

EFFECT OF LIPASE SPECIFICITY ON THE
TRANSESTERIFICATION OF PALM OLEIN WITH
COD LIVER OIL

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FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
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EFFECT OF LIPASE SPECIFICITY ON THE TRANSESTERIFICATION OF
PALM OLEIN WITH COD LIVER OIL

By

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**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **EFFECT OF LIPASE SPECIFICITY ON THE TRANSESTERIFICATION OF PALM OLEIN WITH COD LIVER OIL** oleh **ABDUL RAHMAN BIN HASIM** No. Matrik **UK 6550** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains, Sains Biologi, Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

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LIST OF ABBREVIATIONS

EPA	Eicosapentanoic acid
HPLC	High performance liquid chromatography
GC	Gas chromatography
PO	Palm olein
CLO	Cod liver oil
RBD	Refined, bleached and deodorized
DHA	Docosahexanoic acid
FFA	Free fatty acid
DAD	Diode array detector
DoH	Degree of hydrolysis
DoT	Degree of transesterification
rpm	Rotations per minute

ABSTRACT

The effect of lipase specificity on transesterification of palm olein with cod liver oil was studied using 5 different lipases from *Rhizomucor miehei*, *Aspergillus niger*, *Pseudomonas fluorescens*, wheat germ and Amano lipase PS-C 1. The transesterification reaction was carried out at 60°C and 200 rpm for 6 hours in water-saturated hexane. Each lipases catalytic performance was appraised by determining the changes in peak composition and concentrations using Reversed-Phase High Performance Liquid Chromatography (RP-HPLC) as well as calculated degree of hydrolysis (DoH) and degree of transesterification (DoT). It was possible to blend palm olein with cod liver oil due to the mixture of peaks observed on the HPLC profile of blend compared to the unblended oils. Four new peaks namely Peak 3, 7, 9 and 10 were produced by lipases from *R. miehei*, *A. niger*, *P. fluorescens* and wheat germ. At least one new peak (Peak 7) was produced during transesterification in all lipases except for Amano lipase. Highest increase in concentration for Peak 1 and Peak 4 was displayed by *P. fluorescens*. The calculated DoH and DoT showed that *R. miehei* gave the highest DoH with 3.18% while *P. fluorescens* lipase gave the highest DoT with 11.48%. The DoH for Amano lipase PS-C 1, *A. niger*, *P. fluorescens* and wheat germ lipases were 2.56%, 0.20%, 0.14% and 0.09%, respectively. DoT for Amano lipase PS-C 1, *A. niger*, *R. miehei*, and wheat germ lipases were 9.78%, 8.67%, 7.91% and 2.32%, respectively. In this study, it can be concluded that *P. fluorescens* lipase to be most suitable for transesterification because of its highest DoT and low DoH.

KESAN SPESIFISITI LIPASE TERHADAP TRANSESTERIFIKASI OLEIN KELAPA SAWIT DENGAN MINYAK HATI IKAN KOD

ABSTRAK

Kesan spesifisiti lipase terhadap transesterifikasi olein kelapa sawit dengan minyak hati ikan kod dikaji menggunakan 5 jenis lipase dari *Rhizomucor miehei*, *Aspergillus niger*, *Pseudomonas fluorescens*, germa gandum dan Amano lipase PS-C 1. Selepas tindak balas transesterifikasi, setiap tindak balas lipase dinilai berdasarkan perubahan di dalam komposisi dan kepekatan puncak menggunakan RP-HPLC dan juga dari pengiraan darjah hidrolisis (DoH) dan darjah transesterifikasi (DoT). Empat puncak baru berlabel Puncak 3, 7, 9 dan 10 telah dihasilkan oleh lipase daripada *R. miehei*, *A. niger*, *P. fluorescens* dan germa gandum. Sekurang-kurangnya satu puncak baru (Puncak 7) dihasilkan semasa transesterifikasi oleh semua lipase kecuali Amano lipase. Peningkatan kepekatan tertinggi untuk Puncak 1 dan 4 dapat dilihat pada *P. fluorescens*. Melalui pengiraan, didapati lipase daripada *R. miehei* mempunyai nilai DoH tertinggi iaitu 3.18% diikuti dengan Amano lipase PS-C 1 (2.56%), lipase dari *A. niger* (0.20%), *P. fluorescens* (0.14%) dan germa gandum (0.14%) manakala lipase daripada *P. fluorescens* menunjukkan nilai DoT tertinggi iaitu 11.48% diikuti dengan Amano lipase PS-C 1 (9.78%), *A. niger* (8.67%), *R. miehei* (7.91%), dan germa gandum (2.32%). Dalam kajian ini, *P. fluorescens* dikenalpasti sebagai lipase yang paling sesuai untuk transesterifikasi berdasarkan nilai DoT tertinggi dan nilai DoH yang rendah.