The Potential of Pistia stratiotes in the Phytoremediation of Selected Heavy Metals from Simulated Wastewater

The pollution of heavy metals in aquatic environments is a major concern for human beings. The present study demonstrates the phytoremediation potential of the aquatic macrophyte Pistia stratiotes for removal of Cr, Pb and Ni from simulated wastewater. Pistia stratiotes was grown in Faculty of Science & Natural Resources (FSNR) lake water and spiked with different concentrations of heavy metals at 1 mg/L, 2 mg/L and 3 mg/L of Cr, Pb and Ni, respectively. The experiment was conducted within a 14-day period in laboratory conditions. The study investigated the percentage of removal of heavy metals by P. stratiotes as well as determining the distribution of heavy metal patterns in plant tissues, the bioconcentration factor (BCF), translocation factor (TF) and relative treatment efficiency index (RTEI). The results showed that P. stratiotes is efficient in removing single Pb at 1 mg/L and 3 mg/L and single Cr at 1 mg/L, with a removal efficiency of 99.31%, 79.86% and 76.25%, respectively. It was found that P. stratiotes managed to concentrate Pb in its roots up to 15,000 mg/kg in plant tissue. Data on bioconcentration factor (BCF) showed that P. stratiotes managed to reach BCF values over 6,000 each for single chromium at 2 mg/L and lead at both 2 mg/L and 3 mg/L. It was found that the plant can consistently translocate nickel from the roots to the shoots, while chromium and lead tend to concentrate in the root tissues. The results revealed that P. stratiotes uses rhizofiltration as its phytoremediation uptake mechanism. This study helps significantly to increase knowledge regarding the potential of P. stratiotes in the phytoremediation of heavy metal-polluted wastewater.