up in the city of Sonoma and graduated from the University of Oregon with a degree in journalism. In addition to working at daily newspapers for more than a decade, Adams worked in the cellar and lab at the former Starmont winery in Napa Valley.

THE TANTALIZING REVENUE OF DTC shipments has always belied the expense of getting that wine to consumers, and with inflation at historic levels and no end to cost increases in sight, it's getting more challenging for wineries to account for those costs.

But added shipping costs are toxic in e-commerce, and custom packaging can provide the high-touch engagement necessary to retain the best consumers who are increasingly more likely to ditch a club sooner.

According to Christian Ahlmann, general manager of Six Sigma Ranch & Winery in Lake County, Calif., the cost of a single four-bottle club shipment has increased from $25 to $30 over the last four months. "We offer flat rate $1 or $10 shipping on club orders, so a $29 subsidy on a $120 order takes a chunk out of the margin we have left to run a company and pay our team," he said.

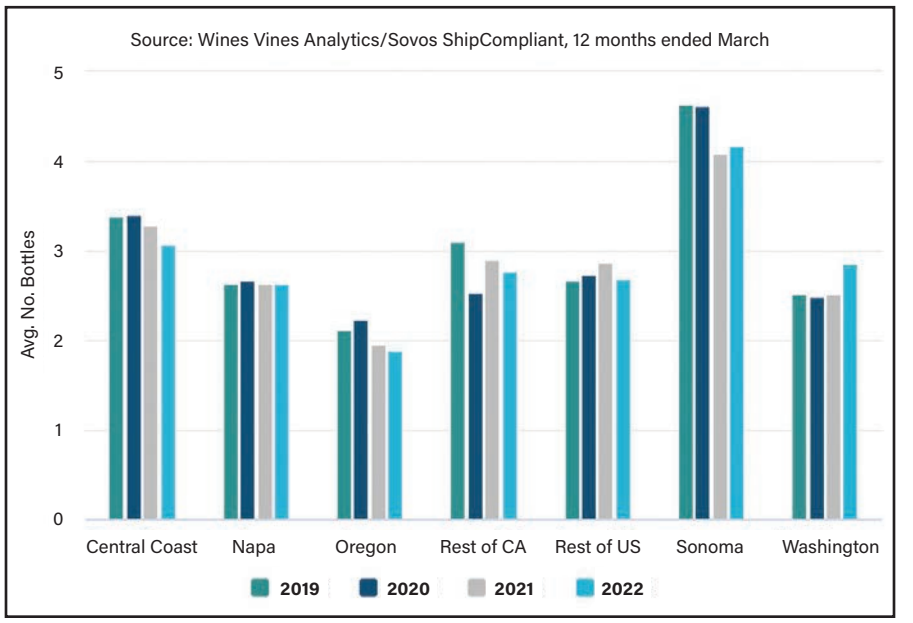
The winery did launch a "case club" a few years ago where members can consolidate their quarterly allotments; and while that does reduce shipping costs, it makes keeping those members engaged a bit more challenging. Case club members still receive perks, such as a newsletter, as well as gifts that aren't too expensive to ship, including a wall calendar, kitchen gear with the winery logo and other small items.

While many wineries hope that consumers will understand and ultimately accept price increases on retail shelves, Ahlmann attributes a proactive approach in helping with shipping costs. That transparency, Ahlmann believes, is one of the reasons why the club has steadily grown by 13 percent even as DTC business has increased from 50 percent of total sales to 95 percent. "We communicate very openly with our members about what it takes to do the work we do for them, and they are very understanding of necessary price increases," he observed. "They know we are a family farm and that we need to pay our team for the work they do."

Ahlmann added another tool to boost engagement, while reducing shipping costs, in order to get club members back to the winery. "We are constantly looking for ways to get guests to the property to engage with them deeper," he said. "That also makes it easier to 'ship' them the wine when we can load it directly into their car."

Re-engaging to Retain Members

Colette Fay Simpson is the vice president of sales operations for Three Sticks Wines in Sonoma. She stated that the winery is fully allocated, through its DTC program, as it contends with limited inventory; and while that limits



growth projections for the coming year, they still supported the spring release with key market visits to drum up engagement. This follows a focus on digital advertising, virtual experiences and cross promotions with other wineries and wine country lifestyle companies in 2020 and 2021.

"Our expectation for the coming year is virtual tastings becoming more seasonal, travel and event participation to increase, and visitation to our hospitality home to continue to thrive," she noted.

In terms of packaging and shipping cost increases, she has scaled back shipping discounts for everyday consumers and extended most of those savings to club members. "But overall, we have not yet passed along the increasing costs of shipping to our supporters," she said. "With quarterly increases from our warehouses, we are definitely feeling the constraints of shipping wine more than ever."

The ongoing cost increases come with ongoing shortages of key materials as well. This has become problematic for Jude Radeski, general manager of Adelaida Vineyards in Paso Robles, who has had to reschedule several bottling runs and continues to contend with delays and limited availability of glass, capsules, cases and other supplies. "It hasn't been visible to customers on the DTC side as of yet," he observed. "While our third-party fulfillment house has mentioned corrugated shortages and increased fuel costs, they seem to be keeping up. In short, these (challenges) haven't impacted growth but certainly could."

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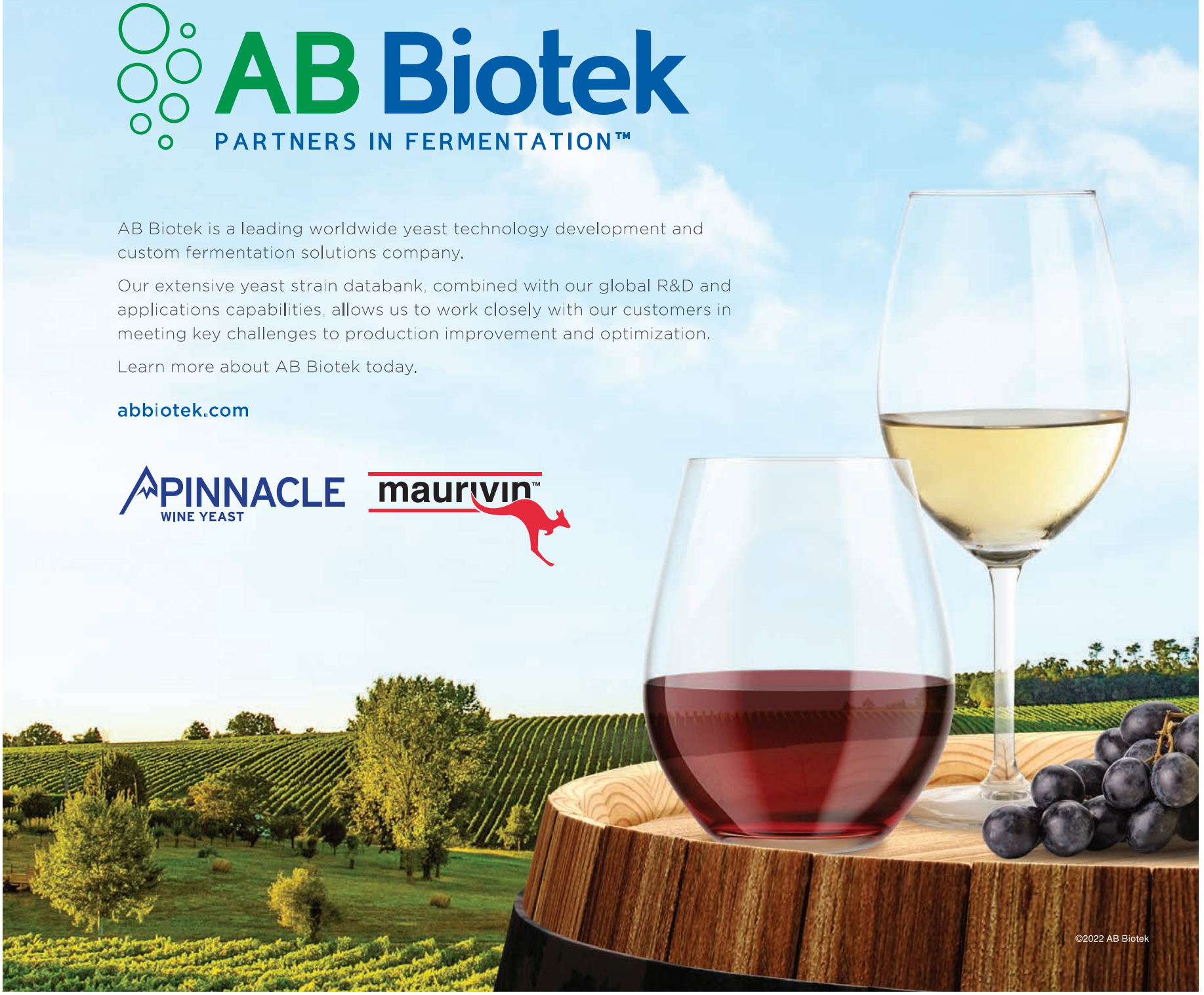

He said tasting room bookings, through June, are up compared to last year, and increased demand is in step with the winery pulling back a bit on e-commerce. "We're actually getting a little constrained on inventory, so I am holding wine for tasting room use more so than I did in the past."

Tracy Timmins, vice president of consumer sales at the Stoller Wine Group in Dayton, Ore., said the company continues to adjust after the wider wine industry was forced to enter the 21st century because of the COVID-19 pandemic. "The traditional rules for how we talk about and engage with wine are off the table," she said in an email.

Direct outreach via phone calls by the company's concierge team continues to work well as the calls are not always seeking sales but rather are direct outreach calls tailored to the individual. "The act of reaching out allows us to learn more about our consumers and ensures the wines they are purchasing are the wines they'll like most," Timmins explained. "Much like an onsite experience, we can match wines with taste profiles, weeknight meal planning or upcoming major milestones."

Within the actual shipments sent to club members, Timmins said the goal is to try and create an experience that evokes a visit to the winery. "We've created beautiful club allocation box toppers that tell seasonal stories about the wines in their box to achieve this," Timmins said. "The rebirth of the QR code allows us to embed winemaker videos that speak to each of the wines, recipes from our culinary director and executive chef that perfectly pair with our wines, and education about our vineyard and philosophy."

Timmins acknowledged the cost of shipping heavy glass bottles in an Amazon world in which consumers expect it to be free will always be challenging, so the winery has included those costs in the price of certain membership tiers or offers flat-rate discounts to others based on volume. "We find the shipping price to be less of a hurdle when the experience inside the box is engaging. Consumers are demanding personalization and experience, and we are responding."

Spending More to Add a 'High Touch'

Despite the rising costs of shipping wine to customers, packaging remains an outlay that clients don't skimp on, according to Dave Schuemann, owner and creative principal of CF Napa Brand Design. Indeed, many of his clients, who are heavily invested in the DTC space, are spending more on packaging rather than less. "The attrition rate is brutal if you don't treat them with a high touch," he said, referring to consumers in premium-priced wine clubs.

Higher-quality, folded cardboard shippers with detailed, custom printing are very popular because they offer a premium feel and appearance while remaining compliant with the major carrier companies. "They have really high-quality printing; it's not your traditional cardboard box," he explained.

Such shippers may also allow wineries to ship different bottle shapes and sizes, so a Cabernet Sauvignon in Bordeaux glass can be delivered with a sparkling wine and even a Chardonnay in a Burgundy bottle. Such boxes can also enable consumers to customize their DTC shipments in much the same way tasting room visitors can vary their purchase selections.

Wineries are also giving more thought to the materials that support DTC programs. Schuemann said a mix of the very traditional—such as a handwritten note on high-quality, heavy cardstock—plus digital outreach appears to be the most effective at keeping the interest of DTC consumers. "It's another opportunity for you to make them feel special and exclusive," he observed.

For winery events, many of Schuemann's clients are using easily customizable materials, like tasting menus or winery notes, which are then printed out on high-quality stock. The menus can feature a special greeting for VIP club members or large groups who then, more often than not, take them home with their purchases.

Shipments are not as likely to be sent out with a large, multiple-page brochure about the winery and estate vineyards but rather a succinct mailer with a sleeve or pocket that staff can fill with a personal note and information on the included wines.

Schuemann, like many other people working in winery DTC and sales, also expressed amazement at a resurgence in the humble QR code's popularity among consumers, which has opened an entirely new channel from relatively old technology.

According to consumer data firm Customer Vineyard, the percentage of wine club members who leave within the first year grew to nearly 40 percent in 2019. COVID slowed that churn rate in 2020 to 29 percent, but CEO and founder Mary Jo Dale said it's quickly going back up, and those leaving wine clubs the soonest are also the youngest.

After 18 months, the average wine club—among Customer Vineyard's clients and complemented by consumer data—has retained 71 percent of its members between the ages of 50 and 60 but only 48 percent of those aged 20 to 30. "The younger generation signs up for subscriptions all the time, but they don't stick," Dale noted. "They move on to the next subscription offering to take advantage of better introductory pricing or new offerings. Our industry needs to invest more in retaining customers, not just acquiring them, and focus on delivering unique, personalized experiences and superior customer service."

Packaging and complimentary materials sent with each wine shipment can play a role in retaining consumers of all ages. However, the materials and items must be of high quality, bring "surprise and delight" and be seen as sustainable or not just more stuff to throw away but something that can be repurposed. "It's the intersection of all three, and trying to find a way to do it affordably is difficult," she said.

It also is in line with the ever-growing desire among the best DTC consumers for exclusive experiences that make them feel as if they are not just on a mailing list but part owners of a winery. "What other industries have figured out long ago is that customer psychology is as important to attracting and maintaining great relationships as is the product and service," Dale added.

And in terms of the cost of getting the wine to their customers, wineries need to be even more strategic in accounting for it in the wine price, simply taking the cost increases or even pursuing cooperative arrangements with other wineries. "We need to figure this out for our industry," Dale said, "because American consumers have been trained to never pay for shipping, and that's not going to change." **WBM**

PACK DESIGN SHOWCASE

Bringing in Global Talent to Offer Unique Perspective on a Unique Partnership

optik
(Brand of Miller Family Wine Co.)

Santa Barbara, Calif.
ANNUAL CASE PRODUCTION: 350,000
OPTIK CASE PRODUCTION: 1,700
AVG. BOTTLE PRICE (ALL BRANDS): $12
OPTIK MSRP: $35-$45

Packaging Vendors:

DESIGNER: The Show Must Go On
BOTTLES: Encore Glass
CLOSURES: Scott Labs
CAPSULES: Cork Supply
LABELS: MCC, Wine & Spirits

CELEBRATING UNIQUE PERSPECTIVES IS integral to the winemaking and packaging design for the optic brand. Developed by Miller Family Wine Co., which planted the famed Bien Nacido Vineyard in the Central Coast in the late 1970s, optik launched as a vineyard-designate produced in collaboration with winemaker Joey Tensley.

That partnership, intended to bring a novel approach to Bien Nacido grapes, was relatively new for the family company. "This was a new brand concept rooted in the opportunity we had to work with a winemaker like Joey Tensley," noted Tommy Gaeta, the winery's director of marketing. "He has quite a following and a name for himself, (and) we had never taken an approach like this. This was a first time for everyone involved."

When Gaeta joined the Miller company, only the brand name was in place; therefore in keeping with the theme of unique perspectives, he issued a request for proposal to design firms located around in the world. That elicited the winning pitch from the design firm The Show Must Go On (TSMGO), a Rioja-based agency in the city of Logrono, Spain. "They brought the most unique perspective, and their work really spoke to what we were trying to accomplish," Gaeta said.

The project would also be the design firm's first foray into the U.S. wine industry, adding another unique perspective in building the brand. The signature image for optik, an eye within an outstretched palm, is an interpretation of the iconic Hamsa, created by a TSMGO artist. Also known as the Hand of Fatima, the image has been used in many of the world's religions for centuries.

Since launching in 2021, optik has done quite well among consumers and the trade, according to Gaeta. The inaugural release was comprised of two Pinot Noirs, two Chardonnays and two Syrahs produced with grapes from specific Bien Nacido blocks. The subsequent release, of 2020 vintage wine, was of Bien Nacido Vineyard-designated Pinot, Chardonnay and Syrah, plus a Solomon Hills Vineyard Pinot Noir. The 2021 vintage release will also feature a Petit Sirah and Valdiguié from the Miller's French Camp Vineyard.

Gaeta said critics appear to like what's in the bottle, as each release has come with a slew of 90+ scores, while the packaging design won the People's Choice award in the 2021 PACK Design Awards. Judges praised how the brand incorporated elements of climate and terroir.

To get a glimpse of that terroir, one does need a different perspective. Tilting the bottle 180 degrees, or one's head, unveils a portrait of either the Bien Nacido Vineyard or the other vineyard source for the wine. **WBM**

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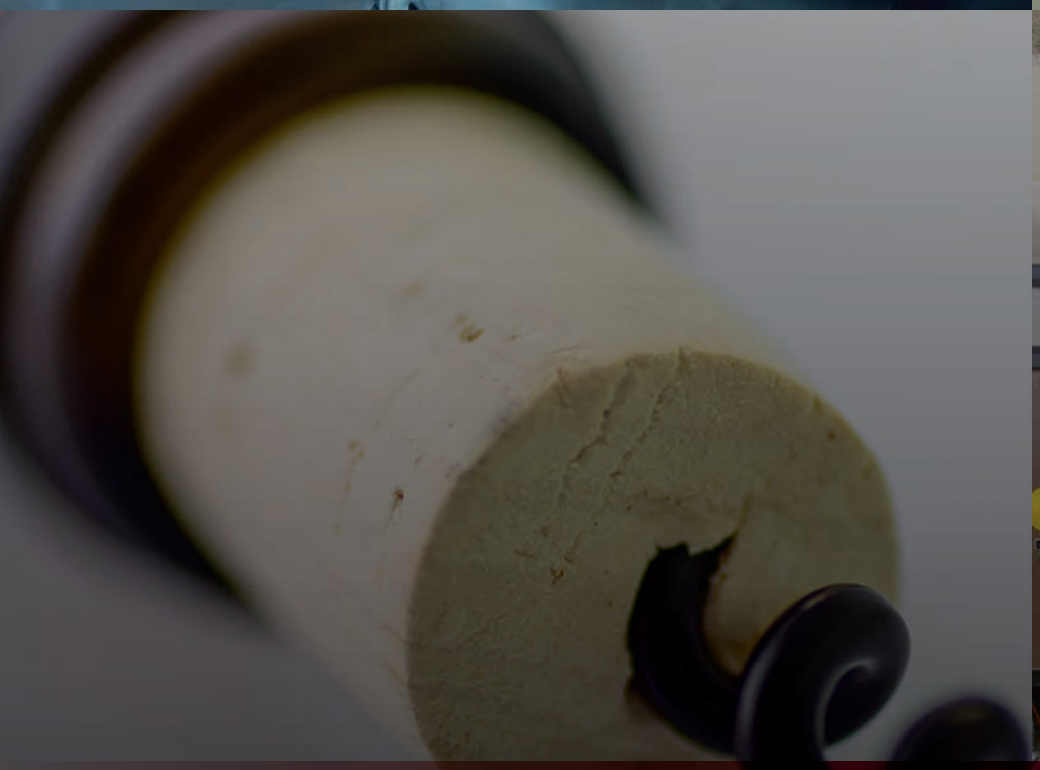

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RETAIL SALES ANALYSIS

Retail Wine Sales Down 4 Percent in April

Wines Vines Analytics

Produced by **Wines Vines Analytics**, the *Wine Analytics Report* is the industry's leading source of market insights, objective analysis and data.

Sales Value Down 4 Percent in April

Off-premise table wine sales fell nearly 4 percent versus a year ago to $1.2 billion in the four weeks ended April 23, NielsenIQ scan data showed. Sales in the latest 52 weeks totaled $16 billion, down 8 percent from the previous year. While sales of wines priced at $20 a bottle and up continued to show growth in the latest 52 weeks, the most recent four-week period showed growth shifting to wines priced between $15 and $24.99 as pre-pandemic spending patterns reasserted themselves. Growth turned negative in the $25-plus price tier.off-premise sales are establishing a new baseline.

Sales Volume Down 6 Percent in April

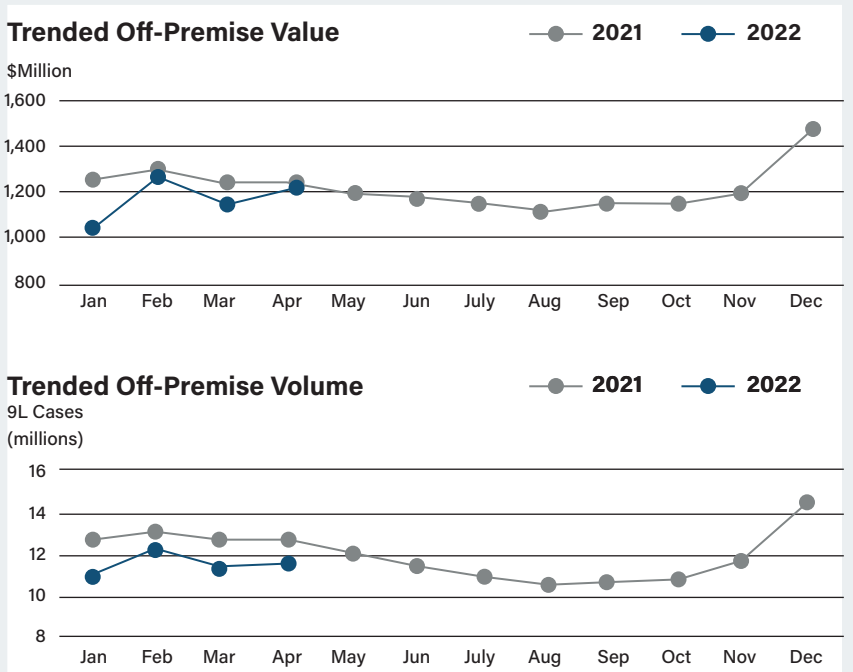
Off-premise table wine volumes dropped 6 percent versus a year ago in the four weeks ended April 23 to 11.8 million 9L cases. The decline contributed to a contraction of more than 11 percent in the latest 52 weeks versus a year earlier to 157.4 million 9L cases. While sales volumes continued to decline more sharply than sales value, underscoring the shift in spending to more expensive wines, the $15-$19.99 price tier posted marginal volume growth versus a year ago – the only price tier to do so.

Post-Pandemic Sparkling Wine Sales Contract

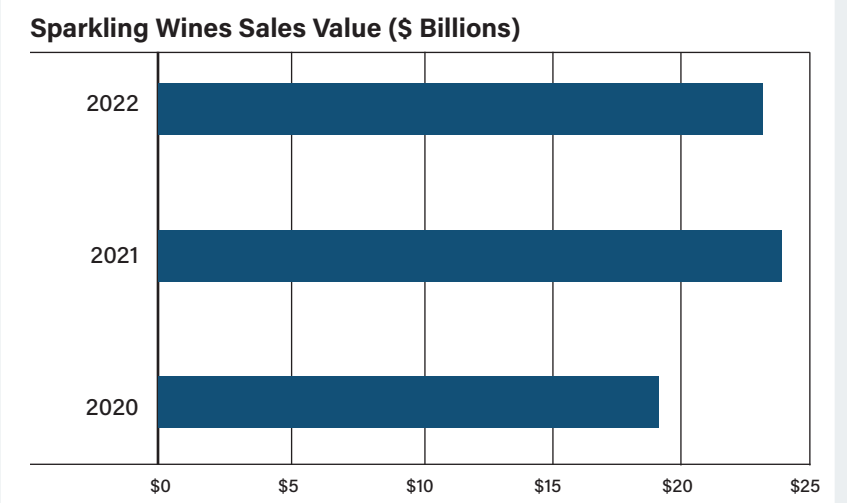
Sparkling wine was one of the big winners during the pandemic as consumers shifted spending to the off-premise channel from on-premise outlets. But as consumer spending returned to pre-pandemic patterns, sales of sparkling wines through NielsenIQ outlets have seen growth patterns reverse. The four weeks ended April 23 saw sales contract nearly 5 percent versus a year earlier to $167.8 million. This marked a deceleration versus the latest 52 weeks, when sales contracted 3 percent versus a year earlier to $2.4 billion. During the comparable 52 weeks ended April 24, 2021, sales surged by 29 percent.

A glance at sales volumes also indicates a return to pre-pandemic patterns. Sales in the latest 52 weeks continued to exhibit the premiumization that took hold during the pandemic, with volumes declining faster than value to support a 3 percent increase in average bottle price to $14.35. But during the latest four weeks, sales value and volume declines were more closely aligned. This resulted in an average bottle price of $14.21 in the latest four weeks, a decline of little more than 1 percent versus a year earlier.

Despite the shifts, off-premise sparkling wine sales have emerged from the pandemic in a stronger position than they were two years ago. Sale value in the latest 52 weeks is up 25 percent versus two years ago and average bottle price is up 11 percent over the same period. **WBM**



SOURCE: NielsenIQ Latest 4 Wks - W/E 04/23/22



SOURCE: NielsenIQ, off-premise sales in the 52 weeks ended April 23 and comparable prior periods.

Methodology

Sourced from NielsenIQ, these figures represent off-premise retailer wine sales to the consumer aggregated across a variety of channels nationwide, including grocery, drug, mass merchandisers, convenience, dollar, military, as well as a selection of warehouse clubs, and liquor channel geographies and liquor channel retail chains. NielsenIQ figures are updated and released every four weeks.

NielsenIQ Table Wine Category Segments **MARKET:** Total US xAOC+Conv+Military+Liquor Plus **PERIOD:** Week Ending April 23, 2022

		Dollar Value		Dollar Value % Chg YA		9L Equivalent Volume		9L Equivalent Volume % Chg YA		Avg Equivalent Price Per 750ML	
		Latest 52 Wks - W/E 04/23/22	Latest 4 Wks - W/E 04/23/22	Latest 52 Wks - W/E 04/23/22	Latest 4 Wks - W/E 04/23/22	Latest 52 Wks - W/E 04/23/22	Latest 4 Wks - W/E 04/23/22	Latest 52 Wks - W/E 04/23/22	Latest 4 Wks - W/E 04/23/22	Latest 52 Wks - W/E 04/23/22	Latest 4 Wks - W/E 04/23/22
	TOTAL TABLE WINE	**16,029,060,922**	**1,204,640,753**	**-7.8**	**-3.5**	**157,422,536**	**11,799,083**	**-11.2**	**-6**	**8.49**	**8.51**
PRICE TIERS BY CONTAINERS	BOX	1,569,833,606	121,285,439	-8.4	-0.8	35,325,261	2,684,501	-9.5	-3.2	3.70	3.77
	$0-$3.99	557,467,639	43,139,183	-11.6	-3.8	18,540,823	1,391,977	-12.2	-7.2	2.51	2.58
	$4+	1,011,860,167	77,767,361	-6.5	0.4	16,775,208	1,285,622	-6.2	1.1	5.03	5.04
	Total Table Wine Glass	14,123,261,405	1,057,975,208	-7.8	-3.8	118,394,764	8,839,009	-12	-6.7	9.94	9.97
	Value Glass $0-$3.99	480,107,557	35,960,914	-17.8	-9.7	11,843,035	866,347	-18.8	-12.2	3.38	3.46
	Popular Glass $4-$7.99	2,687,756,385	203,301,047	-14.8	-6.6	39,941,643	2,985,525	-15.5	-8.2	5.61	5.68
	Premium Glass $8-$10.99	3,091,043,136	227,858,520	-12.7	-7.8	27,062,265	1,977,283	-13.1	-8.9	9.52	9.60
	Super Premium Glass $11-$14.99	3,667,615,479	279,608,036	-5.9	-2.4	24,102,369	1,839,026	-6.8	-3.5	12.68	12.67
	Ultra Premium Glass $15-$19.99	1,945,310,030	149,813,802	-1.7	1.6	9,439,483	725,524	-2.8	0.5	17.17	17.21
	Luxury Glass $20-$24.99	827,854,885	62,818,039	0.6	0.6	3,137,175	236,754	-0.4	-0.6	21.99	22.11
	Super Luxury Glass $25+	1,411,068,397	96,495,415	5.6	-1.8	2,793,813	194,879	2.7	-2.9	42.09	41.26
IMPORTED	IMPORTED	4,393,630,396	331,467,062	-9.5	-5	41,759,624	3,138,047	-12	-6.7	8.77	8.80
	ITALY	1,447,814,196	106,796,562	-9.3	-6	11,467,561	842,643	-11.6	-7.5	10.52	10.56
	AUSTRALIA	657,772,429	48,807,853	-14.9	-10	10,524,076	777,267	-14.6	-10.2	5.21	5.23
	FRANCE	628,055,997	45,220,894	-6.9	-7.6	3,382,891	242,118	-10.9	-11.3	15.47	15.56
	CHILE	359,376,237	29,164,696	-12.8	-2.8	6,182,285	493,607	-11.6	-2.2	4.84	4.92
	SPAIN	156,837,132	12,553,953	-8.1	5.4	1,117,936	92,467	-13.1	8.2	11.69	11.31
	GERMANY	79,181,309	5,802,474	-11.5	-7.6	674,446	49,579	-13.3	-8.6	9.78	9.75
	NEW ZEALAND	644,213,625	50,800,254	-2.3	1.5	4,415,052	343,596	-3.9	-1	12.16	12.32
	ARGENTINA	305,495,173	22,329,280	-14	-9.2	3,064,916	220,858	-16.4	-11.3	8.31	8.43
	SOUTH AFRICA	25,940,445	1,985,341	-11.2	-7.6	216,390	17,216	-9.9	-1.2	9.99	9.61
	PORTUGAL	49,445,252	3,613,570	-12.2	-6.7	484,160	34,702	-13.8	-9	8.51	8.68
DOMESTIC	DOMESTIC	11,635,430,526	873,173,691	-7.1	-3	115,662,912	8,661,036	-11	-5.7	8.38	8.40
	CALIFORNIA	10,474,372,139	787,753,678	-6.6	-2.5	106,849,198	8,008,463	-10.7	-5.5	8.17	8.20
	WASHINGTON	589,650,461	42,845,208	-14.8	-11	4,657,518	337,597	-15.6	-11.9	10.55	10.58
	OREGON	302,152,872	21,652,905	-3.9	-4.5	1,467,402	103,752	-6	-7.6	17.16	17.39
	TEXAS	30,662,714	2,335,857	-15.4	-9.1	325,104	23,575	-18.7	-16.3	7.86	8.26
	NEW YORK	42,432,319	4,569,937	-10.3	18	454,247	53,445	-12.5	33.6	7.78	7.13
	NORTH CAROLINA	44,744,314	3,318,863	-5.5	-1.9	448,883	32,367	-7.9	-6.7	8.31	8.55
	INDIANA	25,115,314	1,908,863	-9.7	-3.6	268,884	19,587	-10.1	-8.9	7.78	8.12
	MICHIGAN	26,212,362	1,693,296	-11.3	-2.8	259,572	16,298	-14.4	-7.4	8.42	8.66
TYPES	RED	8,330,169,982	615,780,576	-8.1	-3.6	71,703,079	5,340,388	-12.2	-5.7	9.68	9.61
	WHITE	6,505,125,772	501,159,760	-6.3	-1.9	70,642,195	5,367,402	-9.2	-4.6	7.67	7.78
	PINK	1,186,887,917	87,611,355	-13.2	-11.9	15,010,034	1,090,329	-15.6	-13.4	6.59	6.70
VARIETALS	TOTAL CHARDONNAY	2,711,283,612	208,816,798	-6.1	-1.9	28,934,353	2,205,026	-9.1	-4.5	7.81	7.89
	TOTAL CABERNET SAUVIGNON	3,171,475,335	236,272,587	-5.3	-0.8	25,397,161	1,924,824	-9.8	-2.2	10.41	10.23
	TOTAL PINOT GRIGIO/PINOT GRIS	1,466,958,986	113,154,375	-5.3	-0.9	18,001,506	1,368,794	-7.4	-2.9	6.79	6.89
	TOTAL PINOT NOIR	1,333,221,381	100,065,837	-4.8	0.2	9,043,941	681,446	-8.4	-2.2	12.29	12.24
	TOTAL MERLOT	628,283,955	46,609,749	-13	-7.7	7,913,534	585,892	-15.4	-9.5	6.62	6.63
	TOTAL SAUV BLANC/FUME	1,301,490,229	102,516,882	-1.5	2.4	10,760,093	837,806	-3.8	0.1	10.08	10.20
	TOTAL MUSCAT/MOSCATO	606,818,035	45,383,301	-16.3	-9.5	8,465,856	622,222	-18.2	-12.1	5.97	6.08
	TOTAL WHITE ZINFANDEL	227,995,722	16,887,039	-15.6	-11.5	4,415,046	320,519	-16.5	-13.4	4.30	4.39
	TOTAL MALBEC	239,777,984	17,841,867	-12.9	-7.2	2,117,994	157,318	-14.3	-7.8	9.43	9.45
	TOTAL RIESLING	231,492,468	17,239,395	-13.4	-8.4	2,293,188	169,661	-15.8	-10	8.41	8.47
	TOTAL ZINFANDEL	213,919,836	15,241,600	-13.8	-10.4	1,374,210	96,681	-17.2	-14.7	12.97	13.14
	TOTAL SHIRAZ/SYRAH	112,936,202	8,261,002	-16.6	-11.3	1,154,292	84,719	-20	-12.5	8.15	8.13
	WHITE BLENDS (ex. 4/5L)	250,002,878	18,827,341	-10.3	-5.9	2,653,125	199,801	-13.3	-8.3	7.85	7.85
	RED BLENDS (ex. 4/5L + CHIANTI)	2,156,408,897	155,047,678	-10.1	-7	17,565,907	1,266,048	-13.9	-8.9	10.23	10.21
	ROSE BLEND	689,922,867	50,516,038	-11.5	-12.9	5,300,174	379,930	-14.4	-15.6	10.85	11.08
GLASS SIZES	750ML	11,972,243,550	896,213,510	-6.9	-3.4	83,360,314	6,220,785	-10.8	-6.3	11.97	12.01
	1.5L	1,858,452,060	140,561,881	-13.7	-5.3	30,460,581	2,285,398	-14.6	-7.1	5.08	5.13
	3L	50,716,190	3,842,099	-16.3	-10.3	1,167,995	84,441	-17.1	-16.4	3.62	3.79
	4L	66,410,032	4,962,784	-14.4	-7.3	2,021,773	149,176	-15.5	-9.8	2.74	2.77
	187ML	89,356,845	6,424,028	-14.6	-15	1,005,931	73,029	-15.4	-15.5	7.40	7.33
	375ML	61,201,222	4,626,397	17.3	3.1	226,557	16,989	21.7	2.2	22.51	22.69
BOX SIZES	ex. 4/5L	1,105,758,942	85,409,934	-7.1	0.3	19,263,030	1,482,154	-7	0.4	4.78	4.80
	1L	34,402,957	2,686,749	-0.7	12.5	488,494	38,217	-0.9	13.4	5.87	5.86
	1.5L	18,421,332	1,347,888	-21.9	-12.9	338,777	24,571	-26	-14.9	4.53	4.57
	3L	816,456,233	62,492,140	-10	-1	15,537,230	1,189,732	-8.5	-0.3	4.38	4.38
	5L	464,070,647	35,874,894	-11.3	-3.5	16,062,133	1,202,332	-12.2	-7.3	2.41	2.49
	TETRA	271,450,404	21,612,452	4.2	5.4	3,392,739	268,284	3.4	5.4	6.67	6.71

Source: NielsenIQ

Finding Ideal Tasting Room Employees Means Looking at More Than a Résumé

Michael S. Lasky

SINCE THE START OF COVID-19, there has been a sea change in the hiring process, particularly for tasting room employees. It has become much more difficult for wineries to find candidates willing to work in the hospitality space, but that doesn't mean it's right to settle for someone who can't fulfill those duties. While wine knowledge is certainly a plus, tasting room and hiring managers are really looking for candidates with impeccable social and sales skills—now that most tastings and experiences are reservation-only, it's up to the staff to make the most of every visitor that walks through the door.

Accordingly, *WBM* asked winery HR recruiters, hospitality directors and independent recruitment agencies for the sure-fire questions they use to vet the best candidates for today's tasting room positions. And, while acknowledging that every winery has its own culture and expectations, just what are the essential, universal, personal and experiential qualities of successful candidates?

Reading Between the Lines: How Winery Pros Interpret Job Résumés

Before you start looking at a candidate based off the résumé, a quick note about job postings and descriptions: While posting job descriptions that list the essential duties and responsibilities, professional qualifications and previous work experience required for the position is essential to soliciting candidates, putting too much information on the listing can be detrimental. As veteran tasting room consultant Craig Root cautioned, "Some job postings are so detailed, with a surfeit of the duties expected, they can overwhelm applicants and scare them away. It's best to list the essentials and get more into the nitty gritty details in the interview."

Eugenia Keegan, vice president of Oregon winery operations for Jackson Family Wines, said that the résumé may not be the best way to judge a candidate, and that the interview will be key.

"Once you've looked at that résumé, it's very hard to have any sense of the person, particularly when you're hiring them for a customer-facing job. I treat résumés for essentially what they are: an employment history and the stability as an employee—how long they have been in their jobs," she said. "Also, I'm more inclined to look less at wine knowledge, and more at a passionate personality."

While an initial indicator of potential candidacy, a résumé's work history does not reveal anything more about the person: Are they a team player? Are they flexible in the tasting room environment? Are they engaging enough to convincingly tell the winery's story?

> *"The candidate's excitement and enthusiasm and how sparkling their personality is determines their hireability."*
>
> **Deja Harrington**, director of hospitality, Terlato Wineries

"Unless you're checking references where you can ask questions about the person's personality, sales ability, and how they relate to guests, for instance, it's very challenging to find out if an applicant is the kind of person the winery is seeking for its own particular style and mission," Keegan noted.

As the managing partner at Napa-based Benchmark Consulting, Dawn Bardessono reviews dozens of résumés each week but, she noted that most applicants' résumés rely on descriptors, not metrics, and that could be their downfall.

"Metrics demonstrate the results of a worker's actions. If I don't see metrics in a résumé but only the pedigree of the applicant, such as the length of employment and the pedigrees of the wineries or restaurants where they worked, I will ask questions to determine those metrics," explained Bardessono. "For instance, if the metrics on the résumé showed how much wine they moved or signed up numerous wine club memberships, then I want to talk with the person."

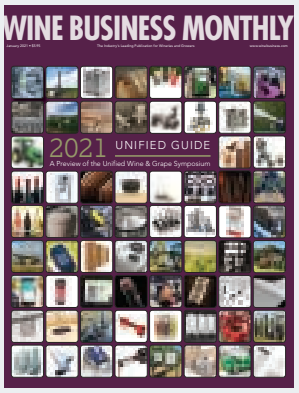
Wine Knowledge is Not Necessarily a Prerequisite—Engaging Personality Is

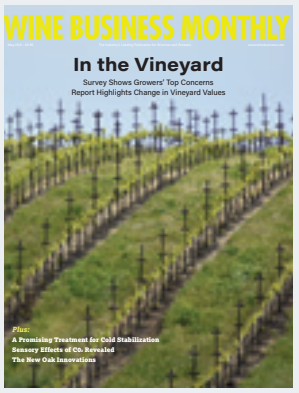
You only need to look at the job postings at *Winejobs.com* to see that most listings request varying amounts of wine knowledge and education. Surprisingly, every winery recruiter *WBM* spoke with, be it in-house or third-party employment agency, specifically said they prefer to educate the incoming employee.

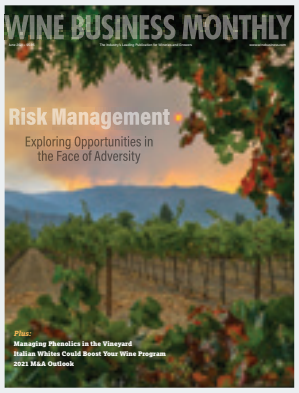
Because each winery has its own unique portfolio of wines and preference as to how staffers present that information to guests, most employers like

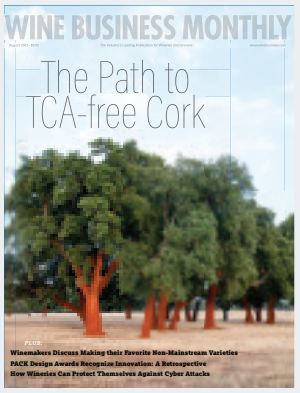
Don't miss an issue.

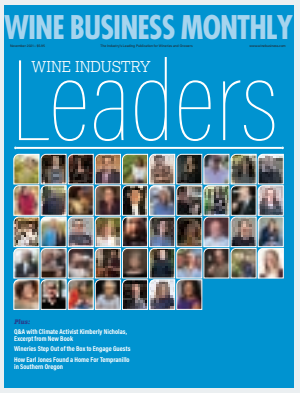
WINE BUSINESS MONTHLY











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"I'm always surprised when I get to the middle of, or three-quarters through, an interview and I say, 'Well, do you have any questions for me?' and the ostensibly eager candidate says no."

Erik Ackerman, senior vice president of DTC, Jackson Family Wines

to train incoming employees about their specific wines and not rely on any previous wine knowledge.

"I can teach you wine. I can't teach you 'friendly'," said Root.

Erik Ackerman, senior vice president of direct-to-consumer at Jackson Family Wines, bolstered Root's philosophy. "First and foremost, there's a lot of emphasis that winery recruiters will put on wine knowledge. I put a little bit less emphasis on wine knowledge and a little bit more on just examining the person in front of me and their abilities as a conversationalist. If someone is sitting in front of me and they have an immense amount of wine knowledge, but they're unable to hold a conversation with me in an interview, they'll be far less likely to hold the attention span of guests in our taste-rooms as well," he said.

"I'm looking for someone with a great personality, and one of the top qualities I'm looking for is curiosity. I want to see if that person wants to ask me questions. I want to see that they want to learn a little bit more about me in the interview process," he added.

Ackerman emphasized that personality is ultimately more important than wine knowledge. "We can teach selling and closing tactics, but it's very hard to change someone's personality or to improve someone's ability to be engaging in conversation," he said. "That's something that is a little bit more innate, and just something that I'll lean on if I'm not seeing the applicant's sales background in their work history."

A work history doesn't always indicate how the person will fit in with the existing group of employees.

"Most of the people in the tasting room are 25 to 35," said Keegan. "It's just as important that the person fit into that group of people that they're working with, particularly in the tasting room, because it is literally a group exercise. It's not like sitting in your office, keying in data. It's a dance, it's a ballet all day long, where you're literally looking at everybody—customers and staff—all the time and what their needs might be."

Interview Questions are Critical: From Recruiter and Applicant

While a well-crafted résumé will earn the job-seeker a foot in the door, it's the interview that determines whether there is a job offer. While the questions posed by the recruiter or the tasting room or hospitality manager are important, it's the queries made by the applicant that reveal whether they have the curiosity Ackerman looks for.

For Deja Harrington, the director of hospitality for Terlato Wineries, questions directed at the candidate are geared toward behavior to determine how the person will fit in with the company's positive-minded work environment and culture.

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"The primary way to attract people with hospitality and wine knowledge is to offer better compensation packages. There's a lot of jumping around that happens because of that."

Neil Solari, president and CEO, Intertwine Group

"Our questions are set up around specific scenarios that the interviewee encountered in their previous roles or in their life. We want to understand how the candidate conducts themselves as a person in the world, but also how they would conduct themselves with guests and with team members," said Harrington. "We're looking for how they've communicated, how they've responded. Maybe even how they've utilized organizational skills or customer service skills to handle various situations, either positive or negative."

Questions and prompts she's used in the past include:

- Have you ever had a time where you had to adjust your approach based on someone's personality?
- Describe a time when a customer was angry and how you dealt with it.
- Describe a time when you had to use your organizational skills to arrive to a solution of a problem.

"Other questions focus on specific activities for the position or what's happening currently at the winery or region," Harrington added. "A good example is what has changed in the tasting rooms in Napa Valley. Folks don't realize that since the pandemic they need a reservation to enter the tasting room. For this requirement we may ask 'How would you handle a situation when a party shows up without a reservation, or has a reserved slot but arrives at the wrong time?'"

Additionally, a tasting menu is placed in front of the candidate and they are asked to talk about it as if the interviewer were a guest. "We think this is an effective way to measure the interviewee's ability to speak with customers. The actual storytelling and the impactful way that people can talk about wine is more important than just gushing stats and the figures behind the wine," Harrington said. "The candidate's excitement and enthusiasm and how sparkling their personality is determines their hireability."

Terlato's hiring process includes at least three interviews with three different staffers who then conference about their findings and evaluate the candidate. As Harrington concluded, "I think that what's interesting about tasting room jobs is that they are essentially 100 percent sales jobs."

Get to Know the People You Hire Before You Hire Them

"I'm always surprised when I get to the middle of, or three-quarters through, an interview and I say, 'Well, do you have any questions for me?' and the ostensibly eager candidate says no," said Ackerman.

"For example, I recently left a meeting with a new hire at a luxury winery and he inquired 'What advice do you have for me?' I told him, 'If you're speaking more than 70 percent in your tastings, you're doing it wrong. You need to be asking questions with your guests all the time, you need to be learning more about them. If you're going to be building your own business within this team environment, you got to be able to keep wine collectors excited long term,'" Ackerman related.

During the research for this article, *WBM* asked the experts previously quoted for some of their favorite questions, those that have returned the salient, most informative responses from job applicants. The goal is to determine how well-rounded and curious these tasting room job candidates are.

These queries are simple, yet they are designed to reveal the complexity and personality of a tasting room candidate.

- When did you start to learn about wine?
- How long have you been interested wine?
- What led you to being here today for this interview?
- What excites you about working in a tasting room?
- Why would you want to work with this particular winery?
- What do you do personally outside of work?
- What are your favorite tasting rooms in this or other regions? Why?
- Do you like to cook?
- What are your favorite varietals? And what are your favorite wines? Why?
- Do you now or in the past belong to a wine club? What did you like or not about it?
- How would you go about stocking non-wine merchandise for this winery?
- What is your MO for keeping a conversation going?

Combatting Chronic High Turnover Rates

Tasting room positions suffer from traditionally high turnover rates. As Neil Solari, president and CEO of the Intertwine Group, a wine, spirits and hospitality recruiting firm, explained, "Tasting room jobs, by their very nature, have some operational issues that result in high turnover of employees. That's because the hours can be inconvenient with high times on Friday, Saturday and Sunday. People are giving up their weekends for pay that does not meet the high living expenses of wine country regions and now higher priced commutes. If you are in this profession, having a family with kids makes the job difficult."

That being the case, is there any way for recruiters to hire workers with longer retention in mind?

"A lot of my clients at this point are opting not to hire people with wine experience. They're hiring people with hospitality experience and teaching them the trade. A majority of our clients said, 'Look, we'd rather hire somebody that doesn't know anything then we can teach them our story and our brand and what we do.' Those people tend to stick around a little bit longer too, because they're learning something new," Solari said.

"The primary way to attract people with hospitality and wine knowledge to offer better compensation packages. There's a lot of jumping around that happens because of that. Unfortunately, the wine industry is historically slow to react to the changing labor markets. And my conversation with clients is, 'Well, you're not going to find somebody at that level anymore because wages have gone up and competition for those people have gone up significantly,'" added Solari. **WBM**

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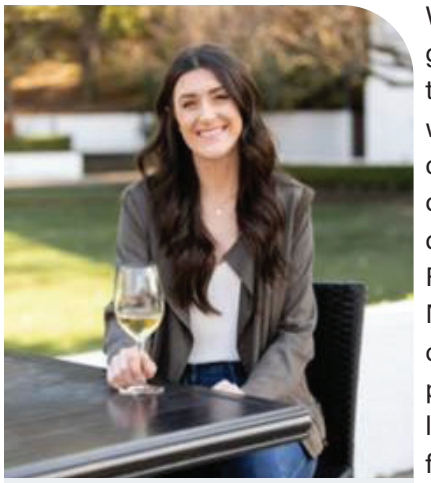
Wineries & Winemaking

Joe Padilla

Willamette Valley Vineyards, a leading producer of Pinot Noir in Oregon, hired Joe Padilla as its chief operating officer to oversee operations of the growing company, including winemaking, vineyard and direct sales operations. The addition of Padilla in this new role supports the company's ongoing expansion in 2022 and 2023, with the opening of a new sparkling winery in Dundee, Oregon, and tasting room and restaurant locations throughout Oregon and Southwest Washington, as well as continued growth in its wine production and sales. Padilla brings more than 30 years of management experience to his new position. Before joining Willamette, he spent 11 years with Summerland Wine Brands in Buellton, California, where he most recently led strategic business development in a senior vice president role. During his time, he was known for positively impacting the company, its culture and earnings.



Niki Wente

Wente Family Estates promoted fifth-generation winegrower, Niki Wente, to director of vineyard operations, where she will is responsible for the creation, implementation, and oversight of all farming operations and vineyard development projects under the Wente Family Estates portfolio umbrella. Niki will continue to oversee farming operations for the Wente Family Estates portfolio's roughly 3,000 acres of land, making critical decisions in the farming plans for over 200 blocks—in both the Livermore Valley and Arroyo Seco – leading the team towards improved efficiencies, with a specific focus on vine health, fruit quality, and sustainable vineyard practices. In her expanded role, Niki will take an even more strategic position conceptualizing and advocating for aggressive sustainability initiatives, that transcend even those that recently earned Wente Family Estates its prestigious Green Medal Leader Award from The Wine Institute in April 2022.

Geoff Labitzke

Sonoma producer Hamel Family Wines named Geoff Labitzke, MW, as its first general manager. With more than 40 years of experience in the wine industry, Labitzke brings his background in fine wine marketing, sales, and wine education to Hamel. He most recently served as director of sales for Sebastopol's highly regarded Kistler Vineyards where he directed the wholesale and marketing efforts domestically and internationally. Prior to his role at Kistler, Labitzke was a corporate vice president of fine wine at Young's Market Company and vice president imports manager and director of education for The Estates Group. In 2006, he earned the Master of Wine, becoming one of just 22 people in the U.S. to hold the prestigious designation at the time. Labitzke will provide strategic guidance and leadership as well as bring marketing and sales expertise to Hamel as it enters a new phase of growth and continued innovation.

Melissa Stackhouse

Dutton-Goldfield Winery announced that winemaker veteran Melissa Stackhouse has joined the winery as winemaker. Under the direction of owner/winemaker Dan Goldfield, Stackhouse will be extensively involved in all aspects of Dutton-Goldfield's winemaking, as well as overseeing the management of our custom crush clients. Stackhouse comes to Dutton-Goldfield with a winemaking history that parallels Dan Goldfield's in several ways: she received her winemaking degree at University of California at Davis, apprenticed at Robert Mondavi Winery, and was winemaker at La Crema. A native of Michigan, Stackhouse apprenticed at Robert Mondavi Winery, Sterling Vineyards, Joseph Phelps Winery, and Peter Michael Winery. She went on to hold winemaking

positions at some of the most esteemed wineries in California including La Crema, J Vineyards & Winery, Meiomi, and SIMI.

William Chris Wine Company (WCWC) announced the appointment of key new hires including David Oelrich as Chief People Officer (CPO), Skip King as Director of Culinary, Valerie Elkins as director of memberships, and the promotion of Kelsey Kramer to director of education.

Bringing more than 14 years of experience in the human resources field to WCWC, David Oelrich has been appointed as the company's first ever chief people officer to lead, assess, mentor, and support team members to cultivate a motivating working culture and develop the infrastructure to maintain the growth and success of the company. Joining the WCWC team as the new director of culinary, Houston-native Skip King brings over 25 years of hands-on restaurant and hospitality experience to his role of maintaining the day-to-day food and wine pairing experiences at all locations, with plans to expand and enhance the seasonal offerings. Valerie Elkins joins the team as director of memberships and will be responsible for driving member engagement, as well as creating opportunities to further customize the membership experience and build programs to better meet wine club members' needs. Since joining William Chris Vineyards in 2020, Kramer advanced from tasting room ambassador, where she designed five immersive wine experiences and developed the private virtual tasting program during COVID-19.

Industry Services & Suppliers

Plata Wine Partners, an independent grape grower and strategic brand producer, launched into full-blown expansion mode with the addition of two new hires to its core team. Jessica Valenzuela joins Plata in the newly created role of production planning manager, with Shane Owens appointed to the new post of national strategic accounts director, East. The appointments coincide with the promotion of veteran winemaker Alison Crowe from director of winemaking to vice president, winemaking, and Maria Janovich, formerly controller at Plata Wine Partners, to director of finance and accounting. Crowe's career at Plata dates to the company's founding in 2005. Janovich joined Plata from the vineyard side of the business in 2017, with more than 10 years' experience managing revenues.

Valenzuela will head up production planning and procurement, with an emphasis on expanding Plata's operations team. Her dual background in business and wine production includes a strong track record of increasing efficiency and overseeing large projects. Owens, whose responsibilities include extending Plata Wine Partners' East Coast presence, was formerly with Seattle-based Precept Wine. During his 10 years at Precept, Owens rose from handling the Southeast territory to strategic accounts director for the East Coast.

Seguin Moreau Napa Cooperage general manager Christopher Hansen hired Kathleen (K.D.) Organ to join the sales team. Organ comes from a career in winemaking and will be responsible for sales for barrels and oak alternatives in Washington state, Oregon, British Columbia and Idaho. Organ worked for more than 15 years in winemaking and production in Washington state, in large part with Chateau Ste Michelle Wine Estates. Her experience spans the diverse AVAs of the state with in-depth knowledge of Horse Heaven Hills and Wahluke Slope.

Kathleen Organ

Associations & Education

Wines of Georgia, the organization that represents and promotes the wines of the country of Georgia and financed by the National Wine Agency of Georgia, which is a legal entity under the Ministry of Environmental Protection and Agriculture of Georgia, and the country's wineries, announced that Christy Canterbury, MW, has been named campaign ambassador. She will represent the region in the U.S. market through a number of educational events for trade and press and provide overall campaign support and promotion. Activities will include media lunches, virtual trade tastings, a trade trip to the country and trade events such as TEXSOM, among other projects. Canterbury is a New York City-based journalist, speaker, media host and critic. In 2014, she was short-listed for the Roederer Online Wine Communicator of the Year Award, and her work has been published in Decanter, Wine Enthusiast, Wine-Searcher, TimAtkin.com and in many other outlets around the world. She was the consulting editor of the GOURMAND AWARD-winning book, Rock and Vine, as well as editor of other wine and cuisine-focused books.

Washington Winegrowers Association's Board appointed Freddy Arredondo, Cave B Estate Winery's head winemaker, as a new officer. In Italy, Arredondo discovered his love for wine, and returned to the U.S. to attend the Walla Walla Viticulture and Enology program. In 2006, Arredondo started at Cave B Estate Winery as an assistant winemaker and became head winemaker in 2008. Since then, Arredondo has received multiple awards and accolades, most recently earning a 92-point score from the Wine Panel for his 2018 Malbec. The remaining board includes: Patrick Rawn of Two Mountain Winery, Zillah; Shane Collins of Rocky Pond Winery, Chelan; James Mantone of Syncline Wines, Lyle; Dustin Tobin of Precept Wine Brands, Prosser; Becca DeKleine of Four Feathers Wine Estates, Prosser; Scott Williams of Kiona Vineyards, Benton City; Mike Means of Ste. Michelle Wine Estates, Paterson; John Derrick of Mercer Canyons, Prosser; Jeff Andrews of Andrews Family Vineyards, Prosser; and Steele Brown of Golden West Vineyards, Royal City. **WBM**

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Enchiladas


ILLUSTRATION BY BOB JOHNSON

Jake Lorenzo

"HOW WAS I TO know?" pleaded Chuy Palacios. "I was only cooking some enchiladas."

Jake Lorenzo, private eye, shook his head, but I couldn't help but smile. The line of people at Carne y Caldo stretched through the parking lot and around the corner. The people bubbled with excitement, but their eyes hinted at desperation. They knew if Chuy served the last enchilada before they got to the door, they were out of luck.

Chuy started serving his enchiladas two weeks ago. They were incredibly simple, but mind-blowingly delicious. He made his own fresh tortillas from heirloom corn imported from Mexico. He concocted his own nixtamal and cooked the tortillas on a comal. He dipped the tortillas into his homemade enchilada sauce and then filled them with organic lettuce, cheddar cheese, green onion, black olives, and some oregano. That was it. No meat, no spices. He placed the enchiladas on cookie sheets, ladled on his sauce and sprinkled quesillo cheese with a bit more cheddar on top. He baked them until the cheese melted.

In cooking, simplicity with fresh ingredients can be divine. Chuy's enchiladas were simple. His enchilada sauce was another story. He started by sautéing onions in pork fat rendered from his scrumptious carnitas. He toasted four types of dry chiles and reconstituted them in hot homemade vegetable broth. A dozen different spices were toasted and freshly ground. He placed the chiles and spices into a blender and mixed them with juice from the chiles. He added a splash of Pura Sangre Reposado tequila and then poured the concoction over the onions and let it cook down. After hours at a gentle simmer, he adjusted the salt and assembled his enchiladas.

Within days lines had sprouted outside Carne y Caldo. The demand was intense. People shut out of enchiladas after waiting in line got angry and belligerent. They would scream at Chuy and other people in line. Chuy started cooking nothing but enchiladas to appease them. He cooked hundreds of enchiladas each day, but still couldn't keep up with demand. Finally, he told me, "I can't do it anymore, Jake. I can't face another cookie sheet full of enchiladas. Everyone is too tense. I'm taking them off the menu."

Adding enchiladas to his repertoire was a great idea. The execution of Chuy's enchiladas was sublime, and they were an unqualified success. Sadly, there were unintended consequences. Supply could not keep up with demand. In this detective's experience, the current state of American business would suggest that once you create intense demand, you should increase prices. The higher the better. To his credit, Chuy Palacios refused to take advantage, but he also refused to deal with the antagonistic crowd going crazy for his enchiladas.

Years ago, after renting a small house in Sonoma for 23 years, Jake Lorenzo and his family had to move. Our landlords were selling the property, and the new owners didn't want to continue renting the cottage. Reality slapped us hard in the face. House prices were well beyond our budget and the current rents were more than we could afford. We had been isolated in an unrealistic price bubble regarding our housing costs for all that time and we just couldn't process the actual prices and rents, nor did we have the income to deal with them. Fortunately, we had a lot just two blocks away, so we took a flyer, built our own house, and have lived there happily for 22 years.

Now, after 2½ years of COVID, this detective once again feels like I have been isolated in an unrealistic price bubble. This time it is not about housing or rental costs (although I am sure those would terrify me if I needed a place to live), but the cost of normal, everyday pleasures seems to have risen above our ability to pay. We listen to horror stories from our friends who have gone to fine restaurants for dinner. Chuy went to the hot, new restaurant here in Sonoma and reported entrées priced at $60 to $130. Another couple went out in Napa and reported spending almost an hour with the wine list, because each category had one or two bottles at $80 or $90 and then jumped to $300 to $500 or more per bottle.

Jake Lorenzo understands about hip places. I have seen people wait in line to buy over-priced food and wine, thrilled to get into the coolest place in town. That just doesn't float my boat. If there is a line of people waiting to eat, this detective will wander around the corner or stroll up the street until I find a neighborhood place with the menu displayed on the window. I'd rather dine with locals in jeans than celebrities dressed to the nines. Still, now that we are seeing friends again, we've listened to so many stories of $30 appetizers, $70 entrées, $25 desserts, and wine lists with no chance of bottom fishing, that we are terrified of going to a restaurant.

Trepidation is not a good quality in a private eye, so I sat on my porch, put Jon Batiste's Freedom on repeat and sipped on an incredibly delicious 2018 Artadi Viñas de Gain. I nibbled on some Rabbis of Pork Chistorra sausage with Jakelyn's mother's homemade rye bread, and I calmed myself.

It seems like everyone is waiting in line, spending big bucks, and living large. Jake Lorenzo knows that is not true, nor is it necessary, and it certainly isn't sustainable.

It is easy to spend tons of money at a gourmet restaurant to get wonderful food. There has always been a waiting list for a reservation at Stars, or the French Laundry, or Saison. Thousands of bottles of elegant, complex wines are available for a small fortune, so people with loads of money may drink Romanée-Conti, Masseto, or Vega Sicilia Unico daily. You can even take a helicopter to a picnic table at a remote hillside vineyard if that is your idea of the perfect wine tasting experience.

COVID has put all of us on edge a bit. It seems like everyone is waiting in line, spending big bucks, and living large. Jake Lorenzo knows that is not true, nor is it necessary, and it certainly isn't sustainable. Take the time to find restaurants like Carne y Caldo. Peruse the wine shelves for treats from Côtes du Rhône, Argentina, or Portugal. Cold cuts, a local cheese and homemade bread makes for a great vineyard picnic, even without a helicopter.

Right now, we're waiting for Chuy and Iggy Calamari. Chuy's bringing a platter of his enchiladas and I'm opening a few Pinot Noirs. Like the saying on my Guerrilla Vino label, lunch with friends on a spring day is "Not for sale at any price." **WBM**

Randy Herron, head winemaker, and Angelina Mondavi, consulting winemaker, Flat Top Hills, Napa, CA

(Randy) "I've been reading *Wine Business Monthly* for decades, and I visit winebusiness.com almost every day—it is my main source for key industry news, and I always find interesting articles I forward to my colleagues. I especially appreciate the surveys, which are intuitive and timely. The annual Equipment Survey Report is invaluable—I always consult the recommendations on equipment and products when I'm looking at new purchases. It's also great for making connections with other winemakers."

(Angelina) "I rely on *Wine Business Monthly* to keep me up to date on trends and innovations, and the in-depth reporting on the major topics that impact our industry."

NAME & TITLE: Randy Herron, head winemaker, and Angelina Mondavi, consulting winemaker, Flat Top Hills, Napa, CA

WINERY NAME AND LOCATION: Flat Top Hills is a premium collection of vineyard-driven wines from the "G4," or fourth generation of the C. Mondavi family. Designed to elevate everyday occasions, Flat Top Hills combines modern sensibility with a winemaking tradition that dates back more than 75 years. Building on a legacy that includes some of the most storied wines and regions of California, Flat Top Hills is family owned and sources from family farmed vineyards in the Dunnigan Hills and other premier winegrowing regions.

ANNUAL CASE PRODUCTION: 24,000 cases

PLANTED ACRES: Flat Top Hills draws from 300 family owned and family farmed acres in the Dunnigan Hills, which are planted to Cabernet Sauvignon, Merlot, Petite Sirah, Petite Verdot, Chardonnay, Sauvignon Blanc and Pinot Grigio. The winery also has long-term partners in other growing regions.

CAREER BACKGROUND/RANDY: I've been fortunate to have a career that has taken me around the world and have spent more than two decades overseeing winemaking operations with family-owned wineries. I've always been interested in structure and intensity, and in crafting wines that showcase the best characters of the vineyards and the grape varietals. Prior to joining Flat Top Hills, I spent six years with Texas-based Messina Hof Winery. I also spent seven years Casella Family Brands in Australia and worked at E. & J. Gallo Winery for more than a decade. I also guest lectured at Charles Sturt University in Australia. My degree is in food and nutritional science with an enology option from California State University, Fresno. Angelina and I work very closely on each Flat Top Hills wine—we each have our opinions and styles and

CAREER BACKGROUND/ANGELINA: I've grown up in the wine industry. My sisters and cousins call ourselves the "G4"—we're all part of the fourth generation of the Mondavi family, though I am the only one who focuses on winemaking. I have more than 30 harvests under my belt, across three continents, and I consult with several small, luxury wineries where I'm able to flex my skills with different styles and varietals. I'm also involved in our family business as a C. Mondavi & Family board member and brand ambassador. Flat Top Hills is a personal passion project. We're creating the next chapter of our C. Mondavi & Family story and wanted to make wines with a totally fresh personality. I love working with Randy throughout the process on overall style and final blends. My education includes a degree in chemistry with a business minor from Villanova University, and a master's in oenology from the University of Adelaide.

WHAT HAS BEEN YOUR BIGGEST PROFESSIONAL CHALLENGE?/ANGELINA As the granddaughter of Peter Mondavi, Sr., my biggest professional challenge is having large shoes to fill. He was a visionary, and I want to live up to my promise of doing hard work and making great wines.

WHAT HAS BEEN YOUR BIGGEST PROFESSIONAL CHALLENGE?/RANDY Being able to manage through natural disasters has been my biggest professional challenge. I've made wine during floods, remnants of hurricanes, and of course through fires. Of these, the floods were the most devastating. I was in Australia during the 2012 New South Wales floods, and we were under eight feet of water. I've learned to lead with compassion and empathy, to get very creative with problem solving, and to appreciate the camaraderie and community that I've always seen during these unimaginable situations.

VARIETALS THAT YOUR WINERY IS KNOWN FOR: Sauvignon Blanc, Chardonnay, Rosé, Red Blend and Cabernet Sauvignon

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