TREATMENT OF SOME RADIOACTIVE ELEMENTS AND HEAVY METALS FROM THE LIQUID WASTE

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B.Sc.Agric. (Genetices), Ain Shams University, ٢٠٠٣

A Thesis Submitted in Partial Fulfillment
of
The Requirement for the Master Degree
in
Environmental Science

Department of Agricultural Sciences
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ABSTRACT

Many forms of heavy metals and radioactive elements are encountered in the natural environment. Most of them have the potential for both beneficial and harmful effects. Some of the primary toxic metals are chromuim, uranium and lead which may get in food through plant, during its absorption by plant roots and accumulates in edible portions. This study deals with the plants that have the ability of uptake chromuim, uranium and lead clean up the contaminated water from pollutants elements.

The biological treatment of the waste water is of wide usage for several reasons. Exploitation of Sunflower and Duckweed capability to absorb some of the polluting metals was the subject of this work. Investigation of many controlling factors exhibited that the solution pH, the metal initial concentration and the contact time are affecting the absorption process. Under the optimum factors of each target metal, rhizofiltration of the waste water with Sunflower and Duckweed plants .

The obtained data indicated that the highest uptake for Sunflower efficiencies of Cr, U and Pb were ٥٧,٧, ٨٣ and ٧٧٪ respectively. On the other hand, using the Duckweed exhibited that the removal efficiencies of Cr, U and Pb were ٥٢,٥% , ٥٧.٥ % and ٥٢% respectively. From the above results, it could be concluded that using Sunflower and Duckweed plants, as bio-technique, in removal or minimize of some hazardous metals from the contaminated waste water is considered an effective and low-cost mean by which the treated waste water can be safely discharged to the surrounding environment.

Key words: Rhizofiltration , Waste water, chromium, uranium, lead, sunflower, Duckweed

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١- INTRODUCTION

Contamination of the aqueous environment by heavy metals and radioactive elements due to the discharge of metal containing effluents into the water bodies is one of the most serious environmental issues of the century. The heavy metal pollution and radioactive elements represent a significant environmental problem arising from its toxic effects and accumulation throughout the food chain. The removal and recovery of pollutants from waste water is significant in the protection of the environment and human health **(Salt et al ., (١٩٩٨).**

The conventional methods used for metal removal include chemical precipitation, ion-exchange, membrane filtration and activated carbon adsorption, etc. Howeöver these treatment methods become less effective and more expensive when situations involving high volumes and low metal concentrations are encountered. The application of membrane processes and activated carbon are also restricted because they are cost intensive. Biosorption technology has gained important credibility during recent years because of its eco-friendly nature, excellent performance, and cost-effectiveness. Phytoextraction of heavy metals by growing crops and harvesting above-ground material is a promising technology to remediate lightly or moderately polymetallic contaminated soils.The complex interactions among the roots , microbs, metals and soil make phytoremediation a highly site – specific technology **(Schwartz et al ., (٢٠٠٣).**

Assisted phytoextraction ,involves high-yielding crop plants which can take up large amounts of metal, and is a response to those management practices that increase the bioavailability of elements by the application of chemical agents and that maximize the efficiency of metal uptake by the plants . But this can lead to the expected results only if the

crop management is able to counteract the pressure that the hostile soil exerts on the plants. In fact, the soils of polluted sites and in particular those contaminated by industrial slags and mining wastes dare often characterized by beyond the research that deals with metal uptake, transport and tolerance of heavy metals in plants, another area of great importance is the planning of the extensive field applications used in the agronomic management of crops**. Chronopoulos et al ., (١٩٩٧).**

The aim of this work is studying the treatment of liquid wastes to minimize and/or remove their heavy metals and radioactive element contents from waste laboratory liquids at Nuclear Materials Authority, Egypt resulted from Abu-Resheid lamprophyre dykes using some plants such as duckweed and sunflower that have absorption capability as a safe and economic method.

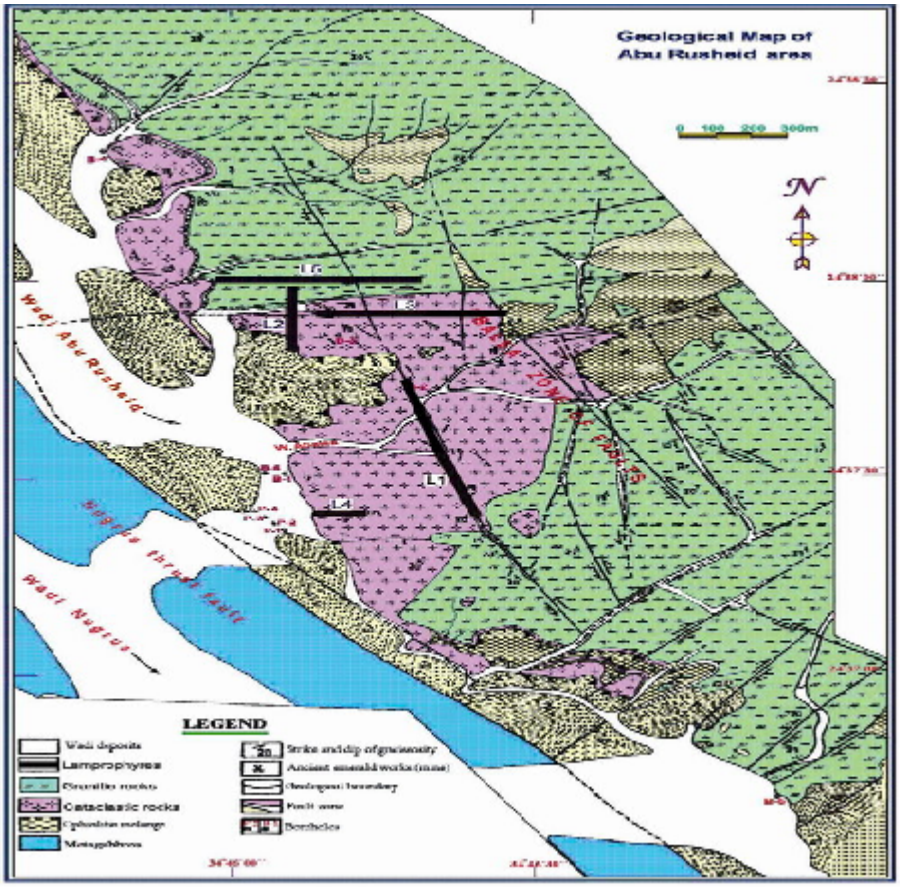

Fig: (١): Geologic map of Abu Rusheid area showing the location of lamprophyre dykes, Eastern Desert, Egypt.

II . REVIEW OF LITERATURE

As previously mentioned, the present work is mainly concerned with the extraction of uranium, chromium and lead from the waste lab liquor of Nuclear Materials Authority, Katamia, Cairo, Egypt using phytoremediation . Therefor, it was necessary to review some theoretical aspects concerning waste(definitions ,composition, environmental impact, costs, types and classification) . In addition to, uranium, chromium and lead characterization and their behaviour in the plants was involved. In this regard, special references are essential involve different methods used for interesting metals extraction from their natural resources. Finally,an overview of the phytoremediation.

١. Waste

١,١.Waste Definitions

Governments, organizations, and scholars need to define what waste is in order that it can be safely and legally managed. Different definitions need to be combined in order to ensure the safe and legal disposal of waste (**Torbay Council , (٢٠٠٦.)** .

Waste is directly linked to the human development, both technologically and socially. The composition of different wastes have varied over time and location, with industrial development and innovation being directly linked to waste materials.An example of this include plastics and nuclear technology. Some components of waste have economical value and can be recycled once correctly recovered.