

# 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

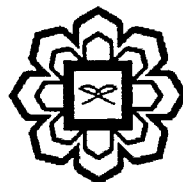
**CURRENT RESEARCH AND  
DEVELOPMENT IN BIOTECHNOLOGY  
ENGINEERING AT IIUM**

*(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

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

Md. Zahangir Alam, Ahmed Tariq Jameel & Azura Amid: Current Research and Development in Biotechnology Engineering at IIUM Volume III

ISBN: 978-967-418-144-4

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		i
CHAPTER 1	OPTIMIZATION OF EXTRACTION PROCESS PARAMETERS FOR ANTI-CANCER AGENT FROM <i>Solanum lycopersicum</i> <i>Azura Amid, Abdul Aziz Ahmad and Raha Ahmad Raus</i>	1
CHAPTER 2	OPTIMIZATION OF THE EXTRACTION PROCESS PARAMETER FOR KENAF SEEDS OIL TO OBTAIN HIGH OIL YIELD <i>Azura Amid, Parveen Jamal, Nurul Elyani Mohamad and Engku Hasmah Engku Abdullah</i>	11
CHAPTER 3	OPTIMIZATION OF THE EXTRACTION PROCESS PARAMETER TO OBTAIN HIGHEST ANTI-CANCER ACTIVITY FROM KENAF SEEDS <i>Azura Amid, Parveen Jamal, Nurul Elyani Mohamad and Engku Hasmah Engku Abdullah</i>	17
CHAPTER 4	OPTIMIZATION OF HEAT STERILIZATION ON MANGO FRUIT ( <i>Mangifera indica</i> ) PUREE AND EFFECTS TOWARDS CANCER TREATMENT <i>Azura Amid, Irwandi Jaswir and Muhd. Ezza Faiez Othman</i>	25
CHAPTER 5	DETERMINATION OF OPTIMAL RANGE OF POST-INDUCTION TEMPERATURE FOR PRODUCTION OF SOLUBLE RECOMBINANT BROMELAIN IN <i>Escherichia coli</i> USING ONE-FACTOR-AT-A-TIME (OFAT) APPROACH <i>Azura Amid and Jamil Jamaluddin</i>	33
CHAPTER 6	AEROBIC BIODEGRADATION OF OIL AND GREASE IN PALM OIL MILL EFFLUENT USING CONSORTIUM OF MICROORGANISMS <i>Ahmad Tariq Jameel and Alade Abass Olanrewaju</i>	43
CHAPTER 7	WASTEWATER TREATMENT BY IMMOBILISED CELL SYSTEMS <i>Ahmad Tariq Jameel and Alade Abass Olanrewaju</i>	53
CHAPTER 8	BATCH FERMENTATION OF RECOMBINANT <i>Escherichia coli</i> PRODUCING $\beta$ -GLUCURONIDASE USING DIFFERENT CONTROL CONDITION <i>Mohd Ismail Abdul Karim, Hamzah Mohd Salleh and Maizirwan Mel</i>	61
CHAPTER 9	OPTIMIZATION OF PROCESS CONDITION FOR <i>E. coli</i> FERMENTATION PRODUCING NUCLEOCAPSID PROTEIN-AVIAN INFLUENZA VIRUS (NP-AIV) <i>Maizirwan Mel, Md Rashid Shamsuddin, Hamadah Mohd Nur Lubis, Syarifah Syed Hasan and Suriani Mohd Noor</i>	73

CHAPTER 10	CELL DISRUPTION IMPROVEMENT OF <i>E. coli</i> PRODUCING NP-AIV USING HIGH PRESSURE HOMOGENIZER <i>Maizirwan Mel, Mohd Rashid Shamsuddin, Hamadah Mohd Nur Lubis, Sharifah Syed Hasan and Suriani Mohd Noor</i>	79
CHAPTER 11	SEEDS' OIL AS BIOLUBRICANT <i>Mohamed E. S. Mirghani, I. A. Ahmed, N. A. Kabbashi, S. A. Muyibi, J. I. Daoud and M. A. Mikail</i>	85
CHAPTER 12	SPECIAL OIL FROM DATE PALM KERNEL <i>Mohamed Elwathig Saeed Mirghani, Nasereldin A. Kabbashi and Nur Ellyana Mohd Noor</i>	93
CHAPTER 13	GUM ARABIC: A NARRATIVE EMULSIFYING AGENT <i>Mohamed Elwathig Saeed Mirghani, Maizirwan Mel and Fatimah Misran</i>	105
CHAPTER 14	INVESTIGATIONS ON SPIDER HOUSE FOR ANTI MICROBIAL ACTIVITY <i>Mohamed Elwathig Saeed Mirghani and Mohamad Zul Fahmi Zulkifli</i>	117
CHAPTER 15	EVALUATION ON QUALITY OF HEAT RESISTANCE CHOCOLATE <i>Mohamed Elwathig Saeed Mirghani and Maan Fahmi Al- Khatib</i>	129
CHAPTER 16	ANTIMICROBIAL PROPERTY OF DATE SEED EXTRACT <i>Mohamed E. S. Mirghani, M. A. Mikail, I. A. Ahmed, M. I. Abdul Karim and J. I. Daoud</i>	139
CHAPTER 17	PROCESS IMPROVEMENT OF CONVENTIONAL PALM OIL MILLING: CONTINUOUS COOKER <i>Azlin Azmi, Mageswari Somasundaram and Dzun Jimat</i>	146
CHAPTER 18	FOWL CHOLERA VACCINE PRODUCTION: SCREENING AND OPTIMIZATION OF MEDIA IN SHAKE FLASK CULTURE <i>Maizirwan Mel, Mohd Ismail Abdul Karim, Nor Jannah Yob, Intan Zahrah Samsury, Sharifah Syed Hassan and Akma Nghah Hamid</i>	155
CHAPTER 19	FOWL CHOLERA VACCINE PRODUCTION: PROCESS OPTIMIZATION IN LABORATORY SCALE FERMENTER <i>Maizirwan Mel, Mohd Ismail Abdul Karim, Nor Jannah Yob, Intan Zahrah Samsury, Sharifah Syed Hassan and Akma Nghah</i>	163

CHAPTER 20	PROCESS IMPROVEMENT OF CONVENTIONAL PALM OIL MILLING: DEPULPER <i>Azlin Azmi, Mageswari Somasundaram and Dzun Jimat</i>	169
CHAPTER 21	DIFFUSION-REACTION OF NUTRIENT IN IMMOBILIZED SLAB BIOCATALYST FOR FIRST AND ZERO ORDER REACTIONS <i>Ahmad Tariq Jameel and RM Syibli Milasi</i>	175
CHAPTER 22	DIFFUSION-REACTION OF SUBSTRATE IN CYLINDRICAL IMMOBILIZED BIO-CATALYST <i>Ahmad Tariq Jameel and RM Syibli Milasi</i>	183
CHAPTER 23	DIFFUSION-REACTION OF SUBSTRATE IN IMMOBILIZED SLAB BIOCATALYST FOR MICHAELIS-MENTEN KINETICS <i>Ahmad Tariq Jameel and RM Syibli Milasi</i>	189
CHAPTER 24	FERMENTATION OF BIOETHANOL FROM SAGO STARCH <i>Mohamed Ismail Abdul Karim and Husna Muhammad Nadzri</i>	197
CHAPTER 25	KINETIC STUDY ON VINEGAR PRODUCTION USING STAR FRUIT JUICE <i>Mohamed Ismail Abdul Karim and Noor Izzaida Kamaruddin</i>	203
CHAPTER 26	FERMENTATION OF VINEGAR FROM STAR FRUIT ( <i>Averrhoa carambola</i> ) <i>Mohamed Ismail Abdul Karim, Farah Izora Jasni and Parveen Jamal</i>	207
CHAPTER 27	DESIGN AND DEVELOPMENT OF A LAB SCALE BIOREACTOR FOR HEAT INDUCIBLE ENZYME EXPRESSION SYSTEM <i>Daud Adam, Ahmad Faris Ismail and Hamzah Mohd. Salleh</i>	211
CHAPTER 28	OPTIMIZATION OF PHYTOCHEMICAL ANTIOXIDANTS IN RBD PALM OLEIN DURING FRYING PROCESS <i>Irwandi Jaswir and Mohd Syakirin Sudin</i>	219
CHAPTER 29	OPTIMIZATION OF PROCESS PARAMETERS FOR EXTRACTION OF XANTHINE OXIDASE INHIBITOR (XOI) FROM <i>Lycopersicon esculentum</i> <i>Parveen Jamal, Azura Amid, Rasidi Bahardin and Saiful Mohammad Nizam Azmi</i>	226
CHAPTER 30	PROCESS OPTIMIZATION OF HYDROCOLLOID PRODUCTION FROM SEaweEDS <i>Irwandi Jaswir, Mohd Razi Kodin and Parveen Jamal</i>	237
CHAPTER 31	IMPROVEMENT OF CONVENTIONAL MILLING PROCESS IN PALM OIL PROCESSING: ROTARY FILTER PRESS	245

CHAPTER 32	SCREENING OF FUNGI ON SOLID STATE BIOCONVERSION OF OIL PALM EMPTY FRUIT BUNCH FOR PRODUCTION OF CELLULASE <i>Mohamed Ismail Abdul Karim, Manisya Zauri A. Hamid, Faridah Yusof and Md Zahangir Alam</i>	251
CHAPTER 33	SINGLE STAGE STIRRED TANK BIOREACTOR PRODUCTION OF STAR FRUIT ( <i>Averrhoa carambola</i> ) VINEGAR <i>Mohamed Ismail Abdul Karim, Parveen Jamal and Mohd Nasir Jamaluddin Ab Rahaman</i>	259
CHAPTER 34	TREATMENT OF PALM OIL MILL EFFLUENT USING MICROORGANISMS <i>Mohamed Ismail Abdul Karim, Nurul Aima Daud and Md Zahangir Alam</i>	269
CHAPTER 35	COMPARATIVE STUDY OF BIOREACTORS USED FOR PALM OIL MILL EFFLUENT TREATMENT BASED ON CHEMICAL OXYGEN REMOVAL EFFICIENCIES <i>Ahmad T. Jameel, Suleyman A. Muyibi and Alade A. Olanrewaju</i>	277
CHAPTER 36	EFFECT OF HOMOGENIZATION IN BREAKING PROTEIN-CAROTENOID COMPLEXES FOR RELEASING ACTIVE COMPOUNDS <i>Parveen Jamal, Irwandi Jaswir, Nurhasri Mulyadi Hashim and Saiful Mohammad Nizam Azmi</i>	285
CHAPTER 37	THE USE OF MODIFIED POLYMERIC POLYHIPE AS AN IMMOBILIZED CELL MATRIX <i>Dzun Jimat and Azlin Azmi</i>	297
INDEX		306

## 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

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

#### ABSTRACT

Twelve extracts from four solvents (ethanol, methanol, acetone and distilled water) and three varieties of date palm seeds (Deglet Nour, Biruni and Mixture) were tested in vitro for their antimicrobial activity against two Gram-positive (*Staphylococcus aureus* and *Bacillus subtilis*) and two Gram-negative (*Escherichia coli*, *Pseudomonas aeruginosa*) bacteria species to establish whether or not they have antimicrobial activity. The central composite design was used to investigate the effects of three independent variables (extraction temperature, extraction time and agitation speed) on the dependent variable (inhibition zone). All the twelve extracts of date palm seeds inhibited all the test microorganisms with minimum inhibitory concentration ranging from 10 to 42mg/ml and with minimum bactericidal concentration ranging from 21 to 167mg/ml. Extraction temperature, agitation, and extraction time significantly affected total antimicrobial contents extracted from date seeds.

#### INTRODUCTION

*Phoenix dactylifera*, commonly known as the date palm (Fig. 1), is a palm in the genus *Phoenix*, extensively cultivated for its edible sweet fruit. Due to its long history of cultivation for fruit, its exact native distribution is unknown, but probably originated somewhere in the desert oases of northern Africa, and perhaps also southwest Asia (Jassim, 1995).

Dates of date palm tree (*Phoenix dactylifera* L.) are popular among the population of the Middle Eastern countries. The fruit is composed of a fleshy pericarp and seed which constitutes between 10% and 15% of date fruit weight ( It is a medium-sized tree, 15–25 m tall, often clumped with several trunks from a single root system, but often growing singly as well. The leaves are pinnate, 3–5 m long, with spines on the petiole and about 150 leaflets; the leaflets are 30 cm long and 2 cm broad. The full span of the crown ranges from 6–10 meters (Hamada *et al* , 2002).

Date is dioecious, having separate male and female plants. They can be easily grown from seed, but only 50% of seedlings will be female and hence fruit bearing, and