Isolation and characterization of a heavy metal resistant isolate of Rhizobium leguminosarum bv. viciae potentially applicable for biosorption of Cd (II) and Co.

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Abstract:

A rhizobial isolate was recovered from the root nodule of the faba bean (Vicia faba L.) grown in sludge-contaminated fields in Upper Egypt. The isolate was identified as Rhizobium leguminosarum bv. viciae on the bases of phenotypic characteristics and sequences of the gene encoding 16S rRNA. The isolate was resistant to heavy metal stress in decreasing order Ba2⁺ (80 ppm), Zn2⁺ (70 ppm), Co2⁺ (50), Al3⁺ (40 ppm), Ni2⁺ (30 ppm), and Cd2⁺ (10 ppm). The rhizobial isolate was used as an efficient biosorbent for Cd2⁺ and Co2⁺ removal from aqueous solutions. The maximum adsorption capacities for Cd2⁺ and Co2⁺ biosorption calculated from the Langmuir adsorption isotherm were 135.3 and 167.5 mg g⁻¹, respectively. The adsorption isotherm for both heavy metals fit well with the Langmuir isotherm rather than the Freundlich model with correlation coefficient (r²>0.98). This study indicates that the R. leguminosarum bv. viciae isolate STDF-Egypt19 can be useful as an inexpensive and efficient bioremediation technology to remove and recover heavy metal ions from an aqueous solution.

Keywords:

16S rRNA gene Adsorption isotherm Biosorption Cadmium Cobalt Heavy metal ions Rhizobium

Published In:

International biodegradation and Biodeterioration 67, 48-55.