
BUSITEMA UNIVERSITY

FACULTY OF NATURAL RESOURCES AND ENVIRONMENTAL SCIENCES

**Diurnal Variations of Dissolved Oxygen Concentration in a Pilot-scale s High
Rate Algal Pond System Utilizing Water from River Nile at Namasagali
Campus, Busitema University: Implications for Water Reuse in Aquaculture**

BY

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**RESEARCH PROPOSAL SUBMITTED TO THE FACULTY OF NATURAL
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DECLARATION

I, Namaganda Jildah, declare that this research titled Diurnal variations of dissolved oxygen concentration in a pilot-scale high algal pond system utilizing water from River Nile at Namasagali campus, Busitema University is my original work. It is the culmination of my efforts and contributions, conducted under Dr. Tebitendwa Sylvie Muwanga's guidance and supervision towards completing my bachelor of science in Fisheries and Water Resource Management.

SIGNATURE:

DATE.....

NAMAGANDA JILDAH

APPROVAL

This is to certify that this research has been submitted with my approval as supervisor.

Signature.....

Date.....

Dr. Tebitendwa Sylvie Muwanga (Supervisor)

DEDICATION

I dedicate this research work to My Family Members especially my parents Mr. Tezita Moses and Mrs. Kagoya Susan whose unwavering support, prayers, and encouragement have been my guiding light throughout this journey and Dr. Tebitendwa Sylvie Muwanga (Busitema University, Research Supervisor) whose cooperation and insights have enriched this research and its findings. Your love, guidance, encouragement, and understanding have been instrumental in shaping this endeavor. This work stands as a tribute to your support and the inspiration drawn from your experiences. Above all, I give glory and honor back to God who has gifted me with His spirit and life amidst my trials during my research up to now.

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LIST OF ACRONYMS

FWR: Fisheries and Water Resource Management

DO: Dissolved Oxygen

HRAP: High Rate Algal Pond

TDS: Total Dissolved Solids

EC: Electrical Conductivity

pH: Potential Hydrogen

L: liters

cm/s: centimeter per second

ANOVA: Analysis of Variance

μS/cm: microsiemes per centimeter

mg/L: milligrams per liter

SD: Standard deviation

BOD: Biological oxygen demand

FAO: Food and Agriculture Organization

mm: millimeters

Lux: lumens per square meter

ABSTRACT

Fluctuation in dissolved oxygen concentration (DO) is one of the major water quality parameters influencing aquaculture production. Low levels of DO in earthen ponds cause stress in cultured fish resulting to poor appetite, growth performance and greater exposure to diseases that subsequently leads in low fish yields. This study aimed to investigate the diurnal variations of DO concentrations in a high rate algal pond (HRAP) system to ascertain the potential use of its effluent in aquaculture production. The specific objectives were to: i) determine the DO concentration of a HRAP system over a 12 hour cycle, ii) to determine the influence of temperature and light on DO concentration and, iii) find out if diurnal variation of DO concentration is within the requirement to support fish culture. The study employed a HRAP system constructed and operated at the Faculty of Natural Resources and Environmental Sciences, Namasagali campus, Busitema University. DO concentration and temperature were measured on-site using a multi-meter probe while light intensity data was obtained from an on-line meteorological site. Data was collected at different time intervals i.e. 6:00 AM, 12:00 NOON and 6:00 PM for three weeks from 23/06/2024 to 17/07/2024. Results revealed that DO concentrations varied significantly during the 12 hour monitoring period. Mean DO concentrations recorded were 5.14 ± 0.20 mg/L, 8.53 ± 0.14 mg/L and 7.14 ± 0.14 mg/L at 6:00 AM, 12:00 NOON and 6:00 PM respectively. Mean DO concentration varied significantly with temperature and light intensity throughout the monitoring period with highest DO levels recorded at midday when temperature and light intensity were at maximum. Meanwhile, despite the diurnal variation in DO, mean DO levels were within the recommended range for culture of the commonly farmed tropical fish species i.e. *Oreochromis niloticus* and *Clarias gariepinus*. Results of the present study suggest potential application of HRAP system for use in fish ponds to overcome DO concentration problems and the result improvement in fish health and production.

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