PHYTOREMEDIATION OF SOME HEAVY METALS POLLUTED SOIL USING SOME ORNAMENTAL PLANTS

by

EMAN MAHMOUD AHMED

B. Sc. Agric. (Horticulture), 2000

Cairo University

A Thesis Submitted in Partial Fulfillment of

The Requirement for the Master Degree in

Environmental Science

Department of Agricultural Science

Institute of Environmental Studies & Research

Ain Shams University

APPROVAL SHEET

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This Thesis for Master Degree in Environmental

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ACKNOWLEDGMENT

First I would like to thank my god for helping me to carry out ***this work.***

I would like to present my full thanks and gratitude to ***Prof. Dr. Hesham I. El-Kassas*** Professor, of Studies and Research, Institute of Environmental Ain Shams University for his supervision, valuable guidance, kindness and continuous support.

I am grateful to ***Prof. Dr. Gamal Abd El-Naser*** Deputy Director of Drainage Research Institute (DRI) for his true effort through the experimental work.

Thanks are due to ***Prof. Dr. Naglaa Said Abu Taleb*** for her advises and encouragement and help in writting.

I am deeply thankful for ***Dr. Mohamed Shaban Mohamed Abu-Salama*** (DRI) for his valuable remarks and support in the statistical analysis.

I am fully of prettied to my father for helping, supporting and encouraging me, also my husband.

Finally I will present this master for my mother, my father and my son ***Hamzah***.

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ABSTRACT

Phytoremediation is a promising technique that employs different types of plants to remove, degrade or immobilize pollutants from soil and water.

In this research, three ornamental plants **Geranium (*Pelargonium zonal var. Chalumin*), Bermuda Grass (*Cynodon dactylon*) and the Baby Sun Rose (*Aptenia cordifolia*)** were employed to test their potential in the removal of some heavy metals from polluted soils under the Egyptian conditions. The selection of the plant species was based on four main criteria; growth rate, retention period, root depth and cost required. A fixed experiment was carried out at **"Bortos Village"** during the successive seasons of 2004 and 2005. Three plots were excavated at 4.0 m length x 1.5 m width × 50 cm depth. Then, they were isolated with perforated plastic sheets in order to ensure the natural drainage for the irrigation water. The plots were then filled with soils imported (directly after the regular drain rehabilitation) from the bottom soil of **Al-Lebiny** drain. Every two months, three soil samples were collected from each plot and mixed together to obtain one sample that may represent the whole plot. The same procedure was also practiced with plant samples. Series of statistical tests were carried out including checking the normality status, the homogeneity of variances, analysis of variances and multiple comparisons (least significant differences). The results showed that there are gradual decreases for the

average metal concentrations measured in the soil samples. The overall decrease (after 19 months) varied from 61.3% to 99% with an average around 93.6% for the samples collected from soils that were cultivated with Bermuda grass, Geranium and the Baby Sun Rose (*Aptenia cordifolia)*.

In the meantime, there is gradual increase recorded for the metals concentrations measured in the plant samples cultivated in the polluted soils. The statistical evaluation proved that no differences were found between metal concentrations that were extracted by the Bermuda Grass plant. In the meantime, Geranium has a special behavior with some metals compared to the others.

At the same time, there is insignificant difference between the plants uptake of the Nickel (Ni), Iron (Fe), Copper (Cu), Manganese (Mn), Chromium (Cr), Cobalt (Co), Barium (Ba), Aluminum (Al), Zinc (Zn) and Lead (Pb).

Only, Geranium has higher ability to uptake the Cadmium (Cd) compared to the Baby Sun Rose (*Aptenia cordifolia)*.

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