



## **Elemental profiling of Cabernet Sauvignon grapes as a function of geospatial variability in a Napa Valley vineyard**

Angela Carvalho, Helene Hopfer, Jenny Nelson, Sue Ebeler, Christopher Jenkins, Richard Plant, and David Smart  
University of California at Davis, United States (drsmart@ucdavis.edu)

A primary tenant of the concept of geoscience and wine is that elemental composition of soils may be reflected in the elemental profile of fruit and discerned in the organoleptic assessment of wine. The extremely varied soil composition at the vineyard level in the Napa Valley region of California provides an ideal setting to study elemental pattern correlations between grape berries and soil samples.

In the Napa Valley Cabernet Sauvignon is a wine grape variety of substantial economic value. Elemental profiling of Cabernet Sauvignon grapes in function of origin will provide a better understanding of the relationship between elemental accumulation in berries and soil element composition. The aim of this study was to explore the geospatial variability of elemental patterns in Cabernet Sauvignon grapes with respect to the soil elemental profiles at thirty-six geo-referenced vines in a 4 ha vineyard.

Sixty-eight elements were determined via inductively coupled-plasma mass spectrometry (ICP-MS); this allowed for elemental profiling of both soil and berries at each sampling site. It was found that for the soil samples twenty-two elements contributed to a significant difference between sampling points, and thirty for the berries.

Application of principal components analysis (PCA) showed that soil and berry elemental composition varied as a function of location in the vineyard. For the soil PCA, rare earth metals such as Dy, Ho, Ce, Er, Yb and Tm were driving separation towards the southern section of the vineyard while K, Ga, V, Al, Mg and P were correlated with the northern section. In the berry samples the Lanthanides, Gd, Pr, Yb, Dy, Er and Ho, also showed a higher influence in driving separation towards the southern section while Sr, Mo, Ba, Mg, P, K, Cd, Cu, B, Rb and Ti characterized the elemental profile of the northern part of the block. These findings showed that the rare earth metals, in particular Yb, Dy, Er and Ho, were the most distinguishing elemental patterns correlating both soil and berry profiles across the 4 ha vineyard.