PHYTOEXTRACTION OF METALS FROM E-WASTE INDUCED HYDROPONIC SYSTEM

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Introduction:

The rapid industrialization and urbanization have dramatically increased the generation of wastes and new types of pollutants. Industrial revolution followed by the advances in information technology during the last century has radically changed people' s lifestyle. The hazardous content of these materials pose an environmental and health threat. Widespread pollution by heavy metals generated from various industrial and agricultural activities has adverse effects on human health and ecosystems'-waste is growing exponentially in recent years because the markets in which these products are produced are also growing rapidly-waste problem is of global concern because of the nature of production and disposal of waste in a globalized world. Like hazardous waste, the problem of e-waste has become an immediate and long term concern as its unregulated accumulation and recycling can lead to major environmental problems endangering human health. E-waste can be toxic, it is not biodegradable and accumulates in the environment, soil, air, water and living things. For example, open-air burning and acid baths being used to recover valuable materials from electronic components release toxic materials releasing into the environment. Phytoremediation refers to the use of plants to remove, degrade, or stabilize contaminants in the

environment. As e-waste contains a range of toxic heavy metals (like lead, mercury, cadmium, and arsenic), hazardous chemicals (such as brominated flame retardants), and other pollutants, it presents a significant environmental and health risk. Phytoremediation offers an innovative, cost-effective, and environmentally friendly approach to mitigate these dangers. Phytoextraction is a type of phytoremediation that involves the use of plants to absorb contaminants, particularly heavy metals and toxic elements, from soil or water and store them in their tissues, primarily in their roots, stems, and leaves. The study is developed to use phyto-extraction of Cadmium, Chromium and Lead from the e-waste induced hydroponic system using selected plants that exhibit effective absorption of the mentioned metals.

Objectives:

➢To assess the characteristics of E-waste used for research.

➢To design the hydroponic system using Indian mustard and amaranth as phytoextraction agents.

➢To conduct experimental analysis of the removal of metals from water in hydroponic system induced with E-waste.

Methodology:

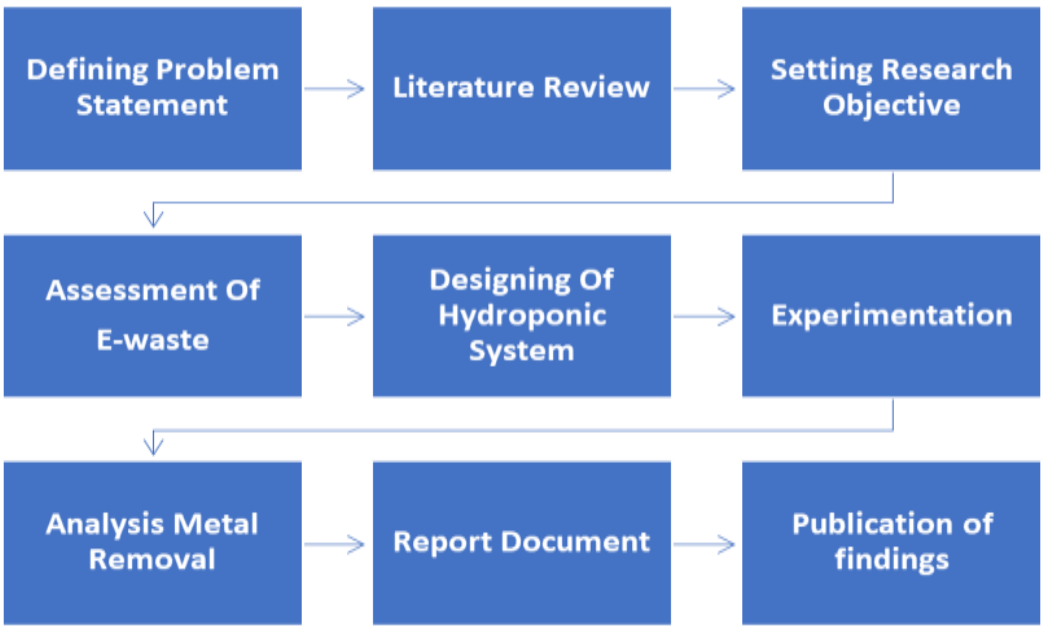
1. **Preparation of E-Waste Samples**:
    I. Collection of e-waste from certified recycling centers.
    II. Mechanical and chemical processing to isolate controlled quantities of heavy metals for hydroponic experimentation.
2. **Development of Hydroponic System**:
    I. Construction of an efficient, low-cost hydroponic system featuring nutrient reservoirs, glass tanks, and integrated pH and temperature sensors.
3. **Plant Selection and Growth Conditions**:
    I. Selection of hyperaccumulative plant species based on literature.
    II. Cultivation in a controlled environment to ensure healthy growth and efficient metal uptake.
4. **Measurement of Metal Uptake**:

I. Utilization of atomic absorption spectrometry (AAS) to quantify heavy metal absorption in plant tissues and water.

II. Determination of bioaccumulation and translocation efficiency for each species.

5. **Data Analysis Techniques**:

I. Baseline comparisons and statistical validations (e.g., ANOVA) to ensure reliability and reproducibility of results.



Future Scope:

The future scope of this project includes:

1. Creation of a Sustainable Remediation Technique
2. Identification of Effective Phytoextraction
3. Practical and Policy Recommendation
4. Dissemination of Knowledge