

Mathematical modelling of molybdenum reduction to Mo-blue by a cyanide-degrading bacterium

ABSTRACT

Molybdenum, an emerging pollutant, has being demonstrated recently to be toxic to spermatogenesis in several animal model systems. Metal mines especially gold mine often use cyanide and hence isolation of metal-reducing and cyanide-degrading bacteria can be useful for the bioremediation of these pollutants. Preliminary screening shows that three cyanide-degrading bacteria were able to reduce molybdenum to molybdenum blue (Mo-blue) when grown on a molybdate low phosphate minimal salts media. Phylogenetic analyses of the 16S rRNA gene of the best reducer indicates that it belongs to the *Serratia* genus. A variety of mathematical models such as logistic, Gompertz, Richards, Schnute, Baranyi-Roberts, von Bertalanffy, Buchanan three-phase and Huang were used to model molybdenum reduction, and the best model based on statistical analysis was modified Gompertz with lowest values for RMSE and AICc, highest adjusted R² values, with Bias Factor and Accuracy Factor nearest to unity (1.0). The reduction constants obtained from the model will be used to carry out secondary modelling to study the effect of various parameters such as substrate, pH and temperature to molybdenum reduction.

Keyword: Molybdenum-reducing bacterium; Cyanide-degrading; Mo-blue; *Serratia* sp.; Modified Gompertz