

O2 SS3

**CHARACTERIZATION, SIZE DISTRIBUTION AND TIME-EVOLUTION ANALYSIS OF ENDOGENOUS NANOPARTICLES IN ITALIAN RED WINES**

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The presence of colloidal particles in wine impacts properties, taste and palatability, and can vary greatly among wines of the same cultivar.

Wine macromolecules consist of proteins, polysaccharides and polyphenols [1]. The first two interact with polyphenols participating in aggregation, and originating nanoparticles which may have different composition [2]. This aggregation directly influences wine quality, its sensory characteristics such as the perception of astringency, and colloidal stability.

If the chemical composition of wine is widely studied, and analysis of the molecular and macromolecular content are routinely performed in the course of wine production, there are many gaps in the characterization of colloidal systems endogenously formed in wine.

One of the key steps of such a characterization is the ability to work in analytical conditions as close as possible to the colloid environment, to preserve the sample structure and avoid degradation. As a soft and versatile fractionation technique, asymmetrical flow field-flow fractionation (AF4) can provide native separation of wine colloidal matter while working in simulated wine as mobile phase. In our work, in the context of mapping wine properties and nano-structure, we analyzed a pool of Italian red wines by using an AF4-multidetector platform. The two directions of this study involved identifying the differences between different wines from the same cultivar, and the changes in the size distribution of the colloids over time. Different red wines were analyzed and characterized using UV, Fluorescence and Multi-Angle Light scattering (MALS).

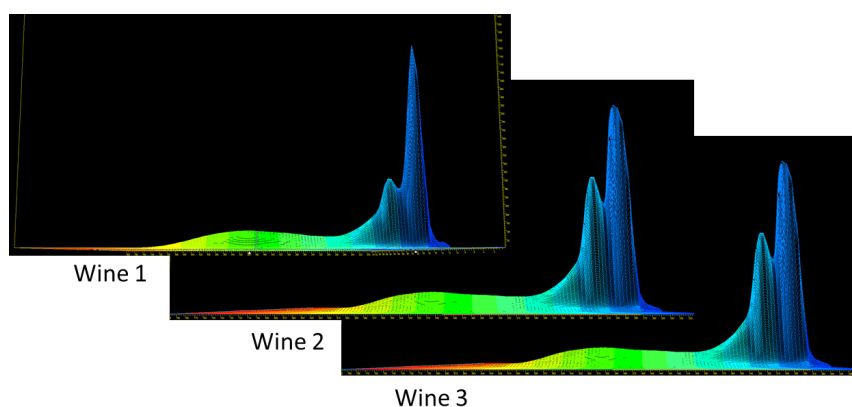


Figure 1. Absorption profile of nanosystems from different red wines

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From UV detection we collected online, 3D spectra showing the compresence of absorption maxima within the same peak, suggesting that proteins, polysaccharides and polyphenols might agglomerate together and possibly layer into nano-sized specimens. Fluorescence confirmed the presence of proteins in these systems, and showed to be useful in estimating the protein content via calibration with bovine serum albumine. MALS allowed the identification of the size distribution of these species, which ranged from 25 to 70 nm in terms of gyration radius ( $r_g$ ). The difference between samples mainly consisted in the relative intensity of the absorption maxima, meaning that different nanoparticles can form from different protein-polysaccharide-polyphenol ratios. Moreover, the nanoparticles size varied between samples. Each wine was analyzed over time: the changes in  $r_g$  suggest the insurgence of conformational changes of the nanoparticles after the sample is exposed to air, implying a correlation between these systems and the organoleptic modifications which incur over aging.

Lastly, fractions of each wine were collected to facilitate downstream analyses, such as Mass Spectrometry.

### References

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- [2] F. Saura-Calixto, M.E. Diaz-Rubio, Food Research International, 40 (5) (2007), pp. 613-619