

**SYNTHESIS OF FATTY ACID MONOGLYCERIDES FROM PALM OIL
BY GLYCEROLYSIS WITH PROTECTED GLYCEROL**



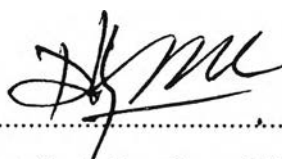
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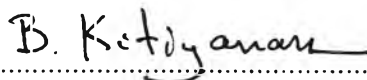
Thesis Title: Synthesis of Fatty Acid Monoglycerides from Palm Oil by Glycerolysis with Protected Glycerol
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Program: Petrochemical Technology
Thesis Advisors: Asst. Prof. Boonyarach Kitiyanan
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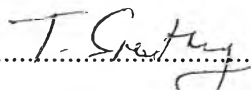
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ABSTRACT

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Ms. Kanyanida Makkam: Synthesis of Fatty Acid Monoglycerides
from Palm Oil by Glycerolysis with Protected Glycerol

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Fatty acid monoglycerides are used as emulsifiers in the food, cosmetics, and detergents industries. Conventional routes of monoglyceride production are the direct esterification of glycerol with fatty acids or the transesterification of triglycerides. Since glycerol has three hydroxyl groups, the higher esters, such as diglycerides and triglycerides can also be simultaneously produced. To selectively produce monoglycerides, the protected glycerol having only one hydroxyl group available for transesterification is used instead of glycerol. Initially, two adjacent OH groups in glycerol are converted to the isopropylidene group; then the protected glycerol will be used in transesterification with triglycerides. Subsequently, the resulting monoglycerides will be deprotected. The products are identified by Fourier-Transform Infrared Spectroscopy (FT-IR) and High Performance Liquid Chromatography (HPLC) with an ultraviolet detector. As expected, the very high selectivity towards monoglycerides is obtained when the protected glycerol was utilized. The influence of protected glycerol to refine palm oil mass ratio and transesterification temperature on protected monoglycerides were also investigated. It observed that the protected monoglycerides content increased with the increasing mass ratio of protected glycerol to refined palm oil while other undesired esters content decrease. Furthermore, the protected monoglycerides selectivity increases with transesterification temperature.

บทคัดย่อ

นางสาว กัญชนิศา มากคำ: การสังเคราะห์แผลดีแอสิดโมโนกลีเซอไรด์จากปฏิกริยากลีเซอรอลไล-
ซิสระหว่างน้ำมันปาล์มกับโพรเทคกลีเซอรอล (Synthesis of Fatty Acid Monoglycerides by
Glycerolysis of Palm Oil with Protected Glycerol) อ.ที่ปริกษา: ผศ. ดร. บุญรัชต์ กิตติยานันท์
และอ.ที่ปริการ่วม: ศ. มาซาฮิโกะ อาเบะ 58 หน้า

แผลดีแอสิดโมโนกลีเซอไรด์ เป็นผลลิตภณที่กิดมาจากการทำปฏิกริยาทรานส์เอสเทอริฟิเคชัน
หรือกลีเซอรอลไลซิสระหว่างกลีเซอรอลกับไตรกลีเซอไรด์และสารอนุพันธ์ อย่างไรก็ตามในการ
สังเคราะห์แผลดีแอสิดโมโนกลีเซอไรด์ด้วยปฏิกริยาดังกล่าว นอกจากจะมีแผลดีแอสิดโมโนกลี-
เซอไรด์เป็นผลลิตภณหลักแล้ว ยังมีผลลิตภณร่วมที่ไม่พึงประสงค์อื่นด้วย เช่น ไคกลีเซอไรด์
ไตรกลีเซอไรด์ วัตถุประสงค์ของงานศึกษานี้คือ การสังเคราะห์แผลดีแอสิดโมโนกลีเซอไรด์อย่าง
มีความเลือกสรรสูง ผ่านปฏิกริยากลีเซอรอลไลซิส ระหว่างน้ำมันปาล์ม (แหล่งกำเนิดไตรกลีเซอ-
ไรด์) กับ โพรเทคกลีเซอรอล ซึ่งเป็นอนุพันธ์ของกลีเซอรอล งานศึกษานี้จะแบ่งกระบวนการ
ศึกษาออกเป็น 3 ขั้นตอน โดยขั้นแรกคือการสังเคราะห์โพรเทคกลีเซอรอล ผ่านปฏิกริยาอะซิโด-
เนชันของกลีเซอรอลกับอะซิโดนเพื่อเปลี่ยนหมู่ไฮดรอกซีสองหมู่ที่อยู่ใกล้กันให้กลายเป็นหมู่ไอ-
โซโพรพิลิตินซึ่งจะไม่เกิดปฏิกริยากับไตรกลีเซอไรด์ หลังจากโพรเทคกลีเซอรอลผ่านการทำให้
บริสุทธิ์แล้วจะถูกนำไปใช้ในขั้นตอนที่สอง ซึ่งก็คือปฏิกริยากลีเซอรอลไลซิสกับไตรกลีเซอไรด์
จากน้ำมันปาล์มโดยใช้ตัวเร่งปฏิกริยาที่มีฤทธิ์เป็นด่างแบบเอกพันธ์ (โซเดียมไฮดรอกไซด์) ซึ่ง
ผลลิตภณที่ต้องการในขั้นนี้คือ โพรเทคแผลดีแอสิดโมโนกลีเซอไรด์ นอกจากนี้ยังมีการศึกษาผล
ของตัวแปรอื่น ได้แก่ อัตราส่วนโดยโมลระหว่างโพรเทคกลีเซอรอลและน้ำมันปาล์ม และ
อุณหภูมิในการทำปฏิกริยา จากการศึกษาพบว่าอัตรา ส่วนที่เหมาะสมที่สุดในการให้ผลลิตของ
โพรเทคแผลดีแอสิดโมโนกลีเซอไรด์มากที่สุด(88.8%) คืออัตราส่วน 17:1 ภายใต้อุณหภูมิใน
การทำปฏิกริยา 180 องศาเซลเซียส จากนั้นนำโพรเทคแผลดีแอสิดโมโนกลีเซอไรด์ที่ได้จาก
ขั้นตอนกลีเซอรอลไลซิส จะถูกนำไปใช้ในขั้นตอนสุดท้าย ซึ่งก็คือการแทนที่หมู่ไอโซโพรพิล-
ิตินบนสายโซ่โพรเทคแผลดีแอสิดโมโนกลีเซอไรด์ด้วยหมู่ไฮดรอกซี 2 หมู่ผ่านปฏิกริยาเอทา-
นอลไลซิส โดยใช้ตัวเร่งปฏิกริยาที่มีฤทธิ์เป็นกรดแบบวิวิธพันธ์ (ดาวเว็กซ์ เอ็ม-41) ซึ่งจาก
การศึกษาพบว่าโพรเทคแผลดีแอสิดโมโนกลีเซอไรด์ถูกเปลี่ยนเป็นแผลดีแอสิดโมโนกลีเซอไรด์
ลิตเป็น 65.8%

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TABLE OF CONTENTS

		PAGE
	Title Page	i
	Abstract (in English)	iii
	Abstract (in Thai)	iv
	Acknowledgement	v
	Table of Contents	vi
	List of Tables	vii
	List of Figures	x
CHAPTER		
I	INTRODUCTION	1
II	THEORITICAL BACKGROUND AND LITERATURE REVIEW	2
III	EXPERIMENTAL	21
	3.1 Materials	21
	3.2 Equipment	21
	3.3 Methodology	23
	3.3.1 Monoglycerides Synthesis	23
	3.3.2 Product Analysis	24
IV	RESULTS AND DISCUSSION	26
	4.1 Synthesis of 1,2-O-isopropylidene Glycerol	26
	4.1.1 Protection Reaction	26
	4.1.2 Purification of of 1,2-O-isopropylidene Glycerol	28

CHAPTER	PAGE
4.2 Transesterification of Refined Palm Oil with Protected Glycerol	31
4.2.1 Effect of Molar Ratio of Protected Glycerol to Refine Palm Oil on Transesterification	31
4.2.2 Effect of Reaction Temperature on Transesterification of Refined Palm Oil with Protected Glycerol	35
4.3 Deprotection of Protected Monoglyceride	38
V CONCLUSIONS AND RECOMMENDATIONS	40
REFERENCES	41
APPENDICES	44
Appendix A Protection Step: Reaction Monitoring by Gas Chromatography	44
Appendix B Protection Step: Identification by Nuclear Magnetic Resonance Spectroscopy	45
Appendix C The Calibration Curves of Reference Standard of 1- Monoolein, 1,3-Diolein and Triolein	49
Appendix D The Transesterified Products Composition on Effect of Protected Glycerol to Refined Palm Oil Molar Ratio.	54
Appendix E The Transesterified Products Composition on Effect of Reaction Temperature on Transesterification.	56
CURRICULUM VITAE	58

LIST OF TABLES

TABLE		PAGE
2.1	Esterification of 1 mole fatty acid with 3 mole glycerol at 180 °C with/ without alkali catalyst	9
4.1	IR spectra of 1,2-O-isopropylidene glycerol	28
4.2	IR spectra of 1,2-O-isopropylidene monoglyceride from transesterification step	38
A1	Profile of the glycerol conversion in the protection of glycerol as a function of time	44
B1	Chemical shifts (ppm) for hydrogen atom in 1,2-O-isopropylidene glycerol	45
B2	Chemical shifts (ppm) for carbon atom in 1,2-O-isopropylidene glycerol	47
C1	The relation between concentration of reference standard of 1-monoolein (by wt.) and response area (A.U.) using HPLC as analytical method.	49
C2	The relation between concentration of reference standard of 1,3-diolein (by wt.) and response area (A.U.) using HPLC as analytical method	51
C3	The relation between concentration of reference standard of triolein (by wt.) and response area (A.U.) using HPLC as analytical method	52
D1	The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 5:1, 140 °C reaction temperature and 5 hours	54

TABLE	PAGE
D2 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 7:1, 140 °C reaction temperature and 5 hours	54
D3 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 10:1, 140 °C reaction temperature and 5 hours	55
D4 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 13:1, 140 °C reaction temperature and 5 hours	55
D5 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 17:1, 140 °C reaction temperature and 5 hours	55
E1 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 17:1, 120 °C reaction temperature and 5 hours	56

TABLE	PAGE
E2 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 17:1, 140 °C reaction temperature and 5 hours	56
E3 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 17:1, 160 °C reaction temperature and 5 hours	56
E4 The composition in oil-soluble phase after the transesterification of refined palm oil with protected glycerol. The reaction was carried out with protected glycerol to refined palm oil molar ratio of 17:1, 180 °C reaction temperature and 5 hours	57

LIST OF FIGURES

FIGURE	PAGE
2.1	Transesterification of triglyceride with alcohol. 2
2.2	Commodity chemicals from glycerol. 3
2.3	Structure of monoglycerides: (a) 1-monoglyceride, (b) 2-monoglyceride. 4
2.4	Glycerolysis of triglycerides with glycerol. 7
2.5	O-isopropylidene group formation via the reaction of <i>cis</i> vicinal hydroxyl groups with acetone. 8
2.6	Transesterification of 1,2-O-isopropylidene glycerol and methyl stearate. 12
2.7	Two-Step process for sorbitol ester production. 13
2.8	Acetonation of glycerol and Acylation of hydroxy group. 14
2.9	Synthesis monitoring of 1,2-isopropylidene glycerol by Gas chromatography with FID: (A) 5 h. of reaction time, (B) 10 h. of reaction time, and (C) 16 h. of reaction time. 15
2.10	IR spectrum of 1,2-isopropylidene glycerol. 15
2.11	Mass spectrum of 1,2-isopropylidene glycerol. 16
2.12	Absorbance of 1- and 2-monoglycerides at 1.430 microns as a function of concentration. Open circles—monopalmitin; closed circles—monostearins; triangles—monooleins. 17
2.13	Diagram showing approximate positions of peaks due to protons attached to glycerol carbons in NMR spectra of mono-, di- and triglycerides. 18
2.14	The chromatogram of rapeseed oil partially transesterified with methanol. 19

FIGURE	PAGE
3.1 Experimental set-up used for protection and deprotection step.	22
3.2 Experimental set-up used for transesterification step.	22
4.1 GC chromatogram of protection of glycerol: (a) at 6 h reaction time and (b) at 16 h reaction time.	26
4.2 Profile of the glycerol conversion in the protection of glycerol as a function of time. The reaction mixture was refluxed at 80 °C, using glycerol to acetone mass ratio of 5:6 and <i>p</i> -toluenesulfonic acid as a catalyst under 300 rpm magnetic agitation.	27
4.3 Schematic diagram of reaction between glycerol and acetone to obtain 1,2-O-isopropylidene glycerol.	28
4.4 IR spectra of 1,2-isopropylidene glycerol: (a) from this work and (b) from García and coworkers' research.	29
4.5 Reaction of glycerol with acetone in the presence of acid catalyst.	30
4.6 Schematic diagram of transesterification of refined palm oil with protected glycerol.	31
4.7 Effect of protected glycerol to refined palm oil mass ratio on protected monoglyceride formation. The reaction was carried out at 140 °C for 5 h under nitrogen atmosphere and 300 rpm magnetic agitation.	32
4.8 Effect of protected glycerol to refined palm oil mass ratio on triglycerides conversion. The reaction was carried out at 140 °C for 5 h under nitrogen atmosphere and 300 rpm magnetic agitation.	34
4.9 Schematic diagram of reaction of theoretical transesterification of triglycerides with protected glycerol.	35

FIGURE		PAGE
4.10	Effect of reaction temperature on protected monoglyceride formation. The reaction was carried out using fixed protected glycerol to refined palm oil molar ratio of 17:1 with various temperatures for 5 h under nitrogen atmosphere and 300 rpm magnetic agitation.	36
4.11	IR spectra of 1,2-O-isopropylidene monoglycerides (protected monoglycerides) synthesis.	37
4.12	Deprotection of protected monoglycerides (isopropylidene group removal).	38
B1	¹ H-NMR spectra of 1,2-O-isopropylidene glycerol from protection step in this work.	46
B2	¹³ C- NMR spectra of 1,2-O-isopropylidene glycerol from protection step in this work.	48
C1	Calibration curve for 1-monoolein (purity~99%).	50
C2	Calibration curve for 1,3-diolein (purity~99%).	51
C3	Calibration curve for triolein (purity~99%).	52