

# CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME I

Editors:

Suleyman Aremu Muyibi  
Mohammed Saedi Jami  
Zaki Zainudin



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*(VOLUME I)*

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



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## CHAPTER 8

### DEVELOPMENT OF RAPID ENZYMATIC PROCESS FOR ACID OIL PRODUCTION FROM SLUDGE PALM OIL

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#### ABSTRACT

Production of acid oil was conducted by utilizing sludge palm oil, with the aid of *Candida cylindracea* lipase through hydrolysis reaction. The sludge oil was found to have 41.7% FFA, 0.82% moisture, 0.185% impurities, 0.448 DOBI and 69.47 ppm carotene content. The statistical optimization was carried out by central composite design (CCD) using four factors (enzyme concentration, temperature, agitation, reaction time) at five different levels to evaluate the polynomial regression model through the effect of linear, quadratic and interaction of the factors. High percentage of FFA was observed at 758.4 U of enzyme concentration, 50°C, 300 rpm for 110 min which was 71.12%. In consequence, validation studies had been conducted and figured out that higher percentage of FFA (72.8%) could be produced at 1264U of enzyme concentration, 50°C, 250 rpm for 90 min. It can be concluded that among all the parameters, enzyme concentration and reaction time determine the final percentage of FFA up to a certain limit.

**Keywords:** acid oil, sludge palm oil, *candida cylindracea*, free fatty acid (FFA)

#### INTRODUCTION

Palm oil industry is developing throughout the world. The industry has become one of the largest economic sources in Malaysia. Tang (2000) mentioned that sludge oil refers to the low quality oils obtained during crude palm oil (CPO) production from the sterilizer condensate, sludge separator in the clarification station, tank sediments during tank cleaning and effluent ponds.

It was estimated that if the extraction rate of a palm oil mill plant is 40 tonnes per hour, then sludge oil that can be recovered during the extraction process is about 0.65% of the CPO produced (Corley and Tinker, 2003). At present, the sludge oil has been sold as a low grade oil due to its low quality. Thus, due to a very good demand and wide usage of acid oil in industries, the enzymatic hydrolysis technique can be applied to increase the free fatty acid content of sludge oil to more than 80%. In parallel, with the increment of free fatty acid content, the price of the sludge oil will be increased. Enzymatic hydrolysis has been found to increase the free fatty acid contents of several oils such as olive oil (Sokolovska et al., 2000),