Effect of Quercus alba oak barrels from different forest on the volatile composition of Tempranillo wines

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INTRODUCTION

• During barrel aging, the oak barrel provides the aromas: almond, vanilla, coconut, toasted, smoked / toasted notes and something spicy like cloves.
• From the point of view of its sensory impact, the main volatile substances released by oak wood are furans, phenolic aldehydes, volatile phenols and lactones.
• The species and origin used for red wine oak aging determines the physiological composition of the wood and thus the finished wines.
• Most studies compare oaks of different species or species from different European regions such as France or Eastern European countries, but there is a great lack of knowledge about the characteristics and nuances associated using oak trees grown in different areas of the United States.

OBJECTIVE

To analyze how the choice of barrels made with Quercus alba oak from different geographic areas of the United States (Missouri, Kentucky, Ohio and Pennsylvania) influences the volatile composition of the Tempranillo wines.

MATERIALS AND METHODS

Barrels: New 225-liter American oak barrels (medium toast degree) from different forests of the United States (Missouri, Kentucky, Ohio and Pennsylvania) were used.

Wines and Aging: The experiences were made in 12 wineries from the D.O.Ca Rioja and the D.O. Ribera de Duero. All the wines were from the Tempranillo variety, and they were aged in the four barrels for 12 months. Samples were taken after 6 and 12 months of aging.

Determination of volatile compounds: The volatile compounds of the wines were quantified by gas chromatography with a mass detector (GC-MS) after liquid-liquid extraction of the volatile fraction [1].

RESULTS

Table 1. MANO-ANOVA statistical analysis of wine samples and percentage of variance attributable (%) of the independent effect of Barrel and Wine, and the interaction of both (Barrel x Wine). Concentration (μg / L) of volatile compounds in wines after 6 months (Table A) and 12 months (Table B) of aging.

From 6 to 12 months of barrel aging, most of the volatile compounds suffered a decrease. This decrease was between 87% and 90% for furfural, and 79% to 87% for 5- methyl furfural. Other studies [2] also found that the concentration of these substances diminished to an important extent after 6 months wine aging. Vanillin decreased around 73% - 80%, was probably attributed to form the corresponding alcohol [3]. The content of 4-ethylguaiacol and 4-ethylphenol and vanillin was higher in the wines aged in Pennsylvania barrels.

CONCLUSION

• The geographical origin of Quercus alba significantly affected to the extraction of the volatile compounds coming from the barrels.
• After 12 months, the wines aged in barrels from Missouri showed the highest concentrations of furfural, 5-methyl furfural, furfuryl alcohol and lactones. The content of 4-ethyguaiacol, 4-ethylphenol and vanillin was higher in the wines aged in Pennsylvania barrels.

REFERENCES