[OP 2.5]

Effects of Zinc on the Phosphorus Availability to Periphyton Communities in the River Göta Älv

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Long-term effect concentrations of zinc on aquatic microbenthic communities are generally reported to occur at concentration levels, which can only be expected in the most polluted areas. Concentration levels causing a restructuring of algal species composition in a periphyton community after a 4-week exposure to zinc in a microcosm system in the phosphorus limited (12-15 µg/l) River Göta Älv in Sweden confirm these findings. However, long-term effects on the biomass production in the same system were found at much lower concentrations. This study will show that the discrepancy between the long-term effects on biomass and species composition is most likely due to a zinc-induced phosphorus deficiency which in turn leads to a decreased biomass production. If this interaction is externally or internally mediated, however, it needs to be further clarified. The results point to the importance of considering bioavailability, not just of the contaminant but also of how the contaminant might affect the bioavailability of e. g. nutrients, when setting criteria for a discharge of contaminants into the environment. In systems rich in phosphorus, zinc exposure might not be a problem, but in systems with low phosphorus it might pose a risk.

[OP 2.6]

Bioavailability of Copper in Runoff Water of a Wine-Growing Mediterranean Catchment (Southern France)

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Mediterranean climate is characterised by punctual heavy rainfalls and long dry periods that renders soils propitious to surface runoff and soil erosion. The transfer of pollutants towards runoff has become the main non-point source pollution in rivers. Within this framework, a small catchment area (91 ha) was selected in southern France, and equipped with sensors and samplers of runoff waters.

The total concentration of pollutants brought into water by runoff is insufficient to evaluate the real exposure of aquatic organisms. In a complex environment, copper interacts with many dissolved (natural organic matter, other pesticides) and particulate compounds which modify its bioavailability.

The purpose of this work was to describe different types of runoff events and to understand factors controlling the bioavailability and toxicity of copper for aquatic organisms in these different contexts.

This study was performed on an untilled field (1200 m^2) with chemical weeding over the whole vineyard. Surface runoff was sampled at the outlet of the field, from summer to winter 1999. One runoff event was sampled in fractions according to the flow rate. Then, for the five next runoff events, samples representative of the total volume of runoff water were collected. Samples (filtrate and ultracentrifugate) were characterised for major ions, dissolved organic carbon and trace metals (Cu, Zn, Pb). Toxic effects were evaluated on biotests - bacteria (*Vibrio fisheri*) and green algae (*Selenastrum capricornutum*). In order to study bioavailability, copper was added to the samples and its toxicity compared to copper toxicity in a standard medium.

Results concerning the first runoff event show that the copper concentration is tightly linked to flow rate. Total concentrations are influenced by three main factors: Rainfall intensity (that determines the content of dissolved matters), succession of rainfalls (influence on soil leaching) and seasons (dry periods and grape harvest).

This study enabled us to determine two types of behaviour in runoff waters. Runoffs occurring after a dry period are interesting cases for the study of metal interactions with natural ligands. Despite high copper values, no toxicity was observed and copper bioavailability was limited. Although the direct impact to receiving rivers could be low, it will be interesting to study the fate of copper on a more large scale: The transport of copper during these events, especially bound to suspended solids, is high. The experimental set of samplers will enable us to study the samples issued from extreme conditions (peaks of rainfall).

Runoffs occurring after a previous leaching are good cases for studying low copper and high bioavailability conditions. The direct impact to receiving rivers must be evaluated.

In both cases, free copper measurements (DPASV), bounded copper (size fractionation, SPE) and organic xenobiotic determinations will complete the study of the behaviour of copper in runoff waters of the wine-growing Mediterranean catchments.