

**NEW PALM OIL PRODUCTS BY ENZYMATIC  
INTERESTERIFICATION AND DRY FRACTIONATION**

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**A DISSERTATION SUBMITTED IN FULFILMENT OF THE  
REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE**

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FACULTY OF SCIENCE  
UNIVERSITY OF MALAYA  
KUALA LUMPUR**

**2010**

## **ACKNOWLEDGEMENTS**

Hereby, I wish to express my warm and sincere thanks to Prof. Dr. Chuah Cheng Hock, my supervisor from University of Malaya for his valuable advice, great support and constant guidance throughout this study. I would also like to express my great gratitude to Dr. Siew Wai Lin from Malaysian Palm Oil Board, the consultant of this research project, who gave me the important guidance, advice, and great support for leading me into this area of work.

Last but not least, I would like to thank and dedicate this work to my family members, especially my parents, and my husband Say Hooi for their loving support, encouragement and understanding. Thank you to be so supportive to me.

## ABSTRACT

Palm olein is one of the major palm oil products that domestically and industrially used as cooking or frying oil. Palm olein tends to crystallize at low temperature that limits its usage in temperate countries. In spite of various nutritional studies, palm olein is also not well considered as recommended choice due to its higher saturation content. Against these factors, there is a need to reduce its saturation content.

In this study, the saturation content in palm olein was reduced through the combination of enzymatic interesterification and dry fractionation. Enzymatic interesterification allows interchanging of acyl groups between and within triacylglycerols (TAG) molecules, specifically at *sn*-1 and -3 positions to form new TAG species such as triunsaturated (mainly OLL, OLO, and OOO) and trisaturated TAG (PPP and PPS). The high melting trisaturated TAG can facilitate the crystallization of the interesterified palm olein, and easily removed as stearin fraction during fractionation process.

Two *sn*-1,3 specific immobilized lipases; Lipozyme® TL IM (*Thermomyces Lanuginosa*) and Lipozyme® RM IM (*Rhizomucor Miehei*) were selected as biocatalysts for interesterification in solvent-free system. The pilot-scale enzymatic interesterification using packed-bed Lipozyme® TL IM produced the greatest amount of trisaturated TAG (5.5%), followed by 5%w/w of Lipozyme® TL IM in batch reaction (4.5%) and 2%w/w of Lipozyme® RM IM in batch reaction (1.9%). The enzymatic interesterification with combination of dry fractionation had successfully reduced the saturation content of palm olein IV 62 from 41.7% to 33.3%, and 33.9%, 36.5% through packed-bed TLIM, batch

TLIM, and batch RMIM, respectively. The IV was increased from 62.0 to 70.7 for batch TLIM and packed-bed TLIM olein products, and 67.4 for batch RMIM olein product.

## ABSTRAK

Minyak sawit olein adalah produk yang penting daripada minyak sawit, ia sering digunakan sebagai minyak masak secara domestik dan juga dalam industri. Minyak sawit olein senang menjadi beku pada suhu yang rendah, ini telah menghadkan kegunaannya dalam negara-negara bercuaca sejuk. Minyak sawit olein juga jarang dipertimbangkan sebagai pilihan utama disebabkan oleh kandungan ketepuan yang lebih tinggi berbanding dengan minyak sayuran yang lain. Disebabkan oleh factor-faktor ini, ketepuan dalam minyak sawit olein harus direndahkan.

Dalam kajian ini, ketepuan dalam minyak sawit olein telah direndahkan melalui interesterifikasi dengan menggunakan enzim, diikuti dengan proses pemeringkatan kering. Enzimik interesterifikasi membenarkan saling pertukaran kumpulan asil di dalam dan di antara molekul trigliserida. Tindakbalas enzimik adalah *sn*-1 dan *sn*-2 spesifik dan spesies trigliserida yang baru seperti trigliserida tri-taktepu (OLL, OLO dan OOO) dan juga trigliserida tri-tepu (PPP dan PPS) boleh dihasilkan. Trigliserida tri-tepu yang mempunyai takat lebur yang tinggi dan boleh mendorong pembentukan cristal, dan ia boleh dipisahkan dengan mudah sebagai stearin dalam proses pemeringkatan.

Dua enzim immobilized yang *sn*-1,3 spesifik; Lipozyme® TL IM (*Thermomyces Lanuginosa*) dan Lipozyme® RM IM (*Rhizomucor Miehei*) telah digunakan dalam kajian ini. Enzimik interesterifikasi berterusan (packed-bed enzymatic interesterification) dalam skala loji rintis telah menghasilkan amount trigliserida tri-tepu yang paling tinggi (5.5%), diikuti oleh enzimik interesterifikasi kelompok (batch enzymatic interesterification) dengan

menggunakan 5% w/w Lipozyme® TL IM (4.5%) dan 2% w/w Lipozyme® RM IM (1.9%). Selepas proses pemeringkatan dalam memisahkan komponen yang tepu ini, kandungan tepu dalam minyak sawit olein IV 62 telah berjaya dikurangkan daripada 41.7% kepada 33.3%, 33.9%, dan 36.5%, menerusi interesterifikasi berterusan TLIM, interesterifikasi kelompok TLIM, dan interesterifikasi kelompok RMIM secara masing-masing. Nilai iodin juga telah ditingkatkan daripada 62.0 kepada 70.7 bagi proses interesterifikasi kelompok dan berterusan TLIM, serta 67.4 bagi interesterifikasi kelompok RMIM.

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