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Metal removal from multi-metal solutions by metal-tolerant *Stenotrophomonas maltophilia* isolated from river sediment

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ABSTRACT

The efficacy of *S. maltophilia* in removing Pb^{2+}, Cu^{2+}, Zn^{2+} and Cd^{2+} from multi-metal solutions was determined by comparing against single-metal solutions. Results showed that the removal of the cations was higher in single than multi-metal solutions with mean uptake of 70 mg g^{-1} of metals removed compared to less than 10 mg g^{-1} metals, respectively. Biosorption of Pb^{2+} was the highest in both single (70.89 mg g^{-1}) and multi-metal solutions (8.05 mg g^{-1}). Metal removal by *S. maltophilia* in multi-metal solutions was influenced by different pH and adsorbent dosages used, in which pH 7 and low adsorbent dosages (0.10–0.50 g) led to higher amount of metals removed (pH 7: 3.26 –12.28 mg g^{-1}; 0.10–0.50 g: 2.30–8.71 mg g^{-1}). ATR-FTIR analysis revealed that metal-binding sites for *S. maltophilia* were attributed to functional groups such as hydroxyl (–OH), amine ($–NH_2$) and carboxyl (–COOH). Biosorption by *S. maltophilia* was found to comply with pseudo-second order, suggesting that the biosorption process is chemically rate-limited. This study showed that the metal-tolerant *S. maltophilia* has good potential as biosorbent for removal of metals, with recommended dosage and pH at 0.10–0.50 g and pH 7, respectively.

Keywords: Adsorbent dosages; Biosorption; Multi-metal solutions; pH; Single-metal solutions; *Stenotrophomonas maltophilia*

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