Faculty of Science
Microbiology Department

Hexavalent Chromate Reduction by Locally Isolated Bacteria

A Thesis

Submitted in partial fulfillment of the requirement for
M. Sc. Degree in Microbiology

Presented by

Alaa Fayez Abd Alraouf Elsayed

B. Sc. in Microbiology (2011) Faculty of Science,
Ain Shams University

Supervisors

Prof. Dr. Einas Hamed El Shatoury

Professor of Microbiology, Microbiology Department,
Faculty of Science, Ain Shams University

Prof. Dr. Sahar Tolba Mohamed

Professor of Microbiology, Microbiology Department,
Faculty of Science, Ain Shams University

Department of Microbiology
Faculty of Science
Ain Shams University
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Approval Sheet

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  Professor of Microbiology, Microbiology Department, Faculty of Science, Ain Shams University

- **Prof. Dr. Sahar Tolba Mohamed**
  Professor of Microbiology, Microbiology Department, Faculty of Science, Ain Shams University

Examining committee:

- **Prof. Dr. Ayman Farrag Ahmed Dardeer**
  Prof. of Microbiology, Botany Department, Al-Azhar University
- **Prof. Dr. Essam Mohamed Abd El-Aziz Hoballah**
  Prof. of Environmental Microbiology at the national research center
- **Prof. Dr. Einas Hamed El Shatoury**
  Professor of Microbiology, Microbiology Department, Faculty of Science, Ain Shams University
- **Prof. Dr. Sahar Tolba Mohamed**
  Professor of Microbiology, Microbiology Department, Faculty of Science, Ain Shams University

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University council approved: / /

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I dedicate this thesis to the memory of my beloved **mother**. She always encouraged me to be the best.

Alaa Fayez Abd Alraouf Elsayed

بِسۡمِ ٱللَّهِ ٱلرَّحۡمَٰنِ ٱلرَّحِيمِ

وَاتَّقُوا اللَّهَ وَيُعَلِّمُكُمُ اللَّهُ وَاللَّهُ بِكُلِّ شَيْءٍ عَلِيمٌ

صدق الله العظيم

سورة البقرة الآية رقم (٢٨٢)

This thesis has not been previously submitted for any degree at this or any other university.

Signed

Alaa Fayez Abd Alraouf Elsayed

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Aim of work

The aim of this study was to isolate, identify bacteria that can biologically reduce hexavalent chromium and enhance their ability to reduce hexavalent chromium then examine their ability to reduce hexavalent chromium as a consortium in a microcosm under optimized conditions.

ABSTRACT

Hexavalent chromium is a toxic heavy metal used in different industries and causes environmental pollution. In this study, three bacterial isolates capable of growing at high concentration of chromium (up to 700 mg/L for some isolates) were isolated from sludge contaminated with Cr(VI). The bacterial isolates were identified by 16S rRNA gene sequence analysis as *Bacillus* sp., *Streptomyces rochei* and *Pseudomonas chlororaphis*. Optimization of different factors for Cr(VI) reduction was carried out. Results showed that the optimum pH, temperature and agitation were 7, 30 ˚C 200 rpm respectively for all isolates, while the percent of Cr(VI) reduction increased with the increase of incubation time and inoculum size and decreased with the increase of Cr(VI) concentration. Bacterial cell wall rupturing by sonication experiment indicated that 14.1 % and 22.3 % of Cr(VI) were accumulated intracellularly and 61.3 % and 21.7 % of Cr(VI) were reduced to Cr(III) for bacteria and actinobacteria respectively. The isolates were mixed and tested as a consortium in Cr(VI) contaminated soil microcosm under optimum conditions and proved a promising reduction with 100 % reduction of 200 mg/Kg and 400 mg/Kg after 4 and 7 days of incubation respectively. Scanning electron microscopy