Fayoum university **Faculty of Agriculture**

BIOREMEDIATION OF WASTEWATER

By

REHAM ELWY MOHAMED MOHAMED

B.Sc. Agricultural Sciences (Soils and water) Faculty of Agriculture,
Fayoum University, Egypt, 2019.

THESIS

Submitted in Partial Fulfilment of the Requirements for the Degree
of Master Agricultural Sciences (Agricultural Engineering)
Degree of Master

IN

AGRICULTURAL SCIENCES (AGRICULTURAL ENGINEERING)

Department of Agricultural Engineering
Faculty of Agriculture
Fayoum University

2024

Fayoum university **Faculty of Agriculture**

Name of Candidate: Reham Elwy Mohamed Mohamed **Degree: Master**
Title of Thesis: Bioremediation of wastewater
Supervisors: 1- **Dr. Mahmoud Mohamed Ali Abd-Elazem**
2- **Prof. Dr. Ehab Abd El-Moniem Magdy**
3- Dr. Eid Salah Abobakr Gaballah
Department: **Agriculture Engineering** **Specialization**: **Bioengineering**
Approval Date: 11/ 9 / 2024

ABSTRACT

Wastewater containing heavy metals is a major environmental problem that needs to be treated**.** The present study was designed to evaluate the efficiency of two aquatic plant species such as coontail (*Ceratopyllum demersum*) and duckweed (*Lemna minor*) as phytoremediators in the elimination of heavy metals (HMs) in the wastewater. These two aquatic plants were used to remediate wastewater containing three heavy metals (cadmium, nickel, and lead) with three concentrations each. The tested concentrations for cadmium were 0.00, 0.50, and 1.00 mg L^{-1}, for nickel were 0.00, 1.00 and 2.00 mg L^{-1}, and for lead were 0.00, 10.00 and 20.00 mg L^{-1} in addition to a mixture containing the highest and lowest concentrations. The duration of the experiment was 21 days under laboratory conditions. The results indicated that the highest removal efficiency of cadmium was 71% by *L.minor* at a plant-loaded density (PLD) of 20g and the lowest efficiency was 36% by *C. demersum* at PLD of 10 g. The highest removal efficiency of nickel was 54.5% by *C. demersum* at PLD of 20 g and the lowest efficiency was 34% by *L. minor* at PLD of 10 g. As for lead, the highest removal efficiency was 71.8% by *L. minor* at PLD of 20 g and the lowest efficiency was 42.5% by *C.demersum* at PLD of 10 g. Regarding the mixture, the highest removal efficiency was 57.8% and 47% by *L.minor* for both lead and nickel at PLD of 10 g and 20 g, respectively, and the highest removal efficiency for cadmium was 55 % by *C. demersum* at PLD of 20 g however, the lowest removal efficiency was 27 and 32.5 % for nickel and lead by *C. demersum* at PLD of 10 g, respectively, while cadmium was 27.5 % by *L. minor* at PLD of 10 g after 21 days. Therefore, the benefits of using aquatic plants to treat contaminants are substantial technology with cost-effective, visually pleasing, and advantageous for the sustainability of entire ecosystems.

Fayoum university **Faculty of Agriculture**

Keywords: Wastewater treatment, Water resource management, Heavy metals, Phytoremediation, *Lemna minor, Ceratophyllum demersum.*