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THE ENVIRONMENTAL IMPACT OF USING COPPER SULPHATE TO AVOID GRAPEVINE POWDERY MILDEW IN THREE VINEYARDS OF THE DOURO REGION, PORTUGAL

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Copper-based fungicides have been used in vineyards throughout the world, for many decades to protect against downy mildew. However, their use results in an accumulation of Cu in surface soils which can potentially impact on the biological health of the soil and could be transported and stored in the sediments deposited close to valley bottoms. In Douro region, northern of Portugal, vineyards are located on steep slopes and are susceptible to accelerated soil erosion. In this study, 50 soils samples were collected in 3 vineyards of different ages, one with more of 50 years, other with more 15 years and one recently planted. Two rivers converge into a water reservoir located close to vineyards. Five samples of stream sediment, pore water and superficial water were collected in the rivers and reservoir. The total Cu (Cu_T) content in the soils varies between 17.8 and 211 mg/Kg (mean = 79.4 mg/Kg). However in the old vineyard the Cu concentration is higher than in the others (mean value of 144.8 mg/kg). The total Cu content in stream sediments ranges from 19.4 to 35 mg/Kg (mean = 26.1). The average Cu concentration in soils is 3 times higher than in sediments. The solid phase distribution of copper in stream sediments shows that the metal is associated with Fe-Oxyhydroxides and silicates, indicating that most Cu in the sediment has a geogenic source. In sediment pore water the Cu content is always below 2 µg/L, with the exception of the sample collected in the reservoir. For superficial waters no Cu was detected. These results suggest that the rate of erosion is low and the contribution of soils Cu in stream sediments is irrelevant. The sediment core was divided in 31 sub-samples and a pore-water sample was extracted when possible. The distribution of Cu along the profile seems shows a slight increase with depth, with values ranging from 55.3 (surface) to 73.8 mg/Kg. In the pore water, Cu distribution shows an antipathetic pattern.

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