



INVESTIGATION INTO THE SUITABILITY OF SAWDUST WASTE AS A MEDIUM FOR AQUACULTURE EFFLUENT TREATMENT

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**A Thesis Submitted to the Department of Civil Engineering, Faculty of Engineering and
Technology in Partial Fulfillment of the Requirements for the Award of the Degree of
Doctor of Philosophy in Civil Engineering.**

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

MARCH, 2021

APPROVAL PAGE

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This is to certify that this thesis has been read and approved as meeting the requirements of the
Department of Civil Engineering and Postgraduate School, University of Ilorin, Ilorin, Nigeria
for the Award of Doctor of Philosophy Degree (Ph.D.)

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DECLARATION PAGE

I, OLANLOKUN Olayemi Kofoworola hereby declare that this thesis entitled — **Investigation into the suitability Of Sawdust Waste as a Medium for Aquaculture Effluent Treatment** is a record of my research work. It has neither been presented nor accepted in any previous application for a higher degree. All sources of information have been acknowledged.

Also, the research work has been ethically approved by the University Ethical Review Committee.

Olanlokun, Olayemi Kofoworola

Date

DEDICATION

This research work is dedicated to the memory of my late husband,

Kola Folorunsho Tony Olanlokun, Ph.D.

(1958 – 2011)

*‘...Since we are surrounded by so great a cloud of witnesses ...’
Hebrews Chapter 12, verse 1, The Bible (NKJV),*

*‘...there has not failed one word of all His good promises’
1 Kings Chapter 8, verse 56, The Bible (NKJV).*

He lives on in our lovely and wonderful children.

ACKNOWLEDGEMENTS

My worship, adoration and praise belong to the Almighty God, through Jesus Christ for how far He has brought me. Without Him and His Grace, I would not be here today.

My unreserved gratitude to my supervisor and mentor, Prof. B.F. Sule for agreeing to supervise this study despite his busy schedule. Thank you for being there at all times, to listen and to guide. The subtle encouragement and the extra push at appropriate times. Words seems inadequate but I am grateful.

I acknowledge the roles of Late Prof. B.U. Anyata and Prof. E.I. Stentiford in stirring my interest in Environmental Engineering in particular, Solid Waste Management.

My sincere gratitude to colleagues (academic and non-academic) within the Department of Water Resources and Environmental Engineering, the Department of Civil Engineering and the Faculty of Engineering and Technology at large. Special thanks to Prof. A.W.Salami, Dr. Mrs.O.A Mokuolu, Dr. S.O. Bilewu, Dr. Mrs. M.O.Jimoh, Dr. A.M. Ayanshola, Dr. I.T.Yusuf, Dr. O.O. Adeleke, Dr. Mrs.T.E. Odetoye and Mrs. S.I. Adio-Yusuf.

My post humous gratitude to Mr.C.K. Jaiyeoba of the Faculty of Agriculture for his willingness to help source for materials and equipment. Sincere gratitude to Prof. F.O. Nwosu of Industrial Chemistry for the use of his reactor and his readiness to answer those annoying chemistry questions. Thanks to Mr. Godfrey Akalonu of National Centre for Agricultural Mechanization (NCAM), Jimba-Oja, Kwara State and Pastor B. Ige for the willingness to share their knowledge of catfish rearing.

I would not have made it this far without the support of my spiritual family; members of the Chapel of The Light, University of Ilorin. I acknowledge the support of the Chaplains, past and present, Women's Fellowship and the Drama Unit. You would not lose your reward in Jesus' Name.

Thanks to my friends; Chimay Anumba, Moses Iyengunmwena and Late Eloka Anumba who believed in my abilities decades ago when I doubted myself.

My gratitude to my undergraduate project students over the years; supervising your work made my work clearer. Special thanks, Team 6 of 2014; traversing Ilorin looking for Catfish farms was a lot easier with you. Some like Adebisi Mark, Ibrahim Arogundade and Mariam Idowu stepped into the role of Laboratory/ Research Assistants.

My sincere gratitude to my 'Transport Crew'; the ones I called on when I was not in the mood of driving or needed company on long trips; Oluwaseyitan Jaiyeoba, Victor Adewoye, Moses Akande, Olutayo Olusanya, and Fiyin Oyeyinka.

My friends at home and abroad who kept encouraging me; Anike Kakayor, Akin & Rounke Somorin, Deji & Dotun Okubadejo, Ronke Odeneye, Bro. Kayode & Kitan Oluwagbuyi, Jumoke Popoola, Feyi Atinuke, Funmi Ogundijo, Bro. Yinka Adigun

My ‘adopted’ children; Caleb Agboola, Damilola Popoola, Debbie Taiwo, Damilola Popoola (law), Segun Olayemi, Taiwo Adekeye, Victoria Dako, Aweda Ajibola. My #not2old2learn team: Deji (MIT) Ajuwon, Tobi Fabusuyi, John Abolarin

My neighbours turned friends; Mrs. Halima Yusuf and Mrs. Yetunde Falowo - you made life easier by taking up tasks, I am grateful.

My Dad; Chief Theophilus Olatunji Idowu. Thank you for believing in education. My siblings; Tokunbo, Bukky and Fehintoluwa and their respective spouses; Cathy, Wale and Biodun. Thank you for your support in various ways.

My Mother-in-law, Chief Mrs. Lanlokun and my sister-in-law, Mrs. Awe. Thank you for the numerous phone calls and prayers.

My children, The Olanlokun boys; Joseph Olulana, Peter Olushuyi and Benjamin Olusheyeye. What can I say? Thank you for being such lovely children, for understanding when it seemed I was too busy. I can’t promise there wouldn’t be more waste related work but hopefully not with this intensity. I love you.

My gratitude to all authors referred to in the course of this study. Your studies made mine easier.

In the process of trying to express my gratitude, inadvertently, some names will be missed. It is not intentional. It is my prayer that God will remember you all for good.

Thank you.

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ABSTRACT

Water is a renewable resource which should be preserved and protected. Untreated wastewater from aquaculture such as catfish farming most times end up in water bodies which could be sources of water supply downstream. Such water, if untreated before use or discharge into water bodies could result in eutrophication and human diseases. Untreated effluent from catfish farming can thus have these consequences. Therefore, there is a need to examine how the effluent from aquaculture can be treated before discharge. The aim of this study was to investigate the suitability of sawdust waste as a medium for aquaculture effluent treatment. The objectives of the study were to: (i). investigate current practice of Catfish Farming Effluent CFE disposal; (ii). assess quality of CFE; (iii). examine the adsorption abilities of sawdust, Activated Sawdust (AS), and Commercial Activated Carbon (CAC); and (iv). investigate the efficiency of AS in the treatment of CFE.

The methodology employed involved treatment of CFE using adsorption via a batch process in the laboratory and conversion of two different types of sawdust: homogenous (*Isberlina doka* wood specie) and heterogeneous mix (*Daniella ogea*, *Anogesus olivera*, *Isberlina doka*, *Afzelia bipinensis* and *Gmelina arborea*). Wastewater was collected from different catfish farms within Ilorin, the study area. Sawdust was converted into AS using orthophosphoric acid as the activating agent based on a 3-factorial design. The factors considered were molarity of acid, temperature and activation period. Treatment of CFE was investigated using the following physicochemical parameters: Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), nitrite, nitrate and phosphorus. The CFE was also treated with CAC. The laboratory analysis was conducted using Standard Methods.

The findings of the study were that:

- (i). CFE is currently discharged untreated through pipes from ponds into open drains;
- (ii). untreated effluent has TDS, BOD, nitrite, nitrate and phosphorus values of 520 mg/l, 17.4 mg/l, 0.42 mg/l, 150.45 mg/l and 2.48 mg/l, respectively while the discharge limits are 2000 mg/l; 6.0 mg/l; 0.08 mg/l; 40 mg/l; and 3.5 mg/l, respectively;
- (iii). after treatment with sawdust, AS and CAC, TDS reduced from 520 mg/l to 150 mg/l, 210 mg/l and 260 mg/l; BOD from 17.4 mg/l with no change with sawdust, 9.8 mg/l and 9.9 mg/l; nitrite from 0.42 mg/l to 0.32 mg/l, 0.07 mg/l and 0.31 mg/l; phosphorus from 2.48 mg/l to 2.2 mg/l, 2.12 mg/l and 2.19 mg/l. However, nitrate increased in value from 150.45 mg/l to 175.8 mg/l, 156.1 mg/l and 200 mg/l; and
- (iv). the efficiency of AS treatment for phosphorus, BOD, TDS and nitrite were 12 %, 44 %, 60 %, and 83 %, respectively.

The study concluded that activated sawdust has the potential as an adsorbent for treatment of aquaculture wastewater which simultaneously solves the problem of indiscriminate sawdust disposal. The study recommended that AS should be adopted for the treatment of CFE prior to discharge into water bodies.