

## **Phosphorus retention in semi-natural and modified reaches of agricultural streams**

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Improvement of retention in streams and riparian buffer zone is a potentially efficient measure to decrease export of phosphorus from agricultural catchments. A study was conducted with the aim to quantify P retention in different types of agricultural streams and to elucidate controlling mechanisms of P uptake. The study was carried out in the intensive arable land catchment of the Radimovicky stream in South Bohemia (49.442 N, 14.657 E). Soils in this catchment were cambisols on the syenite geological background with a bioavailable P concentration of ca 150 µg/g (Mehlich 3). Principal crops were cereals (winter and spring wheat and barley) and oil rape. Two stream reaches were compared: (i) a semi-natural reach with ca 40 m wide, laggely water logged and uncultivated buffer zone and (ii) a modified reach with deepened, partly fortified channel and a tile-drained buffer zone that was maintained as a cropped meadow. Inputs and outputs of the these reaches were monitored in 2004-2006 by point sampling in ca 6 week intervals for analyses of basic P fractions (total P ( $P_{tot}$ ), dissolved P, dissolved reactive P), total suspended solids, Fe, dissolved organic carbon, and ionic composition. In addition, the  $PO_4$ -P uptake parameters (uptake length and uptake rate) were measured in these reaches by addition of stable isotopes of orthophosphate and chloride and the fine, unconsolidated stream bed sediments were characterised by P sorption isotherms and by fractionation of  $P_{tot}$ , orthophosphate, Fe, and Al using the Psenner procedure ( $H_2O$ -buffered dithionate (BD)- $NaOH_{25^\circ C}$ -  $HCl$ - $NaOH_{85^\circ C}$ ). The mean input concentrations of  $P_{tot}$  into both reaches were similar (ca 200 µg/l) but the retentions largely differed (~60% and ~30% in the semi-natural and the modified reach, respectively). The additional analyses also revealed significant differences between the reaches, especially in the P uptake rates, P uptake lengths, maximum P sorption capacity and P saturation of sediments, and fractional composition of P in sediment particles. Sorption of P on iron hydroxyoxides (FeOOH) was revealed as the key controlling process of phosphorus retention in the oxic conditions in the stream channel. The water logged conditions in the soils of the buffer zone promoted washing up dissolved Fe into streams hence increasing the binding capacity of the system for P.