



Società Chimica Italiana
Divisione di Spettrometria
di Massa



FONDAZIONE
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3rd MS-Wine Day

May 16 - 17, 2019



Fondazione E. Mach
San Michele all'Adige (Trento)

Mass Spectrometry & Grapes, Wines, Spirits

CONFERENCE PROCEEDINGS

PTR-ToF-MS and SPE-GC/MS analysis of red and white wines aged with different types of commercial oak chips

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Keywords: red wine, white wine, oak chips, SPE-GC-MS, PTR-ToF-MS, toasting level.

Barrel aging represents a solution to enhance the sensory perception of wine in reason of the positive modulation of aromatic complexity, astringency and color stabilization. Oak chips provide a cheaper solution when compared to the corresponding wood barrels, thus explaining the increasing interest in wood substitutes in the enological sector. In this study, on lab-scale, we aged 40 wines, both red and white, using 14 different types of commercial oak chips. We analyzed the Volatile Organic Compounds (VOCs) associated to the different wine samples using both Solid Phase Extraction–Gas Chromatography–Mass Spectrometry (SPE-GC-MS) and Proton-Transfer Reaction–Mass Spectrometry coupled to a Time of Flight mass analyzer (PTR-ToF-MS). The first characterized by the efficient separation and identification of the analytes, the second considered for the effective fast quantitative analysis without any sample preparation. Sample preparation for GC analysis was easily carried out by a single step using polymeric SPE cartridges with a high binding capacity and multiple retention mechanisms to retain the broadest spectrum of aromatic compounds. PTR-ToF-MS analysis has been performed using a recently described tailored system achieved connecting with an automated sampler and associated custom-made data analysis applications. Analytical results were explained by multivariate statistical analysis. After a preliminary step performed using principal component analysis (PCA), a discriminant analysis (DA) was carried out. The tested analytical approaches provided further information on chemical VOCs diversity associated the principal experimental modes assessed: oak wood toasting degree and wood geographical origin, also as a function of the wine typologies (red and white). Complementarity in the SPE GC-MS and PTR-ToF-MS analytical potential in characterization of VOCs associated with oak aged wines is also discussed.