Study of the distribution of Rare Earth Elements in soil and in Vitis Vinifera L.cv Cannonau in two different regions

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Introduction

Vitis vinifera L. cv Cannonau (Magnoliopsida Vitaceae) has been grown for years in the Italian regions to produce a fine wine, with Controlled Designation of Origin (DOCG) and Denomination of Controlled and Guaranteed Origin (DOCG). From a geological point of view, the “terroir” has been defined as the geochemistry of soil, surface and ground water. Recent studies, regarding vitis vinifera, based on geochemical characterization have clearly shown the influence of geological origin, vineyard soil and grape berries (Marchionni et al., 2013; Pepi and Vaccaro, 2018).

Materials and Methods

The sampling areas were three different vineyards, two located in the valley of Pardu and Pelau in Sardinia (Italy) and one in Suogana in the Veneto Region (Northern Italy). 10 soil samples (Sardinia) and 6 samples (Veneto) were collected at the depth of 40 cm along the vineyard line, at intervals of 1 m and at 50 cm of distance; each sample was collected in triplicate. At harvest time, grape clusters were freshly picked form grapevines and stored in polyethylene bags. The grape berries were centrifuged to separate the juice residue (JR) from solid residues (SR). The soil and grape berries (JR and SR) samples were prepared by acid digestion to an open platinum plate following the procedure by Pepi et al., 2019.

The concentrations of REE in samples of soil and juice or solid residues of grape berries were determined by inductively coupled plasma mass spectrometry (ICP-MS). The data were elaborated with multivariate statistics analysis (Linear Discrimination Analysis).

Statistical results

To establish the geochemical differences due to geographical origin, Principal Component Analysis (PCA) was applied to all data in soils and grape samples from the three vineyards (Fig. 6, 7 and 8). From PCA analysis it was observed that the samples are not randomly grouped, but rather depending on the vineyard they come from.

Geochemical results

In the figures below are shown the REEs in the samples of soil (Fig. 3, SR (Fig. 4) and JR (Fig. 5). REEs contents have been normalized to the Upper Continental Crust (UCC, Rudnick and Gao 2003).

Conclusions

The concentration of rare earth elements (REEs) was evaluated by ICP-MS in soil and grape berries of Vitis Vinifera L. cv Cannonau, from two different localities in region Sardinia and Veneto. Each vineyard soil was geochemically characterized on the base of different REE concentrations. Juice and solid residues of grape berries (Cannonau) supported the identification of each vineyard based on REE concentration. The work aimed to determine a valid method to identify the terroir, it means in relation between vineyard soil and grape berries. REEs can be used to this aim of geographic designation of origin, also allowing a tool against the counterfeits of wines. At last the same method also should be valid with other label agriculture product closely related to geographic designation.

Bibliography