

EFFECT OF LIPASE SPECIFICITY ON TRANSESTERIFICATION
OF SUNFLOWER OIL WITH COD LIVER OIL

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EFFECT OF LIPASE SPECIFICITY ON TRANSESTERIFICATION OF
SUNFLOWER OIL WITH COD LIVER OIL

By

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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:
EFFECT OF LIPASE SPECIFICITY ON TRANSESTERIFICATION OF SUNFLOWER OIL
WITH COD LIVER OIL

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LIST OF ABBREVIATIONS

DoH	Degree of hydrolysis
DoT	Degree of transesterification
ALA	Alpha-linolenic acid
CLO	Cod liver oil
DHA	Docosahexanoic acid
EPA	Eicosapentanoic acid
FFA	Free fatty acid
GRAS	Generally Recognized as Safe
HPLC	High Performance Liquid Chromatography
MAG	Monoacylglycerol
n-6	Omega 6
NaOH	Sodium hydroxide
OLL	Oleodilinolein
PLL	Palmito-dilinolein
PUFA	Polyunsaturated fatty acid
revmin ⁻¹	Revolution per minutes
TG	Triglyceride

ABSTRACT

The effect of lipase specificity on transesterification of sunflower oil with cod liver oil was studied. The lipases used were from: *Aspergillus niger*, *Pseudomonas fluorescens*, Amano Lipase PS-C1, *Rhizomucor miehei* and wheat germ. Transesterification reaction was carried out at 60°C and 200 rpm for 6 hours using hexane as medium. The catalytic performance of each lipases were appraised by determining the changes in peak composition and concentration by Reversed Phase High Performance Liquid Chromatography (RP- HPLC) and the calculated degree of hydrolysis (DoH) and degree of transesterification (DoT). Blending of sunflower oil with cod liver oil was possible due to its mixture of peaks observed on the HPLC profile of blend compared to the unblended oils. Peaks 1, 2, 3 and 6 were observed to increase in concentration after transesterification with *A. niger* lipase. *R. miehei* produced an increase in the concentration of Peaks 1, 2 and 6. Concentration of Peaks 1, 2, 6 and 9 were increased when *P. fluorescens* lipase was used. Lipases from Amano Lipase PS-C1 showed an increase in Peaks 5, 6 and 9 and wheat germ lipase only in Peak 6. New peaks (i.e Peaks 4, 7 and 10) were formed when the oil blend was transesterified with *R. miehei*. Wheat germ and *P. fluorescens* lipases have shown new peaks, Peaks 7 and 8, respectively. No new peak was formed for *A. niger* lipase. The calculated DoT and DoH showed *R. miehei* gave the highest percentage of DoT and DOH with 31.10% and 1.42%, respectively. DoH for Amano Lipase PS-C1, *P. fluorescens*, wheat germ and *A. niger* was 1.20%, 0.16%, 0.120% and 0.04%, respectively. DoT for *A. niger*, wheat germ, Amano Lipase PS-C1 and *P. fluorescens* was 22.77%, 19.81%, 10.51% and 7.46% respectively. It can be concluded that for this study, *A. niger* lipase was the best catalyst that can be used.

KESAN SPESIFISITI LIPASE KE ATAS TRANSESTERIFIKASI MINYAK BUNGA MATAHARI DAN MINYAK HATI IKAN KOD

ABSTRAK

Kesan spesifisiti lipase ke atas transesterifikasi minyak bunga matahari dan minyak hati ikan kod dikaji. Lipase yang digunakan adalah daripada *Aspergillus niger*, *Rhizomucor miehei*, *Pseudomonas fluorescens*, Amano Lipase PS-C1, dan germa gandum. Tindak balas transesterifikasi dijalankan pada suhu 60°C dan 200 rpm selama enam jam menggunakan heksana sebagai medium. Prestasi pemangkin setiap lipase dinilai dengan menentukan perubahan komposisi dan kepekatan puncak melalui Kromatografi Cecair Berprestasi Tinggi Fasa Terbalik (RP-HPLC), pengiraan kadar hidrolisis (DoH) dan kadar transesterifikasi (DoT). Campuran minyak bunga matahari dan minyak hati ikan kod boleh dilakukan kerana campuran puncak dilihat pada profail HPLC minyak yang dicampur dan tidak dicampur. Kepekatan Puncak 1, 2, 3 dan 6 meningkat selepas ditransesterifikasi dengan lipase *A. niger*. *R. miehei* menghasilkan peningkatan kepekatan Puncak 1, 2 dan 6. Kepekatan Puncak 1, 2, 6 dan 9 meningkat apabila lipase *P. fluorescens* digunakan. Amano Lipase PS-C1 menunjukkan peningkatan Puncak 5, 6 dan 9 dan lipase germa gandum hanya Puncak 6. Puncak baru 4, 7 dan 10 terhasil apabila *R. miehei* digunakan. Germa gandum dan *P. fluorescens* menunjukkan Puncak baru 7 dan 8. Tiada puncak baru terbentuk untuk *A. niger*. DoT dan DoH yang dikira menunjukkan *R. miehei* memberikan DoT dan DoH tertinggi iaitu 31.10% dan 1.42%. DoH untuk Amano Lipase PS-C1, *P. fluorescens*, germa gandum dan *A. Niger* masing-masing ialah 1.20%, 0.16%, 0.12% dan 0.04%. DoT untuk *A. niger*, germa gandum, Amano Lipase PS-C1 dan *P. fluorescens* masing-masing 22.77%, 19.81%, 10.51% dan 7.46%. Kesimpulannya, bagi kajian ini, *A. niger* adalah pemangkin terbaik yang boleh digunakan.