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Abstract

Characterization of Musts, Wines and Sparkling Wines Based on Their Elemental Composition Determined by ICP-OES and ICP-MS †

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Abstract: The control of the composition of food products with protected designation of origin, such as wines and sparkling wines, is essential to prevent fraudulent practices and adulterations. A wide range of compounds can be used as tentative biomarkers for the characterization and authentication purposes, with elemental composition being one of the most successful sources of information, especially for dealing with geographical origin and varietal issues. Currently, Inductively Coupled Plasma with Optical Emission Spectrometry (ICP-OES) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) are the techniques of choice to carry out multi-elemental analysis of these kinds of beverages in a rapid and simple way. In our study, samples from the different processing stages in the elaboration of sparkling wine (cava)—including must, base wine and sparkling wine—of Pinot Noir and Xarel·lo grape varieties have been analyzed by ICP techniques to determine the elemental composition. The resulting data have been used to classify these products according to oenological practices and product qualities. For this purpose, principal components analysis, box plot diagrams and bar charts have been used. Different markers and sample patterns have been found to deal with changes resulting from the different steps of the production process of cava wines. Results have revealed the relevance of some elements as descriptors of winemaking processes. For instance, Cu and K are abundant in must and their concentrations progressively decrease through the cava production process. S levels suddenly increase at the base wine step (and further decay) of the addition of sulphites as preserving species. Finally, concentrations of Na, Ca, Fe and Mg increase from the first fermentation due to the addition of clarifying agents such as bentonite.

Keywords: wine; elemental composition; quality control; ICP-OES; ICP-MS; chemometrics; principal component analysis

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