Relationships between phosphorus fractionations in sediments and phosphorus in overlying water in a constructed wetland: impact of macrophytes

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ABSTRACT

Studies on phosphorus (P) distributions comparing planted and unplanted systems often lead to controversial results regarding the importance and growth seasons of plants. In the present study, the distribution and mobility of phosphorus fractionations (PFs) in eutrophic water and sediments were investigated in the absence or presence of two macrophytes, that is, reed and cattail, in a constructed wetland in autumn and spring. The removal efficiencies of total P in water, soluble reactive phosphorus and total dissolved phosphorous were 51.85%–63.75%, 74.52%–95.96% and 72.23%–83.02%, respectively. PFs mainly presented in permanent forms in sediments. In the absence of macrophytes in autumn, P in the overlying water was related to the mobile iron-bound phosphorus (Fe–P) in the sediment. In the presence of macrophytes, P in the overlying water was related to stable occluded phosphorus (O-P) in sediments which reduced the possibility of P release. In summary, macrophytes contributed to the stability of P in sediments and limited the release of P from sediment to overlying water, especially in spring.

Keywords: Phosphorus distribution; Macrophytes; Overlying water; Phosphorus release; Constructed wetland

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