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Soil and Water Research

Elevated soil copper content in a Bohemian vineyard as a result of fungicide application

Ash C., Vacek O., Jakš k O., Tejnecký V., Drábek O.:

Soil & Water Res., 7 (2012): 151-158

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A set of fifty samples were taken from soil surface layers of an anonymous vineyard in the Bohemia region of the Czech Republic. Samples were analysed for basic soil parameters including pH and humus content and quality and for potentially toxic elements Cu, Pb, Zn, Cd and Mn. When compared to soil guideline values, mean Cu exceeded the limit by 280%. Although other elements did not exceed the guideline value, Zn and Cd surpassed background concentrations by 108 and 187%, respectively. Mn did not occur in concentrations that are considered excessive with respect to common natural soil levels. A statistically significant correlation was observed for Cu and C_{ox} , but no significant correlation could be made between Cu and humus quality, suggesting that in this case, Cu retention in surface soil is more dependent on quantity of humic substances rather than humus quality. The unnaturally high accumulation of Cu in the surface horizon is certainly of anthropogenic origin; most likely due to long term application of copper-based

fungicides. High observed values of Cu are probably a result of the soils parent material and application of fertilizers which may have contained cadmium compounds. Distribution maps illustrated a common trend of potentially toxic element accumulation in the western section of the study area plot. However, many variables which were unmeasured in this study could account for the distribution and therefore more detailed study is required before conclusions can be made regarding this occurrence. An analysis of wine produced at the vineyard showed that although the end product beverage contained insignificant amounts of Cu in both red and white wines, the white wine contained 0.026 mg/l of Cd; a value which could contribute considerably to exceeding the dietary allowable intake of cadmium. The investigation should be extended to analyse a wider range of wines produced from the vineyard with a focus on soil-plant-fruit-wine transfer of cadmium and/or production processes.

Keywords:

Bordeaux mixture; copper toxicity; fungicide; potentially toxic elements;

vineyard soil

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