Microbial and Physicochemical Characterization of Effluent and Waste Water around a Detergent Manufacturing Complex in Ibadan, Nigeria

Tayo Elijah EGBEDEYI

LCU/PG/003963

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Certification

This is to certify that **Tayo Elijah EGBEDEYI** with matriculation number **LCU/PG/003963** carried out this research work titled "**Microbial and Physicochemical Characterization of Effluent and Waste Water around a Detergent Manufacturing Complex in Ibadan, Nigeria**. Faculty of Natural and Applied Sciences, in the Department of Biological Science, Lead City University, Ibadan, Oyo state, for the award of Master of science Degree (MSc.) in Industrial Microbiology and that this has not been previously submitted**.**

Dr. Emeka Taye Umezurike **Date**
(Promoter)

Dr. Omonike Bakare **Date**
(Head of Department)

Dedication

This research is dedicated to the Almighty God for making its completion possible**.**

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Abstract

Industrialization has contributed immensely to economic growth, urban development, and improved standards of living across the world. The detergent manufacturing industry is one of the most polluting industrial sectors due to its high chemical input, complex production processes, and generation of large volumes of wastewater. The aim of this study is to characterize the microbial and molecular profile of effluent, workers wash water, and receiving surface water from a detergent manufacturing complex in Ibadan, Nigeria. Effluent and wastewater samples were collected from three distinct sites associated with the detergent manufacturing complex. Physicochemical parameters were measured and Microbial characterization involved both cultural and molecular techniques were carried out. The results of this study demonstrated that effluents and wastewater discharged from the detergent manufacturing complex in Ibadan are heavily polluted, with significant deviations from recommended physicochemical standards and a high microbial burden dominated by coliform bacteria. The predominance of *Bacillus spp.* (33 %), *Staphylococcus sp.* (15 %), *Klebsiella* spp. (3.0 %), and *Escherichia coli*. (6.1 %) among isolates is consistent with previous reports of the presence of microbial contamination in industrial effluents. Physicochemical analyses confirmed that the effluent was not compliant with World Health Organization (WHO) standards, particularly with respect to pH, BOD, COD, and nutrient load. Out of the three isolates tested, *blaCTX-M,* was detected in 2 (66.7 %) of the isolates, indicating a moderate prevalence of extended-spectrum β-lactamase (ESBL) producers in the sampled environment. The *SUL*1 gene, was identified in all isolates (100 %), suggesting widespread dissemination of sulfonamide resistance within effluent-associated bacteria. Overall, the study highlights the urgent need for stricter regulatory enforcement, improved effluent treatment technologies, and continuous monitoring of industrial wastewater.

Keywords: Effluents, Industrial discharge. Microorganisms, Ibadan, Pollutants, Contaminants

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List of Acronyms

Abbreviation	Meaning
MDR	Multi drug resistance
AMR	Antimicrobial Resistance
WHO	World Health Organization
MRSA	Methicilin Resistant Staphylococcus aureus
VRE	Vancomycin-Resistant Enterococci
ESBLs	Extended-Spectrum Beta-Lactamases
OIE	World Organization for Animal Health
EMB	Eosin Methylene Blue
MSA	Salmonella Shigella Agar
BLAST	Basic Local Alignment Sequence Tool
NCBI	National Center for Biotechnology Information
PCR	Polymerase Chain Reaction
NAFDAC	National Agency for Food and Drug Administration and Control
NESREA	National Environmental Standards and Regulations Enforcement Agent