

Potential of Sr isotopic signature for authenticity and geographical origin of Portuguese wines

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Wine authenticity is a worldwide concern, due to the added-value linked to different terroir. In Portugal, the heterogeneity of some wine regions in terms of soil and geological environments is well known. Therefore, in order to assess traceability relations between wines and the geological setting of the production areas, Sr isotopic determinations and particle size analyses were performed in soil and wine samples from the sub region Melgaço and Monção of the demarcated Vinho Verde Region, with vineyards implanted on granitic derived soils, and in those from the demarcated Douro Region Vineyards, mainly emplaced on metasedimentary derived soils from Desejosa, Rio Pinhão and Pinhão Formations.

The average $^{87}\text{Sr}/^{86}\text{Sr}$ value from selected samples of metasedimentary derived soils is 0.748267 ± 0.000023 , whereas that from granitic derived soils is 0.766220 ± 0.000019 . The sampled grapevine varieties were Alvarinho, Touriga Franca and Touriga Nacional. A consistent depletion in $^{87}\text{Sr}/^{86}\text{Sr}$ values from bulk soil samples to the respective wine is noticeable, which range from 0.713981 ± 0.000024 to 0.721478 ± 0.000017 . Furthermore, wines produced with grape varieties from vineyards emplaced in the sandy loam soils of Rio Pinhão and Pinhão Formations tend to yield the highest Sr ratios ($> 0.719344 \pm 0.000014$), in comparison to vineyards emplaced in the more permeable soils, from both granitic areas and Desejosa Formation metasediments, generally show lower Sr isotopic ratio ($< 0.719856 \pm 0.000020$). No significant differences were found between grape varieties from the same vineyard. These results point to a correlation between Sr uptake by vine roots and texture and clay content of soils, rather than with Sr isotopic ratios of bulk soils. In fact, a higher rate of adsorption of metals in the clay fraction, rather than in the silt and sand fractions, can explain the highest Sr ratios in the soils and also an increased ability of supplying plant nutrients during a specific period.

The lower Sr isotopic ratios in soils can be a consequence of their sand-silt enriched texture, with lower water holding capacity, favoring leaching losses.