# Phytoremediation potential of Lemna minor for removal of microplastics from aquatic environment

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**Abstract**

When microplastics enter the environment, they can interact with aquatic organisms at all trophic levels, including plants. Insufficient understanding of these interactions hinders the development of phytoremediation strategies that are crucial for removal of microplastics. To address this issue, we investigated the interactions of polyethylene microplastics (_˜ 150 $\mu$m) with the aquatic macrophyte *Lemna minor*. Microplastic adhesion was tracked over time: on the first, third, fifth, and seventh (last) days of the experiment. *Lemna minor* fronds were removed from the growth medium and washed with deionized water, which was used to determine the weakly adhered microplastics. Then, the plant biomass was decomposed by Fenton oxidation. The latter was used to determine strongly adhered microplastics. The results showed that maximal capacity for microplastic to adhere to the plant biomass was reached on the first day and decreased with time. About 25% of the adhered microplastic was strongly bound to the biomass, and the rest was weakly adhered, i.e., washed off with water. The same adherence test was performed with a laboratory shaker to simulate the undulations present in the natural environment. No significant difference was found between the experiments. With the aim of obtaining adsorption isotherms, we performed the adhesion test with different initial biomasses of *Lemna minor* - 2, 10, 20, 50 and 80 fronds. Adsorption data were fitted with two empirical isotherm models, Radke-Prausnitz for weakly adsorbed microplastics and Koble-Corrigan for strongly adsorbed microplastics. The adsorption isotherms were convex, suggesting a weak interaction between biomass and microplastics. The latter is confirmed by the high proportion of weakly bound microplastics and the aggregation of plastic particles observed under the optical microscope. With facile adherence of microplastics, *Lemna minor* could be used for phytoremediation of contaminated waters such as ponds and wastewater treatment plant effluents.

**Keywords:** phytoremediation, adsorption of microplastics, Lemna minor

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