Recent Research Isolates Eight New Triterpenoids and Their Effects

Differences are wide enough that they can be used as criteria in barrel-making and purchasing decisions

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BY THE TIME THAT it has been made into a barrel, can one really say what sort of wood has been used in its construction? It's likely that familiarity makes it relatively easy to tell the difference between acacia* (AKA black locust), beech, chestnut and oak barrels on sight although I wouldn't be confident of my own assessment since, like a lot of winemakers, I've only worked with oak barrels myself. Most winemakers can probably tell the difference between an American oak barrel and one made from French or Eastern European oak (*Quercus robur* and *Quercus petraea,* respectively). The difference in weight between an American oak barrel and one made from French or Eastern European oak is a pretty good way for one to guess if the barrel was made from AO (*Quercus alba*). That being the case, I'm not so sure if Oregon oak (*Quercus garryana*) could be separated from AO or FO on sight or feel, but I've used more barrels than most winemakers not working for **Kendall-Jackson**, and I can't recall ever seeing a *Q. garryana* barrel.

American oak may be relatively easy to discriminate from French and other European oaks but, historically, it has been difficult to tell the difference between the two species that make up French and European oak once the trees have been harvested. Over time, coopers have relied upon things like the wood grain (ring width) and the reported forest of origin to predict the eventual organoleptic qualities of the resulting barrels.

Better Identification Through Chemistry

More than a decade ago, **Andréi Prida** and **Jean-Louis Puech** published a paper entitled, "Influence of Geographical Origin and Botanical Species on the Content of Extractives in American, French, and East European Oak Woods[1]". This study was able to determine that it is possible to tell the difference between American and French oak via the analysis of the oak extractives. The chemicals of interest for this study included the ellagitannin as well as the principal oak-derived odorant compounds (aromatic aldehydes, lactones and phenols).

The paper also looked at whether it is possible to tell the difference between the oak from France and Eastern Europe to separate oak wood from the same species based upon the geographical origin. The authors reported some success in discriminating between French and Eastern European oak but noted that, as of 2006 and with the criteria described in this paper, some samples of Eastern European oak could be misclassified.

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Quantitative Analysis: Enter the Triterpenoids

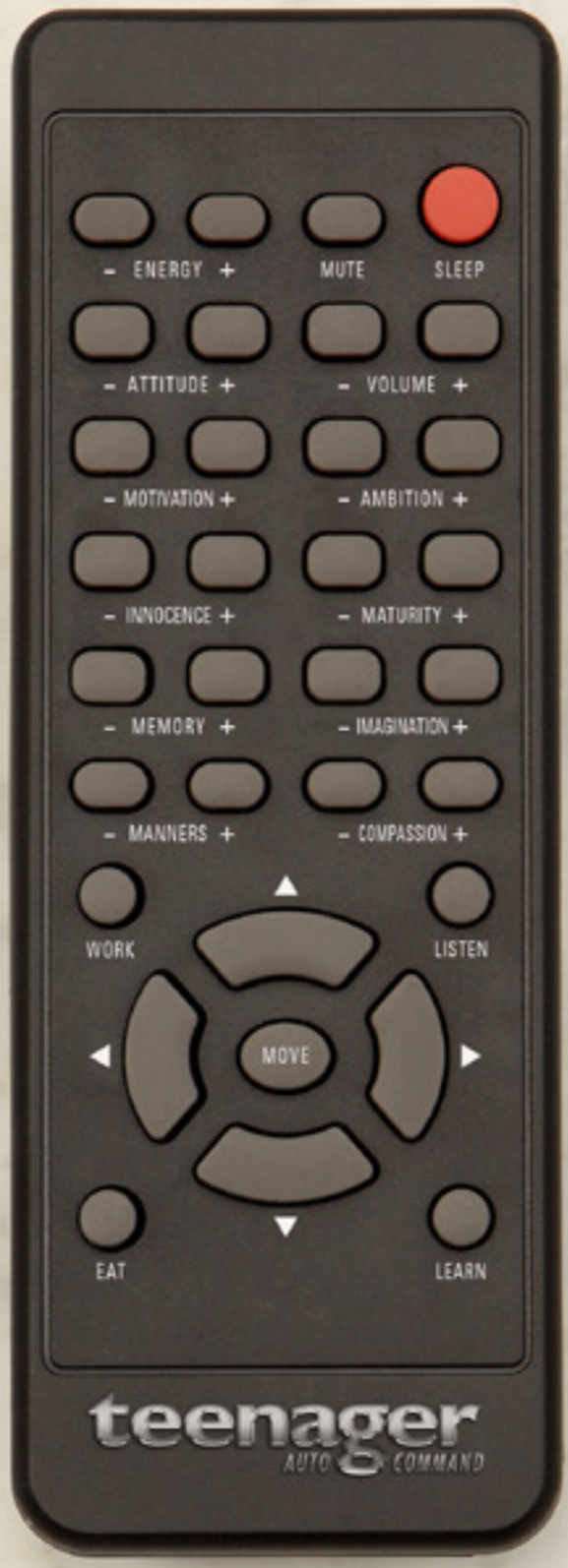
A decade later Prida, along with **Axel Marchal** and **Denis Dubourdieu**, published "New Approach for Differentiating Sessile and Pedunculate Oak: Development of an LC-HRMS Method To Quantitate Triterpenoids in Wood[2]". This paper notes that while the two primary oak species from the French forests that are used in cooperage, *Q. robur* (AKA pedunculate oak) and *Q. petraea* usually are lumped together under the rubric "French oak," there are differences between the two species. For example, *Q. petraea* tends to have higher levels of ellagitannins and lower levels of oak lactones than *Q. robur*. Unfortunately, there is so much individual variation that these can't be used to accurately determine from which species a given oak sample may be.

Citing an article in *Analytical Chemistry* from 2011([4]), which embarrassingly I still had in my "To-Read" stack eight years later, Marchal *et alia* noted that the four new triterpenoids (AKA quercotriterpenoids or QTTs) could be used to discriminate between oak wood from *Q. petraea* and *Q. robur*. Furthermore, three of the triterpenoids were found to increase the perception of sweetness in a wine.

Triterpenoids, The Sweet and the Bitter

This leads us to the most recently published article on the subject of oak triterpenoids published by Marchal, Dubourdieu and several other researchers, "Triterpenoids from *Quercus petraea*: Identification in Wines and Spirits and Sensory Assessment[3]". In this article, the authors note that they isolated eight new triterpenoids.

Aside from the analytical chemistry angle by which these chemicals were isolated, which is interesting in its own right, the authors make a few observations that are worth noting. Firstly, they did identify eight new oak compounds. Secondly, they were able to identify and characterize the organoleptic impact that these triterpenoids have on wine and spirits. Thirdly, the authors noted that some of the triterpenoids are perceived as being intensely sweet. Fourthly, the amount of triterpenoids in either of the two main French/European oak species used in coopering is different enough that it can be used as a criteria in oak selection for the development of particular cooperage styles by building barrels out of staves with higher or lower concentrations of sweet triterpenoids. Additionally, since *Q. petraea* tends to have higher concentrations of sweet triterpenoids, specifically tetrahydroxoleane-type triterpenoids, than *Q. robur,* this sort of quantification could be used in select oak based on the particular French/European oak species.



Just as soon as we make one of these, we'll let you know. The analogy fits. Aging and finishing a wine is actually not at all unlike raising a teenager. It's a particularly critical time, a turning point in the developmental life of your baby. And just when you were sure you'd thought of everything, crossed your "t"s, dotted your "i"s—and then along came nature. Unpredictables happen, it's a fact of life and it's where we come in and shine. Our exceedingly refined array of alternative aging systems offer winemakers a wide range of nuanced control over flavors, textures and mouthfeel. Numerous useful tweaks, trims and controls heretofore unavailable via traditional barrel-aging. For over 30 years, scores of blind tastings have dialed in and proven a rigorous scientific process we call Barrel Profiling. A unique process created by us, which now enables winemakers to not just mimic barrel flavors, but to methodically reproduce the exact barrel of their choice. Flawlessly.

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What Next?

Industry suppliers are taking note. Andréi Prida, research and development specialist at **Seguin-Moreau** said, "We don't use this analysis as routine for Icôn process. But we are soon starting the production of limited edition barrels and big containers based on qtt concept. All trials were successfully completed. We have already processed the wood for it. So wood is seasoning now and will be used for making barrels."

For a mere winemaker like myself, while I do find the analytical chemistry aspects of the isolation, identification and quantification of oak triterpenoids interesting, the winemaking implications are the most significant. I want to make the "best wine" I can. Of course, that is a totally subjective and idiosyncratic term, and I revel in that idiosyncrasy. I am enough of an iconoclast that I don't really care that much about the oak origin or species for their own sake. It is what is in the glass that matters. If triterpenoids can be used to produce barrels that will give me a predictable élevage, then that is one less "vintage variation" with which I must contend. **WBM**

Citations

1 Andréi Prida and Jean-Louis Puech, "Influence of Geographical Origin and Botanical Species on the Content of Extractives in American, French, and East European Oak Woods," J. Agric. Food Chem. 2006, 54, 8115-8126.

2 Axel Marchal, Andréi Prida, and Denis Dubourdieu, "New Approach for Differentiating Sessile and Pedunculate Oak: Development of a LC-HRMS Method To Quantitate Triterpenoids in Wood", J. Agric. Food Chem. 2016, 64, 618-626.

3 Marine Gammacurta, Pierre Waffo-Teguo, Delphine Winstel, Blandine N. Cretin, Lauriane Sindt, Denis Dubourdieu, and Axel Marchal, "Triterpenoids from Quercus petraea: Identification in Wines and Spirits and Sensory Assessment", J. Nat. Prod. 2019, 82, 265-275.

4 Marchal, Axel, Pierre Waffo-Téguo, Eric Génin, Jean-Michel Mérillon, and Denis Dubourdieu. "Identification of New Natural Sweet Compounds in Wine Using Centrifugal Partition Chromatography–Gustatometry and Fourier Transform Mass Spectrometry." Analytical Chemistry 83, no. 24 (December 15, 2011): 9629–9637. doi:10.1021/ac202499a.

Endnotes

* When I first heard of barrels being made from acacia wood, I had images of loggers denuding the African savanna of its magnificent, nitrogen-fixing thorn-trees. In fact, it appears that the "acacia" used in making barrels isn't what I consider acacia tree in the first place. I believe that most/all of the "acacia" use for barrels is actually *false acacia* (*Robinia pseudoacacia*) otherwise known as black locust or Robinia. Black locust is native to the central-eastern United States and widely planted and naturalized to most of the temperate climes in the world. Black locust wood has a reputation for being durable and is used for such things as boat building, fence posts and railroad ties.

True acacias themselves have undergone a number of taxonomic changes in recent years with several species being moved from genus *Acacia* to new genera like *Vachellia*, *Senegalia*, *Acaciella*, or *Mariasousa*.