

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME I

Editors:

Suleyman Aremu Muyibi
Mohammed Saedi Jami
Zaki Zainudin



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

(VOLUME I)

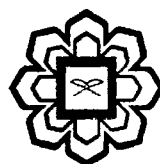
Editors:

Suleyman Aremu Muyibi

Mohammed Saedi Jami

Zaki Zainudin

**Department of Biotechnology Engineering
Faculty of Engineering
International Islamic University Malaysia**



IIUM PRESS

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Suleyman Aremu Muyibi, Mohammed Saedi Jami & Zaki Zainudin: Current Research and Development in Biotechnology Engineering at IIUM Volume I

ISBN: 978-967-418-150-5

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

CONTENTS

PREFACE		v
CHAPTER 1	SELECTION OF POTENTIAL FUNGAL STRAINS FOR THE PRODUCTION OF GLUCOAMYLASE USING NON-FOOD CASSAVA	1 (4157/20570)
	<i>Md Zahangir Alam, Hamzah Mohd Salleh, Juwairiyah Abd Karim, and Aliyu Salihu</i>	
CHAPTER 2	WATER QUALITY MODELING TO ASSESS THE IMPACTS OF PALM OIL MILL EFFLUENT (POME) IN SG. KALUMPANG BASIN	7 (6601/20573)
	<i>Zaki Zamudin</i>	
CHAPTER 3	WATER QUALITY CHARACTERIZATION STUDIES ON SPRING WATER FOR USE IN PONDS FOR KELAH FISH BREEDING IN KELAH SANCTUARY	13 (4164/20576)
	<i>Suleyman Aremu Muyibi, Siti Haryah Binti Morlan, and Mohamed Ismail Abd Karim</i>	
CHAPTER 4	THE SOLID WASTE MANAGEMENT SYSTEM ISSUES ON POLLUTION AND WASTE DISPOSAL PROBLEMS	19 (4286/20578)
	<i>Nassereldeen Kabbashi, Najla Shuhud, and Mohammed Saedi Jami</i>	
CHAPTER 5	SETTLING COLUMN ANALYSIS FOR WATER TURBIDITY REMOVAL USING CHITOSAN	26 (4286/20584)
	<i>Nassereldeen Ahmed Kabbashi and Muhammad Fazil B Anoiar</i>	
CHAPTER 6	PROCESS DEVELOPMENT OF REMOVING LOW TURBIDITY WATER USING CHITOSAN AS A BIOCOAGULANT	32 (4286/20588)
	<i>Nassereldeen Ahmed Kabbashi and Muhammad Fazil B Anoiar</i>	
CHAPTER 7	OPTIMIZATION OF PROCESS CONDITIONS FOR GLUCOAMYLASE PRODUCTION USING NON-FOOD CASSAVA	38 (4157/20590)
	<i>Md. Zahangir Alam, Hamzah Mohd Salleh, Radhiah Ariffin, and Noor Mohammad</i>	
CHAPTER 8	DEVELOPMENT OF RAPID ENZYMATIC PROCESS FOR ACID OIL PRODUCTION FROM SLUDGE PALM OIL	44 (4157/20596)
	<i>Md Zahangir Alam, Hamzah Mohd Salleh, and Noraini Mohd Yusof</i>	
CHAPTER 9	OPTIMISATION OF CHROMATOGRAPHY CONDITION FOR BIOPHENOLS SEPARATION FROM OIL PALM FRUIT FIBER	51 (2937/20598)
	<i>Parveen Jamal, Shahrul Yahaya, Md Zahangir Alam, and Azlin Azmi</i>	
CHAPTER 10	MORINGA SEED OIL EXTRACTION AND CAKE PROCESSING FROM BENCH TO COMMERCIAL PRODUCTION OF ALTERNATIVE WATER TREATMENT CHEMICALS FOR DEVELOPING COUNTRIES	60 (4146/20603)
	<i>Suleyman A. Muyibi and Idris M. Bugaje</i>	
CHAPTER 11	INVESTIGATION OF ANTIBACTERIAL ACTIVITY OF MORINGA OLEIFERA SEEDS FOR APPLICATION IN WATER TREATMENT	66 (4164/20605)
	<i>Suleyman A. Muyibi and Farhana Aina Bt Ahmad Nazir</i>	
CHAPTER 12	SCREENING OF LIGNOCELLULOSIC MATERIALS FOR THE PRODUCTION OF FERMENTABLE SUGAR	72 (4151/20606)
	<i>Md. Zahangir Alam, Abdullah-Al-Mamun, Hikmah Mohd Noor, and Noor Mohammad</i>	
CHAPTER 13	LOCAL SOURCING FOR RENEWABLE AND SUSTAINABLE REPLACEMENT FOR WATER AND WASTEWATER TREATMENT CHEMICALS: ACTIVATED CARBON FROM AGRO-WASTES	77 (4164/20610)
	<i>Suleyman Aremu Muyibi, Mohd Ismail Abdulkarim, Md Zahangir Alam, Emad S M Ameen, and Nassereledeen A Kabbashi</i>	
CHAPTER 14	EVALUATION OF THE PERFORMANCE OF WATER TREATMENT SYSTEM FOR KELAH BREEDING IN FISH PONDS	85 (4164/20612)
	<i>Suleyman Aremu Muyibi, Siti Sara Binti Ghazali, and Mohamed Ismail Abd Karim</i>	

CHAPTER 15	DESIGN OF TERTIARY TREATMENT SYSTEM FOR EFFLUENT FROM STP AT IIUM FOR HORTICULTURAL USES	91 (4164/2063)
	<i>Suleyman A. Muyibi and Tamrin Tajari</i>	
CHAPTER 16	COMPARATIVE STUDIES OF MORINGA OLEIFERA AND ALUMINIUM SULPHATE AS COAGULANTS IN TURBIDITY REMOVAL FROM SURFACE WATER	96 (4164/20618)
	<i>Suleyman A. Muyibi, Eman N. Ali, Md Zahangir Alam, and Hamzah M. Salleh</i>	
CHAPTER 17	AN EXPERT SYSTEM FOR DESIGN OF WATER TREATMENT PLANT	101 (4286/20619)
	<i>Nassereldeen Kabbashi, Anwar Bin Mohamad, and Suleyman A. Muyibi</i>	
CHAPTER 18	ISOLATION AND SCREENING OF POTENTIAL MICROORGANISM FOR BIOREMEDIATION OF HYDROCARBON CONTAMINATED SITES	106 (2937/20625)
	<i>Parveen Jamal, Md. Zahangir Alam, and Nur Aneem Fadza</i>	
CHAPTER 19	SLUDGE PALM OIL AS A POTENTIAL SOURCE FOR EMULSIFIER PRODUCING STRAIN	113 (2937/20631)
	<i>Parveen Jamal, Md. Zahangir Alam, and Nur Fathiah Abd. Samia</i>	
CHAPTER 20	MICROBIAL FERMENTATION FOR PRODUCING SURFACE ACTIVE AGENT BY USING PALM OIL MILL EFFLUENT ISOLATE	119 (2937/20632)
	<i>Parveen Jamal, Md. Zahangir Alam, Nur Aneem Fadza, and Wan Mohd Fazli Wan Nawawi</i>	
CHAPTER 21	A BATCH PROCESS PRODUCTION OF COMPOST AND KINETICS ORDER OF REACTION STUDY BY ISOLATED FUNGAL STRAINS	126 (4286/20635)
	<i>Nassereldeen A. Kabbashi, Optakun Suraj, and Md. Zahangir Alam</i>	
CHAPTER 22	ANALYSIS OF ELECTROFORCED SEDIMENTATION OF ZINC OXIDE	137 (5545/20639)
	<i>Mohammed S. Jami, Masashi Iwata, Maan Alkhatib, and Mujeli Mustapha</i>	
CHAPTER 23	PRODUCTION OF BIODIESEL BY ACID-BASE CATALYZED TRANSESTERIFICATION OF WASTE COOKING OIL IN A BATCH REACTOR	143 (4157/20641)
	<i>Md. Zahangir Alam, Parveen Jamal, and Nor Rashid Bin Mohamad</i>	
CHAPTER 24	FRACTIONATION, IDENTIFICATION AND QUANTIFICATION OF BIOPHENOLS FROM OIL PALM FRUIT FIBER	150 (2937/20644)
	<i>Parveen Jamal, Shahrul Yahaya, Md. Zahangir Alam, and Azlin Azmi</i>	
CHAPTER 25	CELLULASE PRODUCTION FROM RICE STRAW AND CORN COB BY SOLID STATE BIOCONVERSION	158 (4157/20646)
	<i>Md. Zahangir Alam, Mazlinor Mohd Awal, and Aliyu Salihu</i>	
CHAPTER 26	NATURAL DISINFECTANTS FOR WATER TREATMENT	164 (4971/20649)
	<i>Mohamed E. S. Mirghani, I. A. Ahmed, S. A. Muyibi, J. I. Daoud, and M. A. Mikail</i>	
CHAPTER 27	REMOVAL OF WATER TURBIDITY BY USING FABA BEANS	173 (20653)
	<i>Mohamed E. S. Mirghani, Nasereldin A. Kabbashi, and Fasehah Abdul Kadir</i>	
CHAPTER 28	WASTE TO WEALTH: DATE SEED PITS	180 (4971/20656)
	<i>Mohamed E. S. Mirghani, M. A. Mikail, I. A. Ahmed, M. I. Abdul Karim, and J. I. Daoud</i>	
CHAPTER 29	EFFECT OF HYDROGEN PEROXIDE ON SETTLEABILITY AND FILTERABILITY OF SLUDGE FROM DRINKING WATER TREATMENT PLANT	188 (5545/20659)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, and Mohd Shahril Bin Kamaruddin</i>	
CHAPTER 30	ENHANCING THE DEWATERABILITY OF SLUDGE FROM WASTEWATER TREATMENT PLANT	194 (5545/20661)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, and Nur Salihah Embong</i>	
CHAPTER 31	EVALUATION OF AMMONIA NITROGEN REMOVAL IN AN EXISTING SEQUENTIAL BATCH REACTOR	200 (5545/20664)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, and Nur Faizah Bt Ismail</i>	
CHAPTER 32	PRODUCTION OF GLUCOAMYLASE FROM RICE BRAN USING	206 (4157/20666)

	POTENTIAL FUNGAL STRAINS	
	<i>Md Zahangir Alam, Hamzah Mohd Salleh, and Nurhidayah Binti Ahmad Hassan</i>	
CHAPTER 33	OPTIMIZATION OF PROCESS CONDITIONS FOR GLUCOAMYLASE PRODUCTION USING RICE BRAN	213 (4157/20668)
	<i>Md. Zahangir Alam, Hamzah Mohd Salleh, and Siti Najilaa Othman</i>	
CHAPTER 34	MEMBRANE PROCESS FOR REUSE OF TREATED PALM OIL MILL EFFLUENT (POME)	219 (5545/20672)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, Siti Noor Hayati Abdul Kudus, and Munirat Idris Oseni</i>	
CHAPTER 35	PRODUCTION OF FERMENTABLE SUGAR FROM LIGNOCELLULOSIC MATERIALS USING STATISTICAL DESIGN	225 (4157/20674)
	<i>Md. Zahangir Alam, Abdullah-Al-Mamun, and Hikmah Mohd Noor</i>	
CHAPTER 36	STUDY OF THE DEWATERABILITY OF KAOLINE AS A MODEL SUBSTANCE FOR SLUDGE	231 (5545/20676)
	<i>Mohammed Saedi Jami, Tariq Jameel, Mardhiah Farhanah Bt Noor Izan, and Jabir Hussain</i>	
INDEX		237

CHAPTER 19

SLUDGE PALM OIL AS A POTENTIAL SOURCE FOR EMULSIFIER PRODUCING STRAIN

Parveen Jamal, Md. Zahangir Alam, Nur Fathiah Abd. Sani

Department of Biotechnology Engineering, Faculty of Engineering, International
Islamic University Malaysia, Gombak, 50728 Kuala Lumpur, Malaysia

ABSTRACT

There is a recent increase of interest in the production of biosurfactants using microorganisms due to their biodegradability, reduced toxicity compared to synthetic surfactants, and their stability under wide range of temperature and Ph. In this study, organic waste, sludge palm oil was used as a novel source for isolation of potential biosurfactant producer. Complex mixture of hydrocarbons of sludge palm oil can trigger certain strains to produce large amount of biosurfactant in order to survive under such harsh environment. Parafilm test and emulsification index were used as a basis for determination of the best strain. After screening, strain S104 was found to have the potential in producing highest yield of biosurfactant.

Keywords: biosurfactant, sludge palm oil, isolation, parafilm test, emulsification index

INTRODUCTION

Surfactants are amphiphilic compounds that reduce the free energy of the system by replacing the bulk molecules of higher energy at an interface (Mulligan, 2005). They contain a hydrophobic moiety with little affinity for the bulk medium and a hydrophilic portion that is attracted to the bulk medium. Surfactants have been used industrially as adhesives, de-emulsifiers, flocculating, wetting and forming agents, lubricants and penetrants (Mulligan & Gibbs, 1993). Because of their amphiphilic nature, surfactants tend to accumulate at interfaces (air-water and oil-water) and surfaces. As a result, surfactants reduce the forces of repulsion between unlike phases at interfaces or surfaces and allow the two phases to mix more easily (Bodour & Miller-Maier, 2002). Due to the presence of surfactant, less work is required to bring a molecule to the surface and the surface tension is reduced.

Biosurfactant is a structurally diverse group of surface-active molecule synthesized by microorganisms. Their capability of reducing surface and interfacial tension with low toxicity and high specificity and biodegradability, lead to an increasing interest on these microbial products as alternatives to chemical surfactants (Banat et al., 2000). However, up to now, biosurfactants is still unable to compete with the chemically synthesized surfactants in the surfactant market. This could be due to their high production costs in relation to inefficient