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PHTOREMEDIATION OF E-WASTE BY USING NICOTIANA TABACUM

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ABSTRACT
The Heavy metals are one of the most important sorts of contaminant in the environment. Several methods already used to clean up the environment for these kinds of contaminants, but most of them are costly and difficult to get optimum results. Currently, phytoremediation is one of the very effective and affordable technological solution used to extract or remove inactive metals and metal pollutants from contaminated soil. This technology is environmental friendly and potentially cost effective. This project aims to compile some information about heavy metals of lead, Copper, Cadmium sources, effects and their treatment. The plants like Nicotiana tabacum were used in this phytoremediation and their capability to reduce the contaminant is also reported.
Keywords – Environment, phtoremediation, heavy metals, Niotiana tabacum & Pollution.

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I. INTRODUCTION

The worldwide rapid industrial and commercial growth has leading to the increase of municipal solid-waste production. Mainly this large amount of solid waste is disposed in landfill sites due to the economic advantages. However, a sanitary landfill produces wastewater which threatens surface and ground waters. Environmental contamination is one of the most important factors responsible for degradation of the surface environment on earth. Heavy metals play a dominant role in this destruction. Heavy metals released into the environment contribute to a variety of toxic effects on living organisms as they pass through the food chain. Heavy metals and metalloids are most important to create an environmental pollutants, particularly in the areas under highly anthropogenic pressure. Many of these elements are highly toxic in both elemental and soluble salt forms. The presence of heavy metal pollutants in water bodies poses risk to the health of humans and ecosystems. In particular, the bio accumulation of heavy metals in the food chain can be highly dangerous to human health. The most common route of human exposure to heavy metals is through ingestion of food and water sources. However, the large quantity of existing waste soil and water requires semi-permanent disposal and control measures, especially when considering drainage from abandoned mines. Phytoremediation is a technology that involves the use of plants to remove pollutants from the environments.

II. PHTOREMEDIATION

The Phytoremediation is a form of bioremediation and applies to all chemical or physical processes that involve plants for degrading or immobilizing contaminants in soil and groundwater. The word comes from the Greek word phyto, meaning plant, and the Latin word re medium, meaning restoring balance. When put together, the two words refer to technologies that use living plants to clean up soil, air, and water contaminated with hazardous chemicals. Phytoremediation is a cost-effective, plant-based approach to remediation that takes advantage of the ability of plants to concentrate elements and compounds from the environment and metabolize various molecules in their tissues. It refers to the natural ability of certain plants called hyperaccumulators to bioaccumulate, degrade, or render harmless contaminants in soil, water, or air. Toxic heavy metals and organic pollutants are the major targets for phytoremediation. In addition, several field trials confirmed the feasibility of using plants for environmental clean-up. While the technology is not new, current trends suggest its popularity is growing.

III. PROPERTIES OF NICOTIANA TABACUM

The low cost, plant based phytoremediation technique has often been described as a promising technique to remediate agricultural land contaminated with e-waste. The plants used, have to meet certain requirements, which are fulfilled by tobacco. It is a fast growing plant with a high biomass, which is easily harvested. Its propagation is very simple, as each of the plant generate thousands of seeds. Tobacco has also revealed a high tolerance for various organic and inorganic pollutants. It can accumulate heavy metals in relatively high levels , especially Cadmium, Copper, lead. It's rapid growth, high leave biomass and its high disposition for transformation has made tobacco an optimal plant for the genetic engineering. It has not only been applied in the field of medicine and also in the area of phytoremediation. Metal chelator, metal transporter, metallothionin and phytochelatin genes have been transferred to plants for improved metal uptake and sequestration. In our project, we get the result by using the Nicotiana tabacum for phytoremediation of the heavy metals which present in the e-waste contaminated site.

Fig. 1. **Nicotiana Tabacum**

IV. PHYTOREMEDIATION PROCESS

To Phytoremediation is refers to the use of green plants and their microorganisms to reduce environmental problems without the need to excavate the contaminant material and dispose of it elsewhere.it is a natural process and effective remediation method.

In study, add 2ml, 5ml solution of pcb's solution in the culture medium. Must kept the medium in the sterilized cool place. Note down all the observation. After 5 days the treatment was done and the plants should be taken for analysis. Before analysis the plants should be burn and digested in a proper solution.

Fig. 2. Before Treatment

Fig. 3. After Treatment

V. DIGESTION OF PLANTS

The plants were dry in the hot plate at 90^{o}c The solution colour is changes red to white. After the digestion the solution kept in room temperature. Next, the solution is makeup by the distilled water after filtered by the whattman filter paper 41. Then, the samples were collected in the graduated centrifuge tube for AAS analysis.

Fig.4. Digestion of Plants.

VI. AAS TEST

Atomic Absorption Spectroscopy (AAS) determines the presence of metals in liquid samples. The AAS instrument looks for a particular metal by focusing a beam of ultra violet light at a specific wavelength through a flame and into a detector.

In analytical chemistry the technique is used for determining the concentration of a particular element in a sample to be analyzed. AAS can be used to determine over 70 different elements in solution, or directly in solid samples via electro thermal vaporization and it is used in pharmacology, biophysics, archeology and toxicology research.

The technique makes the use of the atomic absorption spectrum of a sample in order to assess the concentration of specific analysts within it. It requires standards with known analyte content to relation between the measured absorbance and the analyte concentration and relies therefore on the Beer-Lambert law.

Fig.5. AAS (Atomic Absorption Spectroscopy)

VII. RESULT AND DISCUSSION

SAMPLE	PCB ALONE	TOBACCO CONTROL	TOBACCO (1ml)	TOBACCO (5ml)
COPPER (ppm)	4705.43	25.4	101.21	317.47
CADMIUM (ppm)	0.64	1.9	2.16	1.177
LEAD (ppm)	13.61	4.759	5.955	19.466

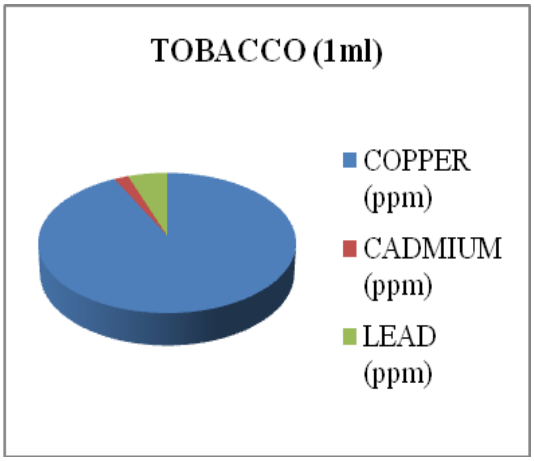

Fig.6. Tobacco for 1 ml

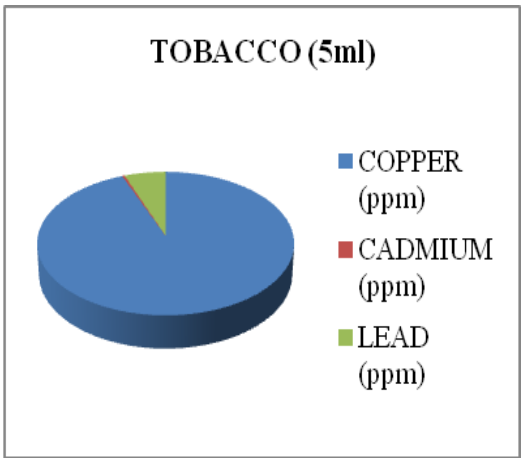

Fig.7. Tobacco for 5 ml

VIII. CONCLUSION

In this study it was found that the extract heavy metal from e-waste by using phytoremediation process. The most of the natural materials can be used as phytoremediation process. In conclusion, using Nicotiana tabacum is used to extract heavy metals from printed circuit board (e-waste). This method is used to reduce the soil contaminants and environmental pollutants. It has considerable advantages such as low cost, sustainable, locally available, simple, reliable, acceptable, eco-friendly. It decontaminates along with the metabolism processes of species without

disturbing the physical, chemical, and ecological characteristics of soil. Heavy metals uptake, by plants using phytoremediation technology, seems to be a prosperous way to remediate heavy-metals-contaminated environment. Moringa has removal of 96% copper, 74% lead, 46% cadmium from the PCB powder. So in our suggestion moringa is the good capability of extraction of toxic metals section must be included and should indicate clearly the advantages, limitations, and possible applications of the paper. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

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