Heavy Metal Removal Efficiency of Vetiver Grass from Contaminated Soil

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***Abstract*— Rapid population increase, along with rapid industrialization and agricultural practices, causes major environmental problems, such as the development and release of massive amounts of toxic waste into the soil environment. The two forms of soil contaminants are inorganic and organic pollutants. Inorganic pollutants, such as lead, arsenic, cadmium, copper, zinc, nickel, and mercury, are regularly introduced to the environment by the discharge of urban sewage sludge and industrial wastes onto agricultural soils. Concerns about the dangers of soil contamination to human health and the environment have driven substantial research into creative, cost-effective remediation techniques in recent years. Installing and operating chemical, physical, and microbiological procedures for treating contaminated soils, for example, is costly.**

This project uses vetiver grass for the removal of heavy metals in soil. It has the ability to adapt and develop in a variety of habitats, as well as fast recovery from poor environmental conditions. It also has the ability to absorb a considerable amount of nitrogen, phosphorus, and dissolved heavy metals from the environment. Heavy metals are hazardous to soil biota because they interfere with critical microbial processes and reduce the number and activity of soil microorganisms. We chose biological approaches for eliminating these pollutants from soil in our experiment.

Heavy metal extraction from contaminated soils were the subjects of pot culture investigations. For the experiment, soil samples were collected from locations where heavy metal concentrations could be high. The tests last approximately three months.

Index Terms*—*Vetiver,heavy metal, Phytoremediation,

I.INTRODUCTION

A. *Need of the study*

Soil is an important component of the environment, as it plays a role in a variety of ecosystem services. However, inadequate land management practices have resulted in a fall in actual and/or potential soil productivity, posing a serious challenge to sustainable agriculture and environmental quality, putting many countries' food security at risk. Poor land management practices often result in soil erosion and agrochemical pollution as a result of agricultural activities, urban trash, and industrial operations, reducing the soil's ability for long-term food production and impacting plants, animals, and human lives.

Heavy metals and metalloids can accumulate in soils due to emissions from rapidly expanding industrial areas, mine tailings, disposal of high metal wastes, leaded gasoline and paints, fertilizer land application, animal manures, sewage sludge, pesticides, wastewater irrigation etc.. Heavy metals are an ill-defined set of inorganic chemical dangers, with lead (Pb), chromium (Cr), arsenic (As), zinc (Zn), cadmium (Cd), copper (Cu), mercury (Hg), and nickel being the most typically found in contaminated locations (Ni).Unlike organic pollutants, which are converted to carbon dioxide by microbial action, most metals do not undergo microbial or chemical degradation, and their total content in soils endures for a long period after their introduction. However, changes in their chemical forms (speciation) and bioavailability may occurToxic metals in soil can prevent organic pollutants from degrading properly. Heavy metal contamination of soil poses risks and hazards to humans and the ecosystem through direct ingestion or contact with contaminated soil, the food chain (soil-plant-human or soil-plant-animal-human), drinking contaminated groundwater, reduction in food quality (safety and marketability) via phytotoxicity, reduction in land usability for agricultural production causing food insecurity, and land tenure issues. Vetiver grass is a tufted bunch grass that thrives in both tropical and temperate climates. Heavy metals don't bother vetiver grass. It could be used to fight pests biologically. When compared to other soil conservation technologies, the usage of vetiver grass has been viewed as a low-cost solution for soil and water conservation, stability and repair of polluted soils, and enhancement of water quality for irrigation applications.

II.METHODOLOGY

Firstly, we chose the subject that we needed for our research. We looked through numerous journals and devised a plan for what we needed to do. We then decided to apply a 2 stage procedure for checking the tolerance level of the plant against heavy metals in soil.Heavy metal-contaminated soils were collected from four different places in Kannur district. Soil samples weighing 5 kg were sampled from an E-waste disposal site in Anjarakandy, Kripesh textiles, a grain factory in Pappinisseri panchayath, Malabar dyeing industry and finishing mills ltd, a textile mill on Kakkad road, and an automobile workshop in Valapattanam.

fig.1 Vetiver planted in pots with soil sample.

The soil samples were taken and then placed in pots and a part of each sample was sent to a soil testing laboratory. The initial soil analysis, the one before planting the vetiver was done.The vetiver plants were planted then and were grown for about 90days. After 90 days the soil samples were again sent for analysis.

Test results at initial stage

Sample No	Zn(ppm)	Fe(ppm)	Cu(ppm)	Mn(ppm)
1	19.08	92.7	4.27	32.1
2	1.07	3.2	0.56	1.2
3	33.6	129	23.8	50.3
4	24.6	147	10.4	61.2

Sample 1 = e-waste anjarakandy
Sample 2 = Kripesh textile factory
Sample 3 = Malabar dying industry
Sample 4 = valapattanm car scrap

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