Chapter 11

Remediation of Uranium Contaminated Soils: Conventional and Emerging Technologies

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Introduction

Uranium (U) is present in most continental earth's crust soils as a natural trace element. Mining and milling of U ores are the most important sources of U contamination of the environment. They generate large quantities of waste materials stored up as heaps of mining rock debris or dumps of mill wastes after U processing. Like other heavy metals U is chemically toxic, and it can also pose radiological hazards. Uranium contaminated soils and water pose a major environmental and human health hazards. Therefore, it is necessary that together with permanent monitoring of environmental contamination, selection of cost effective remediation technology appropriate for large areas such as contaminated water and soil. Conventional remediation techniques: excavation, treatment (soil washing, chelating), conditioning and disposal as low-level radioactive waste are necessary for heavy contaminated sites. Though this problem is taken up by physical and chemical remediation techniques to solve, these days Phytoremediation technology proved to be promising, eco-friendly and economically viable option. This cost-effective plant based approach to Uranium remediation takes advantage of the remarkable ability of plants to concentrate uranium and other radio nuclides from the environment and to metabolize these into their tissues. The search for the accumulator plants, development of omics platform and knowledge of the physiological and molecular mechanisms of Phytoremediation began to emerge in hand with biological and engineering strategies designed to optimize the feasibility of using plants to remediate uranium contaminated soils. Advancements in the field of genetic engineering to develop transgenic plants and recognition of role of microbial association with the plants to enhance remediation has opened new avenues in Phytoremediation.

Contamination of soil, water, and sediments by radionuclides and other toxic metals has become a worldwide problem, affecting crop yields, soil biomass, fertility, and contributing to bioaccumulation in the food chain causing serious health hazards. Increased application of nuclear energy and the use of radionuclides for industrial, medical and research purposes have caused significant contamination of certain sites and their surrounding environment. Till today, no efficient remediation methodology was developed that could be feasible and affordable over a vast areas and decontamination of considerable amounts of radioactive wastes, except for the close environment facility, where decontamination activities may be