Assessing resistance and bioremediation ability of Enterobacter sp. Strain saw-1 on molybdenum in various heavy metals and pesticides

ABSTRACT

One of the most economical approaches for removal of toxic compounds is bioremediation. In the long term, bioremediation is economic and feasible compared to other methods, such as physical or chemical methods. A bacterium that can efficiently reduce molybdenum blue was isolated from polluted soil. Biochemical analysis revealed the identity of the bacterium as Enterobacter sp. strain Saw-1. The growth parameters for optimal reduction of molybdenum to Mo-blue or molybdenum blue, a less toxic product, were determined around pH 6.0 to 6.5 and in the range of 30 to 37 °C, respectively. Glucose was selected as preferred carbon source, followed by sucrose, maltose, l-rhamnose, cellobiose, melibiose, raffinose, d-mannose, lactose, glycerol, dadonitol, d-mannitol, l-arabinose and mucate. Phosphate and molybdate were critically required at 5.0 mM and 10 mM, respectively. The scanning absorption spectrum acquired to detect the development of complex Mo-blue showed similarity to previously isolated Mo-reducing bacteria. In addition, the spectrum closely resembled the molybdenum blue from the phosphate determination method. Heavy metals, including mercury, copper (II) and silver (I), inhibited reduction. Moreover, the bacterium also showed capability of exploiting the pesticide coumaphos as an alternative carbon source for growth. As the bacterium proved its ability to detoxify organic and inorganic xenobiotics, the usefulness of this microorganism for bioremediation is highlighted.