

The accumulation of Cu in vineyard soils under integrated and organic production

Carla Patinha¹, Cristiana Paiva², Nuno Durães¹, Eduardo Ferreira da Silva¹, Ruth Pereira², Anabela Cachada³

1 – Department of Geosciences & Geobiotec, University of Aveiro
 2 – Biology Department & GreenUPorto, Faculty of Sciences, University of Porto
 3 – Biology Department & CIIMAR, Faculty of Sciences, University of Porto

FIGURE 1

(a) Douro Demarcated Region location; (b) Levels of Cu in each soil sample location and some photos of the region.

FIGURE 2

Results of the selective chemical extractions for each plot and reference soils.

The rate of conversion of conventional vineyards into organic farming is currently increasing. Nevertheless, the environmental and economic advantages of organic farming are still controversial, particularly due to the high amount of Cu used. In the Douro Region (Fig. 1a), well known by the production of Porto wine, along with the existence of very old vineyards, there is a growing number of vineyards in organic production mode, and thus, soils contamination by Cu is of special concern. Hence, in order to evaluate the inputs and fate of Cu in vineyard soils, samples were collected from 3 areas with 15-20 years old vines (Fig. 1b): two plots (QG & QA) under integrated production mode and one plot (QS) under organic production. In order to evaluate the geological background inputs, reference soils (forest soils without direct anthropogenic influence) were also collected. Soil physical-chemical parameters (e.g.: pH, organic matter, and potentially toxic element concentrations) were determined to characterize the different vineyards. Further, a sequential selective extraction (SSE) was carried out to study the solid phases of Cu and to study the mobility of Cu. Results

showed that Cu concentrations were higher in vineyard soils when comparing to the background values. Concentrations were particularly high in soils under organic production (Fig. 1b), with some values above the 100 mg/kg required by the Portuguese legislation for agricultural soils receiving sludges (Decreto-Lei nº 276/2009). Differences in the behavior and fate of Cu were observed between plots, as can be seen in the results of the sequential chemical extraction (Fig. 2). In addition, the mobility of Cu in vineyard soils is clearly higher than in the background soils. In vineyard soils, a significant fraction of Cu is associated with the acid soluble phase which may result in additional risks for the environment, and increasing its toxicity for plants.

