Isolation and characterization of a molybdenum-reducing and glyphosate-degrading klebsiella oxytoca strain saw-5 in soils from sarawak

Abstract

Bioremediation of pollutants including heavy metals and xenobiotics is an economic and environmentally friendly process. A novel molyb-denum-reducing bacterium with the ability to utilize the pesticide glyphosate as a carbon source is reported. The characterization works were carried out utilizing bacterial resting cells in a microplate format. The bacterium reduces molybdate to Mo-blue optimally between pH 6.3 and 6.8 and at 34oC. Glucose was the best elec-tron donor for supporting molybdate reduction followed by lactose, maltose, melibiose, raffinose, d-mannitol, d-xylose, l-rhamnose, l-arabinose, dulcitol, myo-inositol and glycerol in descending order. Other requirements include a phosphate concentration at 5.0 mM and a molybdate concentration between 20 and 30 mM. The molybdenum blue exhibited an absorption spec-trum resembling a reduced phospho-molybdate. Molybdenum reduction was inhibited by mercury, silver, cadmium and copper at 2 ppm by 45.5, 26.0, 18.5 and 16.3%, respectively. Biochemical analysis identified the bacterium as Klebsiella oxytoca strain Saw-5. To conclude, the capacity of this bacterium to reduce molybdenum into a less toxic form and to grow on glyphosate is novel and makes the bacterium an important instrument for bioremediation of these pollutants.