Isolation and characterization of a metal-reducing Pseudomonas sp. strain 135 with amide-degrading capability

ABSTRACT

The presence of both heavy metals and organic xenobiotic pollutants in a contaminated site justifies the application of either a multitude of microbial degraders or microorganisms having the capacity to detoxify a number of pollutants at the same time. Molybdenum is an essential heavy metal that is toxic to ruminants at a high level. Ruminants such as cow and goats experience severe hypocuprosis leading to scouring and death at a concentration as low as several parts per million. In this study, a molybdenum-reducing bacterium with amide-degrading capacity has been isolated from contaminated soils. The bacterium, using glucose as the best electron donor reduces molybdenum in the form of sodium molybdate to molybdenum blue. The maximal pH reduction occurs between 6.0 and 6.3, and the bacterium showed an excellent reduction in temperatures between 25 and 40 oC. The reduction was maximal at molybdate concentrations of between 15 and 25 mM. Molybdenum reduction incidentally was inhibited by several toxic heavy metals. Other carbon sources including toxic xenobiotics such as amides were screened for their ability to support molybdate reduction. Of all the amides, only acrylamide can support molybdenum reduction. The other amides; such as acetamide and propionamide can support growth. Analysis using phylogenetic analysis resulted in a tentative identification of the bacterium as Pseudomonas sp. strain 135. This bacterium is essential in remediating sites contaminated with molybdenum, especially in agricultural soil co-contaminated with acrylamide, a known soil stabilizer.

Keyword: Pseudomonas sp.; Molybdenum reduction; Acrylamide biodegradation; Bioremediation; Molybdenum blue