



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES AND MINING ENGINEERING

FINAL YEAR REPORT

OPTIMIZING PHYTOREMEDIATION OF GREY WATER USING WATER HYACINTH (EICHHORNIA CRASSIPES)

BY

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A final year project proposal was submitted in partial fulfilment of the requirement for the award of a Bachelor's of science in water resources engineering at Busitema University

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ABSTRACT

Background: Water scarcity is a global issue and finding alternative way to meet water needs within available resources is becoming increasingly important. Recycling grey water for non- potable uses such as irrigation, car washing helps to decrease the demand for drinking this combats scarcity. This study investigates the treatment of grey water using phytoremediation focusing on effect of water hyacinth plant density and hydraulic retention time. RSM-CCD was used to optimize theses parameters.

Methods: water hyacinth was used in this method. Its application as an excellent adsorbent for pollutants. Removal of pollutants was also demonstrated using response surface methodology (RSM) using Central composite design (CCD). The effects of two independent variables; plant density (0.2-2.3kg/m²) and hydraulic retention time (2.7-32.3 days) on the pollutant removal (PH, DO, COD, BOB, TDS) efficiency were investigated and the process was optimized using RSM. Using central composite design (CCD), 13 experiments were carried out and the process response was modeled using a quadratic equation as function of the variables.

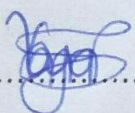
Results: The optimum values of the variables were found to be 2kg/m² and 7 days for plant density and retention time respectively. Using RSM-CCD approach, a quadratic regression model was generated to demonstrate the relationship between removal efficiency (RE) and factors of plant density(A) and hydraulic retention time(B).

Conclusions: The significance of each of the model term was evaluated using the probability of error value (P values) and R-sq. P-values less than 0.050 showed that the terms were significant. The model was adequate with R²> 0.7 and P-value less than 0.050. The study concludes that phytoremediation using water hyacinth can be a viable option for greywater recycling and reuse, effectively addressing water scarcity.

Keywords: Water hyacinth, Phytoremediation, Modelling, Optimization, Response Surface Methodology and Central composite design

DECLARATION

I APOKO PATRICIA MILDRED hereby declare that, this report is the work of my hands and this research has never been presented by any person or institution for an academic award.

Signature: 

Date: 16th May, 2025

APPROVAL

This work has been compiled with the guidance and consultation from my supervisor

Supervisor

Mr. Tigalana Dan

Signature

A handwritten signature in blue ink is written over a horizontal dotted line. The signature is stylized and cursive, with a large initial 'T' and a long, flowing tail that loops back under the line. The signature is positioned on the left side of the page.

ACKNOWLEDGEMENT

Foremost, I thank the Almighty God for the life and protection He has granted me

I whole heartedly thank my supervisor, Dr. Kavuma Chris for the knowledge, sense of direction, advice, and his precious time he has rendered to me to see that I remain on the right track.

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DEDICATION

I dedicate this report to my mum Irene Oburu for her social and financial support as well as the friends, family and entire class of water. And water department for their encouragement and spiritual support. This inspire me to learn more about my project I was able to learn report writing skills. May the almighty God be with them in all they lay their hands on.

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LIST OF ACRONYMS

COD	Chemical Oxygen Demand
BOD	Biological Oxygen Demand
DO	Dissolved Oxygen
PH	Potential of Hydrogen
TDS	Total Dissolved Solids
PD	Plant Density
HRT	Hydraulic Retention time
RSM	Response Surface Methodology
CCD	Central Composite Design

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