

THE EFFECT OF LEASE OF FIGHT WITH ANTERIOR PREDICATION
OF GIVE ON WITH GOD LIVER

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THE EFFECT OF LIPASE SPECIFICITY ON TRANSESTERIFICATION OF
OLIVE OIL WITH COD LIVER

By

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT	ii
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	x
ABSTRAK	xi
CHAPTER 1 INTRODUCTION	1
CHAPTER 2 LITERATURE REVIEW	
2.1 Olive oil	4
2.1.1 Composition of olive oil	5
2.1.3 Nutritional value of olive oil	6
2.2 Cod liver oil	7
2.2.1 Definition and composition of cod liver oil	7
2.2.2 Nutritional value of cod liver oil	8
2.3 Lipases	10

2.3.1	Lipase specificity	11
2.3.3	Lipase in organic solvents	12
2.3.4	Application of lipase	13

CHAPTER 3 METHODOLOGY

3.1	Materials	14
3.2	Methods	15
3.2.1	Transesterification reaction	15
3.2.2	Effect of different lipase specificity	15
3.2.2	Free fatty acids (FFA) removal	15
3.2.3	Reversed-phase High Performance Liquid Chromatography (RP-HPLC) analysis	16

CHAPTER 4 RESULTS

4.1	HPLC profile of unblended olive oil, unblended cod liver oil and olive oil: cod liver oil (1:1) blend	18
4.2	Effect of lipase specificity on transesterification of olive oil : cod liver oil (1:1) blend	23

CHAPTER 5 DISCUSSION

5.1	HPLC profile of unblended olive oil, unblended cod liver oil and olive oil: cod liver oil (1:1) blend	32
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5.2	Effect of lipase specificity on transesterification of olive oil: cod liver oil (1:1) blend	33
CHAPTER 6	CONCLUSION	36
	REFERENCES	37
	CURICULUM VITAE	41

LIST OF TABLES

Table		Page
4.1	Percentage concentration of peaks observed on HPLC profile of unblended olive oil (OO), unblended cod liver oil (CLO) and olive oil: cod liver oil (OO: CLO) (1:1)blend	22
4.2	Percentage concentration of peaks observed on HPLC profile of non-transesterified olive oil: cod liver oil (1:1) blend and transesterified olive oil: cod liver oil (1:1) blend using different lipases	30

LIST OF FIGURES

Figure		Page
4.1	HPLC profile of unblended olive oil	19
4.2	HPLC profile of unblended cod liver oil	20
4.3	HPLC profile of olive oil: cod liver oil (1:1) blend	21
4.4	HPLC profile of OO: CLO (1:1) blend	24
4.5	HPLC profile of olive oil: cod liver oil (1:1) transesterified using <i>Rhizomucor miehei</i> lipase	25
4.6	HPLC profile of olive oil: cod liver oil (1:1) transesterified using Amano lipase PS-C1	26
4.7	HPLC profile of olive oil: cod liver oil (1:1) transesterified using <i>Pseudomonas fluorescens</i> lipase	27
4.8	HPLC profile of blending olive oil and cod liver oil (1:1) transesterified using <i>Aspergillus niger</i> lipase	28
4.9	HPLC profile of blending olive oil: cod liver oil (1:1) transesterified using wheat germ lipase	29

LIST OF ABBREVIATIONS

ALA	Alpha-linolenic acid
AOM	Active oxygen method
CLO	Cod liver oil
DAD	Diode array detector
DHA	Docosahexanoic acid
DoH	Degree of hydrolysis
DoT	Degree of transesterification
EPA	Eicosapentanoic acid
FFA	Free fatty acid
GRAS	Generally Recognized as Safe
HPLC	High Performance Liquid Chromatography
MAG	Monoacylglycerol
n-6	Omega 6
n-3	Omega 3
NaOH	Sodium hydroxide
OO	Olive oil
PUFA	Polyunsaturated fatty acid
revmin ⁻¹	Revolution per minutes
TG	Triglyceride

w/v

Weight per volume

KESAN SPESIFISITI ENZIM TERHADAP TRANSESTERIFIKASI MINYAK ZAITUN DENGAN MINYAK IKAN KOD

ABSTRAK

Kesan spesifisiti enzim terhadap transesterifikasi minyak zaitun dengan minyak ikan kod telah dikaji. Enzim yang telah digunakan adalah seperti *Rhizomucor miehei*, *Pseudomonas fluorescens*, *Aspergillus niger*, Amano lipase PS-C1 dan wheat germ. Tindak balas dilakukan pada suhu 60⁰C dan 200 rpm selama 6 jam. Penentuan luas bagi puncak tiap-tiap graf dilakukan dengan menggunakan HPLC. Daripada keputusan yang didapati, profil bagi luas puncak tiap- tiap graf adalah tinggi apabila minyak ikan kod dan minyak zaitun ditransesterifikasikan dan ini berbeza dengan minyak zaitun dan minyak ikan kod yang tidak dicampur bersama dan tidak dijalankan proses transesterifikasi. Keputusan yang didapati daripada proses transesterifikasi tersebut, campuran minyak zaitun dengan minyak ikan kod dengan menggunakan enzim Amano lipase PS-C1 menghasilkan lapan puncak, *Pseudomonas florescens* dengan lima puncak, *Aspergillus niger* menghasilkan tujuh puncak, campuran minyak zaitun dan minyak ikan kod dengan menggunakan enzim *Rhizomucor miehei* menghasilkan enam puncak dan enzim wheat germ menghasilkan tujuh puncak. Nilai DoT dan DoH dikira bagi setiap enzim. Nilai DoH tertinggi telah dikira didalam *Rhizomucor miehei* dengan 2.72% diikuti dengan Amano lipase PS-C1 dengan 1.64%; *Pseudomonas flourescens* 0.16% , *Aspergillus niger* dengan 0.14% serta wheat germ 0.02%.

Manakala nilai DoT yang tertinggi adalah *Rhizomucor miehei* dengan 63.74%, diikuti oleh wheat germ dengan 42.45%; *Pseudomonas flourescens* lipase 20.34%; Amano lipase PS-C1 19.45% dan *Aspergillus niger* dengan 3.29%. Enzim yang palaing berkesan dalam proses transesterikasi ini adalah enzim *Rhizomucor miehei*.

ABSTRACT

The effect of lipase specificity on the transesterification of olive oil with cod liver oil was studied. The lipases were from *Rhizomucor miehei*, *Pseudomonas fluorescens*, Amano lipase PS-C1, *Aspergillus niger* and wheat germ. Transesterification reaction was carried out at 60°C and 200 rpm for 6 hours. Analyses of peak concentrations were carried out using Reversed- Phase High Performance Liquid Chromatography (RP-HPLC). The degree of hydrolysis (DoH) and degree of transesterification (DoT) for each lipases were also calculated. From the results, the profile of peak concentration was high when cod liver oil and olive oil blend were transesterified compared to non- transesterified of unblended olive oil and cod liver oil. *Pseudomonas fluorescens* show five peaks, Amano lipase show eight peaks, *Aspergillus niger* show seven peaks, *Rhizomucor miehei* show six peak and wheat germ show seven peaks. DoH and DoT was calculated for each lipase. The highest DoH was calculated in *Rhizomucor miehei* lipase with 2.72% followed by Amano lipase lipase with 1.64%; *Pseudomonas fluorescens* with 0.16%, *Aspergillus niger* 0.14% and wheat germ lipase with 0.02%. The highest DoT was also calculated in *Rhizomucor miehei* lipase with 63.74%, followed by wheat germ lipase with 42.45%; *Pseudomonas fluorescens* 20.34%, Amano lipase PS-C1 with 19.45% and *Aspergillus niger* lipase with 3.29%. The most suitable lipase that catalyzed the transesterification was *Rhizomucor miehei*.