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Potential of Phytoremediation, an Emerging Green Technology

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Abstract

Environmental pollution affects the quality of pedosphere, hydrosphere, atmosphere, lithosphere and biosphere. Great efforts have been made in the last two decades to reduce pollution sources and remedy the polluted soil and water sources. Phytoremediation, being more cost effective and fewer side effects then physical and chemical approaches, has gained increasing popularity in both academic and practical circles. More than 400 plant species have been identified to have potential for soil and water remediation. Among them *Thalospi, Brassica, Sedum alfredii H* and *Arabidopsis* sp have been mostly studied. It is also expected that recent advances in biotechnology will play a promising role in the development of new hyper accumulators by transferring metal hyper accumulating genes from low biomass wild species to the higher biomass producing cultivated species in the times to come. This paper attempted to provide a brief review on recent progress in research and practical applications of phytoremediation for soil and water resources.

Key Words: Phytoremediation, Hyper accumulators, *Arabidopsis, Brassica*

Introduction

The cost effective process of phytoremediation is used to clean up toxic substances in the environment.Phytoextraction, phytovolatilization, rhizofiltrtion, detoxification and sequestration are the ways in which plants can clean up. For many plant to remediate, plant species, metal availability to roots, metal uptake by roots, metal translocation to shoots and tolerance to toxic metal are important.

In phytoextraction pollutants such as heavy metals, trace elements and other toxic substances are accumulated by plant from soil, sediments or water bodies. During this process plants may need some mechanism to convert the toxic substances into less toxic substances.Phytoextraction process will be effective when the respective plant can transfer the substance from root to shoot. The metal enriched above ground mass is harvested and a fraction of soil metal contamination is removed.

In case of phytovolatilization, plant uptake the contamination from water after processing is released to the environment in vapor form. Selenium (Se) and Mercury (Hg) are among the most studied.

Many plant species have been identified which can uptake contaminants. As the phytoremediation process is the cost effective process, researchers are looking for more plant species. The plant must possess some qualities such as high capacities for absorption, the translocation of root/shoot, and finally the mechanism by which plant can convert the contaminant to less toxic.

Plant species can be divided into two categories-high tolerant and high accumulators. The combination of both of these is called hyperaccumulator.As the phytoremediation process is long time process, modern day research is focused mostly on hyperaccumulators.There are about 400 plants which can hyperaccumulate have been reported. Among these, most important families are Brassicaceae,Thalspi,Cyperaceae,Alyssum,Arabidopsis etc.These plants can uptake various metals,e.g.-Ni,Cd,Zn,Pb,etc.

Association of metal tolerant microorganism such as, bacteria or fungi to enhance the tolerance is a recent topic of research also.