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Barrels & Oak

Recent Research: Wood Tannin Potential and Wine Quality

Roundtable: Natural Winemaking
Three Advocates Discuss Reasons and Methods

Lessons Learned:
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Why Mark Greenspan Changed His Mind on Natural Plant Extractives
Mendocino Winemakers Recall Best and Worst Business Decisions

New Barrel Technology Uses Science to Produce More Consistent Product

A look at Dr. Marie-Laure Badet-Murat's research on wood tannin potential and wine quality at the second annual Innovation+Quality conference

Curtis Phillips

Curtis Phillips, an editor for *Wine Business Monthly* since 2000, is a graduate of UC Davis, and has been a winemaker since 1984 and an agricultural consultant since 1979.

AS READERS OF THE past several issues of ***Wine Business Monthly*** might have noticed, I've been thinking a lot about barrels. Like any natural product, the chemical composition of a barrel, or more specifically the wood used to make barrels, can vary a great deal. As winemakers we were taught, or learned from experience, that there is a considerable enological difference between oaks of significantly different species, although this is usually expressed as a simple and inaccurate dichotomy between American and French oak.

At *Wine Business Monthly*'s second annual **Innovation + Quality** (IQ) conference, which took place March 2 in the Napa Valley, Barrel Stave Selection by Phenolic Chemistry was chosen as an Innovative Product Category for the Innovation Awards, which honor those companies and products pushing the boundaries for new winemaking technologies. We recognized **Demptos Napa Cooperage** (Essencia), **Seguin Moreau Napa Cooperage** (Icône Concept), **Taransaud** (PureT), **Tonnellerie Radoux** (Oakscan) and **Vicard Generation 7**. This is also one of the reasons we invited Dr. **Marie-Laure Badet-Murat**, owner of **Enologie by MLM, Bordeaux**, to speak about the relation between wood tannin potential and wine quality at IQ 2016. Badet-Murat joined **Corey Beck**, president and director of winemaking at **Francis Ford Coppola Winery** as well as **Jeffrey Stambor**, director of winemaking at **Beaulieu Vineyard** and **Justin Seidenfeld**, winemaker at **Rodney Strong Vineyards**, to speak in the "Achieving Barrel Consistency" session.

The specifics of a single company's method are less significant than the fact that by these various methods, coopers are trying to produce more consistent barrels that have a more predictable sensory impact on wines aged in them. What is significant is that multiple cooperages are using science to produce a natural product (e.g., barrels for winemaking) that is still natural yet gives predictable and reproducible results for the winemaker.

SCOTT SUMMERS

Dr. Marie-Laure Badet-Murat, owner of Enologie by MLM, Bordeaux, spoke about the relation between wood tannin potential and wine quality at IQ 2016.

SCOTT SUMMERS

The Many Sources of Variability

The task of minimizing barrel-to-barrel variability is not an easy one. Beyond the obvious differences in the starting wines and aging processes, Badet-Murat noted that differences in the raw material (oak), seasoning and toasting (This sentence looks like it was cut off). Each of these have their own multiple points of variance. For example, the raw material (the oak) can be a source of variability due to it's species, intra-species genetic variability (i.e., genetic variability within a single species), geographic origin and sylviculture.

OAK

American oak (*Quercus alba*), or more properly American white oak since there are multiple oak species in the Americas, is certainly different from French oak, but "French oak" is not a single species, but rather at least two related and hybridizable species: European sessile oak (*Quercus petraea* AKA *Q. sessiliflora*), and European pedunculate oak *Quercus robur* AKA *Q. pedunculiflora*). Both sessile and pedunculate oak are used in barrel-making under the French oak, Hungarian oak and European oak monikers.

One might expect that there are noticeable sensory difference between oaks of different species. French oak barrels have been traditionally sold as made from wood from a particular forest without noting if the wood used was *Quercus petraea*, *Quercus robur* or a mix of the two. Of course, *Q. petraea* and *Q. robur* are likely closely related enough that they can produce fertile hybrids; that it is just within the realm of possibility that the environmental differences between two different forests may end up being a bigger cause of stave-wood chemistry than the slightly differing genetic heritance between the two.

As it turns out, variability in the oak wood occurs at even smaller scales than between the two European oak or between any one forest versus any other. Even if we eliminate inter-specific variability and took only a single species from a single forest we'd still find a appreciable amount of variability in the resulting stave-wood. Worse yet, even staves cut from a single individual tree can have differing compositions.

Variability Beyond the Forests

No matter the forest or the species, after the oak tree has been harvested there is still a great deal that happens during "seasoning" and toasting that alters the chemistry in the wood. If one were to take the same uncharacteristically homogenous log and split them into rough staves and season one third in southwestern France, another third in Missouri, and the final third in Chile, I would expect that there would be at least some slight differences between the three groups simply due to the differing climates of the respective seasoningyards.

Exercising Control

A cooper is a rare example of a true craftsman. One can't really study how to raise and toast barrels at university, or even at a vocational college. Instead, a cooper usually learns the trade via an apprenticeship that is not all that different from being in a medieval guild. Bending staves and driving hoops is the easy part. The part of being a cooper that relies upon years of experience is the eye for choosing staves so that the wood-grain is consistent and the eye for monitoring the toasting level on the toasting floor. I have seen more than one cooperage that has large clerestory windows above the toasting floor so that the coopers don't have to rely on color-shifting artificial light while they are performing this crucial task.

Control the Toast

We've seen plenty of research over the past 20 to 30 years that points to the dramatic role toasting plays in altering the chemical composition of the barrel-staves (see Swan, James, *AJEV*, 50:4:495-502 (1999) and Chatonnet, Pascal, *AJEV*, 50:4:479-494 (1999)). Sensorially important compounds like vanillin are composition products that are made from the thermal decomposition of lignin. Too little heat and/or time and little vanillin is produced. Too much heat and/or time and the vanillin itself can be "cooked" away. This, and other, research seems to have caused several cooperages to look into ways to exert more control over toasting and produce more replicable barrels.

As we gain a better understanding of the underlying chemistry, the obvious next step would be to control the process to a greater degree. Better control needs better measurement. The eye, even the highly skilled eye, is an indirect measurement at best. In short order, most coopers were using infrared thermometers to track the process. World Cooperage linked thermometers to computers that control the toasting fire for the infinitely repeatable, and customizable, Profile Series line. Other cooperages have taken approaches that differ in the details, but the goals are the same degree of control on the toasting floor.

Control the Source, Control the Process

Absolute control over toasting barrels won't eliminate barrel-to-barrel variability. Even with stave wood of the same species, there is variance due to differing climate, soils and sylviculture. Even the natural variability within a forest, within a single tree means that the chemistry for any given stave can differ a great deal from that of any other stave. The solution, then, is to analyze the staves and each company may have a differing set of criteria that they're analyzing. Badet-Murat uses near-infrared spectroscopy (NIRS) to measure the ellagitannin content. Ideally, the end result would be that staves are grouped with other staves that have a similar chemistry.

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Control on the toasting floor is something cooperages strive for.

New Barrel Technology Uses Science to Produce More Consistent Product

Dr. Badet-Murat concluded her presentation at IQ 2016 with the following bullet points:

- The heterogeneity of oak wood composition, combined with irregular toasting protocols, can lead to substantial variation in wine perception after aging.
- Oak selection by forest should be used with caution as it doesn't reflect the heterogeneity of oak wood chemical composition.
- Selection by grain allows some control of this heterogeneity, but variability remains high.
- To achieve homogeneity, as well as take advantage of the high diversity in chemical composition, sorting by tannin potential at the stave level will yield better outcomes.
- Rationalization of cooperage oak wood selection by tannin potential, combined with precise toasting management, is evidenced both by sensory and chemical analysis.
- We expect this rationalization of wood sorting will play an increasingly important role as natural resources are more effectively utilized and the demand for a consistent product increases.

As I noted above, the exact specifics of any particular barrel company's method or stave slection process are less significant than the fact that by these various methods coopers are trying to produce more consistent barrels that have a more predictable sensory impact on wines aged in them. **WBM**