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Stabilization of Soil by Phytoremediation Technique

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ABSTRACT

Phytoremediation is the name given to a set of technologies that use different plants as a containment, destruction, or an extraction technique. Phytoremediation as a remediation technology that has been receiving attention lately as the results from field trials indicate a cost savings compared to conventional treatments. The use of plants and associated microorganisms to remove, contain, inactivate, or degrade harmful environmental contaminants (generally termed phytoremediation) and to revitalize contaminated sites is gaining more and more attention. In this review, prerequisites for a successful remediation will be discussed. The performance of phytoremediation as an environmental remediation technology indeed depends on several factors including the extent of soil contamination. Phytoremediation is an emerging and eco-friendly green engineering technology that utilizes the natural properties of plants to remediate contaminated soils, water and sediments. Soil contamination by various inorganic and organic compounds has been a worldwide concern, and phytoremediation has been received increasing attention for remediation of these contaminants. However, the practical application of phytoremediation has been limited because of its low remediation efficiency. This paper addresses phytoremediation on its characteristics, research status, with emphasis on description of its practical application in management and remediation of soil contaminated sites

Keywords: Phytoremediation, Heavy Metals In Contaminated Soi, Rizosphere, Plant Species.

I. INTRODUCTION

Soil is the fundamental foundation of our agricultural resources, food security, global economy and environmental quality. With the development of urbanization and industrialization, soils have become increasingly polluted by heavy metals and organic pollutants, which threaten ecosystems, surface and ground waters, food safety and human health. Hence, there is a great need to develop effective technologies for sustainable management and remediation of the contaminated soils. There are conventionally physicochemical soil bremediation engineering techniques such as soil washing, incineration, solidification, vapor extraction, thermal desorption, and disposal as waste, anyway, these methods usually cause secondary air or groundwater pollution, and/or destroy the plant productive properties of soils. Moreover, they are usually extremely high in cost, limiting their extensive application particularly in developing countries and for remediation of agricultural soils.

Phytoremediation has been increasingly received attentions over the recent decades, as an emerging and eco-friendly approach that utilizes the natural properties of plants to remediate contaminated soils. By growing plants in the contaminated sites, contaminants in soils will be removed, immobilized, or degraded, and the cost is much less .expensive than other traditional methods This paper describes phytoremediation on its characteristics, research status, as well as its practical application on management and remediation of contaminated soils with study cases.

PHYTOREMEDIATION : FUNDAMENTAL PROCESSES

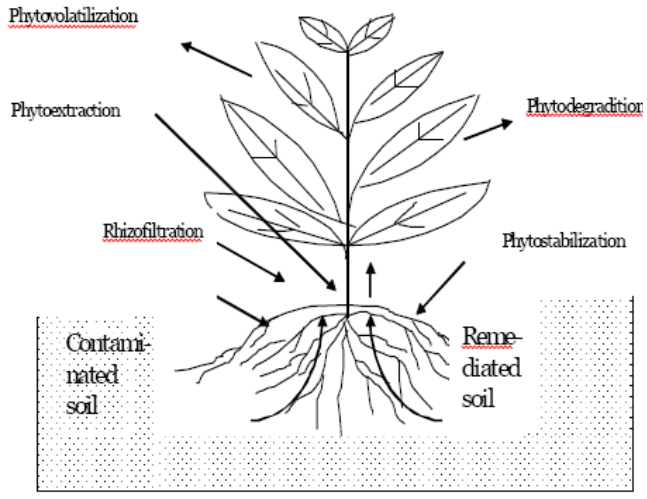


Fig. 1. Phytoremediation processes of contaminated soils

Phytoextraction Plants absorb contaminants and store in above-ground shoots and the harvestable parts of roots. Phytostabilization Roots and their exudates immobilize contaminants through adsorption, accumulation, precipitation within the root zone, and thus prevent the spreading of contaminants. Phytodegradation Plant enzymatic breakdown of organic contaminants, both internally and through secreted enzymes.

Rhizodegradation (phytostimulation) Plant roots stimulate soil microbial communities in plant root zones to break down contaminants. Phytovolatilization Contaminants taken up by the roots through the plants to the leaves and are volatized through stomata where gas exchange occurs.

OBJECTIVES : the objective of this study is to calculate the reduction of heavy metals in a soil using Phytoremediation technique.

II. MATERIALS AND METHODS

1. Selection of suitable site:

We selected a site of a steel plant outlet which is situated near a village. The villagers told us that the grown of the agricultural crops is slow. So we decided to find out is this happening because of the contamination of soil due the heavy metals or not.

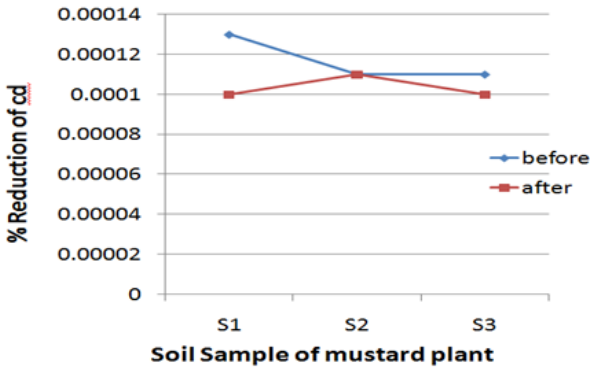
2. Collection of soil sample :
   We took our first soil sample near the end of the outlet. The second one was 3 m from the near end of our first sample. The third one was 6 m from the near end.
3. Testing and study of soil sample:
   Before the plantation we took some test in which we found out that the soil sample is not fully contaminated but it has higher percentage of lead (pb) and cadmium(cd). The percentage of lead was around 35 mg/kg, and cadmium was 0.014. The soil was not actually fully contaminated but the presence of cadmium was not good. Cadmium is harmful for human body plants do not get affected by it.
4. Observation and study of plants :
   Plants of brassica family are usually used for Phytoremediation technique. Mustard was a common plant for Phytoremediation technique. Another plant we used was amaranthus plant. We planted them in ecofriendly environment in 6 earthen pots for each sample for each species.

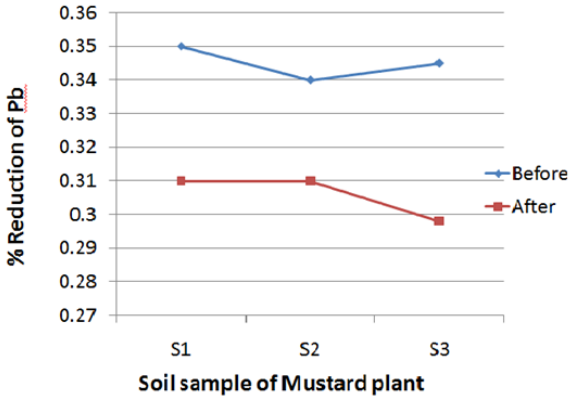
III. RESULTS AND DISCUSSION

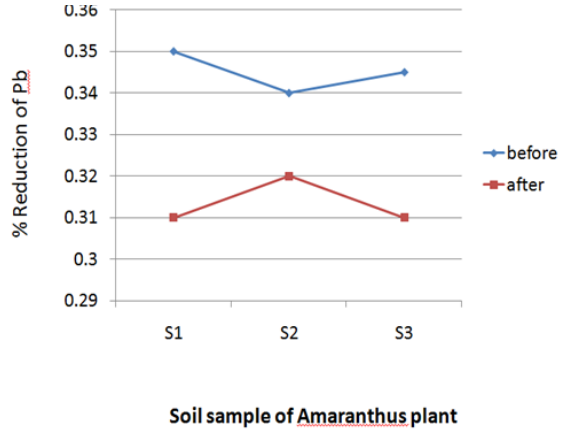
Observation table

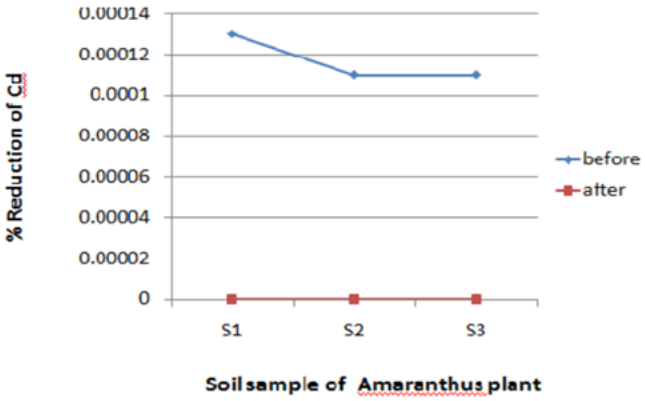
SAMPLE	BEFORE		SAMPLE	PLANTS	AFTER	
	pb	Cd			pb	cd
	35		Sa 1	Mustured	31.5	0.01
			Sa 2	Amaranthus	31	-----
	34		Sa 3	Mustured	31	0.011
			Sa 4	Amaranthus	32	------
	34.5		Sa 5	Mustured	29.85	0.001
			Sa 6	Amaranthus	31	------

As per observation table we can see that there is considerable reduction in both the metals .these reduction can be explained with the help of following graph.









IV. CONCLUSION

From the above experiment we can see that Phytoremediation of contaminated soil is practically possible.

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