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
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 Jas wir and Mu hd. Ez za Faiez Oth man

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 AEROBIC 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 Mat zipper wan Mel

CHAPTER 9 OPTIMIZATION OF PROCESS CONDITION FOR E. coli FERMENTATION PRODUCING NUCLEOCAPSID PROTEIN-AVIAN INFLUENZA VIRUS (NP-AIV)
Mat zipper wan Mel, Md Rashid Shamsuddin, Hamadah Mohd Nur Lubis, Syarifah Syed Hasan and Suriani Mohd Noor
<table>
<thead>
<tr>
<th>CHAPTER 10</th>
<th>CELL DISRUPTION IMPROVEMENT OF <em>E. coli</em> PRODUCING NP-AIV USING HIGH PRESSURE HOMOGENIZER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maizirwan Mel, Mohd Rashid Shamsuddin, Hamadah Mohd Nur Lubis, Sharifah Syed Hasan and Suriani Mohd Noor</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 11</td>
<td>SEEDS’ OIL AS BILUBRICANT</td>
</tr>
<tr>
<td>Mohamed E. S. Mirghani, I. A. Ahmed, N. A. Kabbashi, S. A. Muyibi, J. I. Daoud and M. A. Mikhail</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 12</td>
<td>SPECIAL OIL FROM DATE PALM KERNEL</td>
</tr>
<tr>
<td>Mohamed Elwathig Saeed Mirghani, Nasereldin A. Kabbashi and Nur Ellyana Mohd Noor</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 13</td>
<td>GUM ARABIC: A NARRATIVE EMULSIFYING AGENT</td>
</tr>
<tr>
<td>Mohamed Elwathig Saeed Mirghani, Maizirwan Mel and Fatimah Misran</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 14</td>
<td>INVESTIGATIONS ON SPIDER HOUSE FOR ANTI MICROBIAL ACTIVITY</td>
</tr>
<tr>
<td>Mohamed Elwathig Saeed Mirghani and Mohamad Zul Fahmi Zulkifli</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 15</td>
<td>EVALUATION ON QUALITY OF HEAT RESISTANCE CHOCOLATE</td>
</tr>
<tr>
<td>Mohamed Elwathig Saeed Mirghani and Maan Fahmi Al-Khatib</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 16</td>
<td>ANTIMICROBIAL PROPERTY OF DATE SEED EXTRACT</td>
</tr>
<tr>
<td>Mohamed E. S. Mirghani, M. A. Mikail, I. A. Ahmed, M. I. Abdul Karim and J. I. Daoud</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 17</td>
<td>PROCESS IMPROVEMENT OF CONVENTIONAL PALM OIL MILLING: CONTINUOUS COOKER</td>
</tr>
<tr>
<td>Azlin Azmi, Mageswari Somasundaram and Dzun Jimat</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 18</td>
<td>FOWL CHOLERA VACCINE PRODUCTION: SCREENING AND OPTIMIZATION OF MEDIA IN SHAKE FLASK CULTURE</td>
</tr>
<tr>
<td>Maizirwan Mel, Mohd Ismail Abdul Karim, Nor Jannah Yob, Intan Zahrah Samsury, Sharifah Syed Hassan and Akma Ngah Hamid</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 19</td>
<td>FOWL CHOLERA VACCINE PRODUCTION: PROCESS OPTIMIZATION IN LABORATORY SCALE FERMENTER</td>
</tr>
<tr>
<td>Maizirwan Mel, Mohd Ismail Abdul Karim, Nor Jannah Yob, Intan Zahrah Samsury, Sharifah Syed Hassan and Akma Ngah</td>
<td></td>
</tr>
</tbody>
</table>
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
Irwandi 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
Irwandi Jaswir, Mohd Razi Kodin and Parveen Jamal

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

iv
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

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

ABSTRACT

Kenaf (Hibiscus cannabinus) is composed of various active components including tannins, polyphenolics, alkaloids, essential oils and steroids. In this study, kenaf seeds oil was used as a material in observing the anticancer activity on MCF-7 cancer cell line and finding the optimum parameter to extract the oil that give the highest anticancer activity. Kenaf variety Khon kaen seeds were extracted using Supercritical Fluid Extractor (SFE). The extraction was done at the different level of temperature and pressure which range from 40 to 80°C and 200 to 600 bars respectively. Among these two parameters, temperature shows the highest impact on the percentage viability of MCF-7 breast cancer cell line. All the oils were cytotoxic towards MCF-7 breast cancer cell line in dose dependent manner as detected using the SRB assay. Kenaf seeds oil extracted from SFE at temperature of 40°C and pressure of 400 bars was the most cytotoxic towards MCF-7 breast cancer cell line with the IC₅₀ value of 321.43 μg/ml.

Key words: anticancer, Kenaf seeds oil, MCF-7 cell line, Supercritical Fluid Extractor (SFE)

INTRODUCTION

Kenaf (Hibiscus cannabinus) from the family of Malvaceae is a valuable fibre plant native to India and Africa. Kenaf is composed of various active components including tannins, polyphenolics, alkaloids, essential oils and steroids. Since many years ago, kenaf has been used as cordage (any type of rope or string made by twisting fibers together) crop and secondarily as a livestock feed (Charles, Webber, & Venita, 2002). Charles (2002) reported that kenaf plant is composed of multiple useful components such as stalks, leaves, and seeds. Each of these components contains various usable portions, for examples, fibers and fiber strands, proteins, oils and allelopathic chemicals.