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A Technique for Increasing the Conversion of Cadmium-Containing Plant Biomass into Electricity While Controlling Soil Contamination

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Introduction

As a result of the rapid development of society as a whole over the past few decades, industrial pollution is growing in severity. Due to their low utilization, agricultural fertilizers and pesticides are primarily lost to the soil and water environment. Heavy metal pollution in the soil is typically dominated by one metal element and accompanied by the presence of other elements. This is called compound pollution because multiple heavy metals coexist. The question of how to effectively control soil pollution and safeguard the ecological environment has grown to be a pressing concern that many nations seek solutions to. However, even after remediation, the current methods for remediating soil will still leave behind some pollution. Through the transfer of contaminants and groundwater, the presence of contaminants in these soils destroys human habitats on multiple levels. The cultivation of soil fertility, the prevention of soil pollution, and the achievement of sustainable soil utilization all benefit from a thorough understanding of the environment surrounding the soil.

Description

Some biologists have studied various plants that contain Cadmium because of the severity of the soil contamination. Akoumianaki-Ioannidou A tested the effects of Cd on valerian grown in a greenhouse. Parveen A examined the potential for membrane stability, osmo protectants, vitamin levels, and antioxidant levels by supplementing the medium with thiourea (TU) in Cd-contaminated soil. Nogueirol R. C. examined how the ratio of $NO3^-$ to $NH4^+$ affected Cd bioaccumulation and tolerance in tomato plants that had been grown in the presence of Cd. Using plant-promoting rhizo bacteria and natural zeolite to remediate cadmium-contaminated soil, Shabayev VP investigated the effects of two strains of Pseudomonas and natural zeolite on the growth and elemental composition of barley plants. Kastori R looked into how Cd affected the germination, growth, and composition of plants grown in the field with contaminated grains.

On the basis of these studies, some researchers have conducted research on methods for converting biomass into energy. Waigi M. G. was one of them. He researched how microorganisms helped Sphingomonas with phytoremediation and how they evolved to deal with soil pollution. In order to estimate the potential for surface soil pollution, Kim K E looked into a brand-new mass balance model. Papaioannou D looked into the role that heavy metals play in the relationships between plants and metals by studying how they moved when wastewater that had been contaminated by soil was reused. Vakal S investigated encapsulated mineral fertilizers and applied them to issues with soil pollution to reduce it. Shuai W is of the opinion that laser ablation-induced plasma mass spectrometry under cadmium stress conditions, in addition to cadmium infinity chromatography, is used to separate and identify cadmium-binding proteins in various rice regions. However, no better method has been discovered.

This paper focuses primarily on comparing the effects of various approaches to enhancing the conversion of Cd-containing plants to biomass energy and the effects of various Cd concentrations on the growth of sunflower and rape. The study of two types of plants, as well as the biomass energy conversion method of Cd-containing plants, and the effects of charcoal, Bacillus subtilis, and earthworms on the germination rate and growth of Cadmium-containing plants at various Cd concentrations are the novel aspects of this paper. The loose surface layer about two meters above the surface is referred to as soil. It is able to grow plants, has certain fertility, and gives plants basic elements like heat, water, air, and fertilizers. Numerous pollutants are produced by both human and industrial production. With rainwater, these pollutants enter the soil, enrich the soil to a certain extent, and the soil quality continues to deteriorate, leading to crops with an excessive amount of elements. Soil pollution refers to this occurrence. We refer to it as soil pollutants as long as it affects human health, reduces soil fertility, affects crop production and quality, and enters the human body through the food chain [1-5].

Most pollutants can remain in the soil environment for a long time and are difficult to remove, particularly the residual heavy metal compounds, but some pollutants can be weakened by the inherent biochemical action of the soil or by volatilization after it has been polluted. Furthermore, after being absorbed by cultivated plants, the harmful effects enter the food chain and pose a health risk to humans. As a result, soil pollution has a longer-lasting effect on pollution reduction than general air and water pollution, both of which are easily ignored and cause more harm. The process of soil material cycling relies heavily on soil microorganisms. So, when the soil is polluted, the microbial function suffers greatly, affecting how the soil ecosystem works. Additionally, it will harm plants. At the same time, harmful substances may accumulate in various plant body tissues, lowering plant quality. Through the food chain, soil pollution can also pose a threat to human health.

Conclusion

Reducing the concentration of heavy metals in the soil to a standard level or altering their form so that they cannot harm humans or the environment are both terms used to describe remediation of heavy metal-contaminated soil. Heavy metals in the soil are mostly reduced by absorbing, transferring, transforming, and degrading them.

Methods for removing heavy metals from soil: To begin, the removal of some heavy metals from the soil involves utilizing desorption and concentration techniques. This technology is a long-term solution that lets recovered soil be recycled and makes it easier to use land in the future. The second method is immobilization, in which heavy metals are fixed in specific soil locations to prevent their ionic transformation and spread throughout the soil. However, this

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method is not a long-term fix. Soil reuse for sites remains limited and frequently necessitates ongoing monitoring.

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Conflict of Interest

None.

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