CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME III

Editors:
Md. Zahangir Alam
Ahmed Tariq Jameel
Azura Amid

IIUM PRESS
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

(VOLUME III)

Editors:
Md. Zahangir Alam
Ahmed Tariq Jameel
Azura Amid

Department of Biotechnology Engineering
Faculty of Engineering
International Islamic University Malaysia

IIUM Press
Published by:
IIUM Press
International Islamic University Malaysia

©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


ISBN: 978-967-418-144-4

Member of Majlis Penerbit 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

CHAPTER 1 OPTIMIZATION OF EXTRACTION PROCESS PARAMETERS FOR ANTI-CANCER AGENT FROM Solanum lycopersicum
Azura Amid, Abdul Aziz Ahmad and Raha Ahmad Raus

CHAPTER 2 OPTIMIZATION OF THE EXTRACTION PROCESS PARAMETER FOR KENAF SEEDS OIL TO OBTAIN HIGH OIL YIELD
Azura Amid, Parveen Jamal, Nurul Elyani Mohamad and Engku Hasmah Engku Abdullah

CHAPTER 3 OPTIMIZATION OF THE EXTRACTION PROCESS PARAMETER TO OBTAIN HIGHEST ANTI-CANCER ACTIVITY FROM KENAF SEEDS
Azura Amid, Parveen Jamal, Nurul Elyani Mohamad and Engku Hasmah Engku Abdullah

CHAPTER 4 OPTIMIZATION OF HEAT STERILIZATION ON MANGO FRUIT (Mangifera indica) PUREE AND EFFECTS TOWARDS CANCER TREATMENT
Azura Amid, Irwandi Jaswir and Muhd. Ezza Faiez Othman

CHAPTER 5 DETERMINATION OF OPTIMAL RANGE OF POST-INDUCTION TEMPERATURE FOR PRODUCTION OF SOLUBLE RECOMBINANT BROMELAIN IN Escherichia coli USING ONE-FACTOR-AT-A-TIME (OFAT) APPROACH
Azura Amid and Jamil Jamaluddin

CHAPTER 6 AEROBIQUE BIODEGRADATION OF OIL AND GREASE IN PALM OIL MILL EFFLUENT USING CONSORTIUM OF MICROORGANISMS
Ahmad Tariq Jameel and Alade Abass Olanrewaju

CHAPTER 7 WASTEWATER TREATMENT BY IMMOBILISED CELL SYSTEMS
Ahmad Tariq Jameel and Alade Abass Olanrewaju

CHAPTER 8 BATCH FERMENTATION OF RECOMBINANT Escherichia coli PRODUCING β-GLUCURONIDASE USING DIFFERENT CONTROL CONDITION
Mohd Ismail Abdul Karim, Hamzah Mohd Salleh and Maizirwan Mel

CHAPTER 9 OPTIMIZATION OF PROCESS CONDITION FOR E. coli FERMENTATION PRODUCING NUCLEOCAPSID PROTEIN-AVIAN INFLUENZA VIRUS (NP-AIV)
Maizirwan Mel, Md Rashid Shamsuddin, Hamadah Mohd Nur Lubis, Syarifah Syed Hasan and Suriani Mohd Noor
CHAPTER 10  CELL DISRUPTION IMPROVEMENT OF E. coli PRODUCING NP-AIV USING HIGH PRESSURE HOMOGENIZER
Maizirwan Mel, Mohd Rashid Shamsuddin, Hamadah Mohd Nur Lubis, Sharifah Syed Hasa
and Suriyani Mohd Noor

CHAPTER 11  SEEDS’ OIL AS BIELUBRICANT
Mohamed E. S. Mirghani, I. A. Ahmed, N. A. Kabbashi, S. A. Mutib, J. I. Daoud and M. A. Mika

CHAPTER 12  SPECIAL OIL FROM DATE PALM KERNEL
Mohamed Elwathig Saeed Mirghani, Nasereldin A. Kabbashi and Nur Ellyana Mohd Noor

CHAPTER 13  GUM ARABIC: A NARRATIVE EMULSIFYING AGENT
Mohamed Elwathig Saeed Mirghani, Maizirwan Mel and Fatimah Misran

CHAPTER 14  INVESTIGATIONS ON SPIDER HOUSE FOR ANTI MICROBIAL ACTIVITY
Mohamed Elwathig Saeed Mirghani and Mohamad Zul Fahmi Zulkifli

CHAPTER 15  EVALUATION ON QUALITY OF HEAT RESISTANCE CHOCOLATE
Mohamed Elwathig Saeed Mirghani and Maan Fahmi Al-Khatib

CHAPTER 16  ANTIMICROBIAL PROPERTY OF DATE SEED EXTRACT
Mohamed E. S. Mirghani, M. A. Mikail, I. A. Ahmed, M. I. Abdul Karim and J. I. Daoud

CHAPTER 17  PROCESS IMPROVEMENT OF CONVENTIONAL PALM OIL MILLING: CONTINUOUS COOKER
Azlin Azmi, Mageswari Somasundaram and Dzun Jimat

CHAPTER 18  FOWL CHOLERA VACCINE PRODUCTION: SCREENING AND OPTIMIZATION OF MEDIA IN SHAKE FLASK CULTURE
Maizirwan Mel, Mohd Ismail Abdul Karim, Nor Jannah Yob, Intan Zahrara Samsury, Sharifah Syed Hassa
and Akma Ngah Hamid

CHAPTER 19  FOWL CHOLERA VACCINE PRODUCTION: PROCESS OPTIMIZATION IN LABORATORY SCALE FERMENTER
Maizirwan Mel, Mohd Ismail Abdul Karim, Nor Jannah Yob, Intan Zahrara Samsury, Sharifah Syed Hassa
and Akma Ngah
CHAPTER 20  PROCESS IMPROVEMENT OF CONVENTIONAL PALM OIL MILLING: DEPULPER  
Azlin Azmi, Mageswari Somasundaram and Dzun Jimat

CHAPTER 21  DIFFUSION-REACTION OF NUTRIENT IN IMMOBILIZED SLAB BIOCATALYST FOR FIRST AND ZERO ORDER REACTIONS  
Ahmad Tariq Jameel and RM Syibli Milasi

CHAPTER 22  DIFFUSION-REACTION OF SUBSTRATE IN CYLINDRICAL IMMOBILIZED BIO-CATALYST  
Ahmad Tariq Jameel and RM Syibli Milasi

CHAPTER 23  DIFFUSION-REACTION OF SUBSTRATE IN IMMOBILIZED SLAB BIOCATALYST FOR MICHAELIS-MENTEN KINETICS  
Ahmad Tariq Jameel and RM Syibli Milasi

CHAPTER 24  FERMENTATION OF BIOETHANOL FROM SAGO STARCH  
Mohamed Ismail Abdul Karim and Husna Muhammad Nadzri

CHAPTER 25  KINETIC STUDY ON VINEGAR PRODUCTION USING STAR FRUIT JUICE  
Mohamed Ismail Abdul Karim and Noor Izzaida Kamaruddin

CHAPTER 26  FERMENTATION OF VINEGAR FROM STAR FRUIT (Averrhoa carambola)  
Mohamed Ismail Abdul Karim, Farah Izora Jasni and Parveen Jamal

CHAPTER 27  DESIGN AND DEVELOPMENT OF A LAB SCALE BIOREACTOR FOR HEAT INDUCIBLE ENZYME EXPRESSION SYSTEM  
Daud Adam, Ahmad Faris Ismail and Hamzah Mohd. Salleh

CHAPTER 28  OPTIMIZATION OF PHYTOCHEMICAL ANTIOXIDANTS IN RBD PALM OLEIN DURING FRYING PROCESS  
Irwanadi Jaswir and Mohd Syakirin Sudin

CHAPTER 29  OPTIMIZATION OF PROCESS PARAMETERS FOR EXTRACTION OF XANTHINE OXIDASE INHIBITOR (XOI) FROM Lycopersicon esculentum  
Parveen Jamal, Azura Amid, Rasidi Bahardin and Saiful Mohammad Nizam Azmi

CHAPTER 30  PROCESS OPTIMIZATION OF HYDROCOLLOID PRODUCTION FROM SEAWEEDS  
Irwanadi Jaswir, Mohd Razi Kodin and Parveen Jamal

CHAPTER 31  IMPROVEMENT OF CONVENTIONAL MILLING PROCESS IN PALM OIL PROCESSING: ROTARY FILTER PRESS  

iv
CHAPTER 32  SCREENING OF FUNGI ON SOLID STATE BIOCONVERSION OF OIL PALM EMPTY FRUIT BUNCH FOR PRODUCTION OF CELLULASE
Mohamed Ismail Abdul Karim, Manisya Zauri A. Hamid, Faridah Yusof and Md Zahangir Alam

CHAPTER 33  SINGLE STAGE STIRRED TANK BIOREACTOR PRODUCTION OF STAR FRUIT (Averrhoa carambola) VINEGAR
Mohamed Ismail Abdul Karim, Parveen Jamal and Mohd Nasir Jamaluddin Ab Rahman

CHAPTER 34  TREATMENT OF PALM OIL MILL EFFLUENT USING MICROORGANISMS
Mohamed Ismail Abdul Karim, Nurul Aima Daud and Md Zahangir Alam

CHAPTER 35  COMPARATIVE STUDY OF BIOREACTORS USED FOR PALM OIL MILL EFFLUENT TREATMENT BASED ON CHEMICAL OXYGEN REMOVAL EFFICIENCIES
Ahmad T. Jameel, Suleyman A. Muyibi and Alade A. Olanrewaju

CHAPTER 36  EFFECT OF HOMOGENIZATION IN BREAKING PROTEIN-CAROTENOID COMPLEXES FOR RELEASING ACTIVE COMPOUNDS
Parveen Jamal, Irwandi Jaswr, Nurhasri Mulyadi Hashim and Saiful Mohammad Nizam Azmi

CHAPTER 37  THE USE OF MODIFIED POLYMERIC POLYHIPE AS AN IMMOBILIZED CELL MATRIX
Dzun Jimat and Azlin Azmi

INDEX

306
CHAPTER 11

SEEDS’ OIL AS BIOLUBRICANT

Mohamed E. S. Mirghani, I. A. Ahmed, N. A. Kabbashi, S. A. Muyibi, J. I. Daoud and M. A. Mikail

Department of Biotechnology Engineering, Faculty of Engineering, International Islamic University Malaysia, P.O. Box 10, 50728 Kuala Lumpur, Malaysia

ABSTRACT

The increasing demands for oils both for human consumption and for other industrial applications has culminated into an increasing need to search for oils from non-conventional sources to augment the available ones and also to meet specific applications. Environmental concerns about synthetic non-biodegradable polymers have also encouraged efforts towards their substitution with fully or partially biodegradable polymers of semi-synthetic or bio-origin. The physic-chemical properties of vegetable oils and their structures were discussed in terms of their potentially future use as base oils biolubricants and additives.

INTRODUCTION

Efforts are being encouraged towards the substitution of synthetic non-biodegradable polymers by fully or partially biodegradable polymers of semi-synthetic or bio-origin due to several environmental concerns (Suvangshu et al., 2010). Most vegetable oils are obtained from beans or seeds, which generally furnish two valuable commodities—an oil and a protein-rich meal. Seed extraction is achieved by pressing and/or by solvent extraction (Gunstone, 2002). Generally, the three major and common methods of oilseed extraction are; full press, pre-press and solvent extraction.

There is a great demand for renewable sources of raw materials that have nutritional and industrial potential. To meet the increasing demand for vegetable oils, improvements are being made with conventional crops as well as with selected plant species that have the ability to produce unique, desirable fats and oils (Lin, 2009).

The depletion of world oil pool, rising price of crude oil and increased environmental concerns are pressurizing the scientists for the use of renewable natural resources in different fields of applications as they are eco-friendly and cost effective materials. In this regard, vegetable oils have a number of excellent properties, which could be utilized in production for variable polymeric materials such as alkyd, epoxy,