
Distribution and fate of microplastics in a laboratory surface-flow constructed wetland

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Abstract

Constructed wetlands are wastewater treatment systems in which organic matter, metals and nutrients can be effectively removed. However, the effectiveness of constructed wetlands in retaining microplastics is still unknown. In this context, the distribution and fate of microplastics were studied in a laboratory constructed wetland. The laboratory constructed wetland was filled with humus and sand and planted with four different submerged macrophytes: *Anubias congensis*, *Egeria densa*, *Vallisneria spiralis*, and *Pogostemon octopus*. The floating macrophyte *Lemna minor* was distributed on the water surface. Different types of microplastics (spherical polyethylene microbeads, fragments of rubber tires, and polyethylene terephthalate textile fibers) were added, and their distribution in the constructed wetland and their effects on macrophytes were investigated after 12 days. Microbeads were mainly floating, most of the fibers settled, while rubbers tire microplastics remained in the water phase. A large number of microplastics were found on the plant biomass. Effects on macrophytes were monitored by determining chlorophyll, protein and carbohydrate content, and electron transport system. No significant alternations were detected, indicating that microplastics do not have significant effects on aquatic macrophytes. Considering the bioaccumulation of microplastic particles on aquatic macrophytes, but without significant effects, the presence of plants plays an important role in the distribution of microplastic, indicating the possibility of its removal by phytoremediation.

Keywords: microplastics, microbeads, tire wear particles, textile fibres microbeads, constructed wetland

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