Available online at www.sciencedirect.com

ScienceDirect

Procedia Food Science 3 (2015) 162 – 173

Procedia Food Science

The First International Symposium on Food and Agro-biodiversity (ISFA2014)

Synthesis and characterization of 2-monoacylglycerols from Canarium oil (*Canarium indicum*)

Hamidah Rahman[1*)], Kusnandar Anggadiredja[1)], Johnner P Sitompul[2)], Tutus Gusdinar[1)]
[1]Pharmacy Department, School of Pharmacy, Institute of Technology Bandung
[2]Chemical Engineering Department, Faculty of Industrial Technology, Institute of Technology Bandung
Jalan Ganesha 10 Bandung, 40132, Indonesia

Abstract

This paper studies synthesis and characterization of 2-monoacylglycerols (2-MAGs), generally used for structured lipid production. Synthesis used canarium oil by enzymatic reaction using immobilized lipase from *Mucor miehei* that has a specific activity on the sn-1 and 3 of the triacylglycerol structure. Characterization of 2-MAGs by thin layer chromatography using a standard of 2-oleoylglycerol followed by isolation and purification to determine the fatty acids composition. The highest composition of fatty acids on 2-MAGs were unsaturated fatty acids, namely oleic acid (939.8 ppm) and linoleic acid (445.5 ppm), therefore it could be used for the synthesis of structured lipid.

Peer-review under responsibility of the organizing committee of Indonesian Food Technologist Community

Keywords: Canarium oil; 2-monoacylglycerols; structured lipid; fatty acids; enzymatic reaction.

INTRODUCTION

The important function of fat intake is to provide essential fatty acids for regulating the human body physiology. Essential fatty acids could not be synthesized on humans and animals, therefore humans need to consume from outside, for example from plants source. Biochemical systems in humans could not insert the first double bond at position C3 (n-3) and C6 position (n-6), however was able to extend

*Corresponding author.
E-mail address: gusdinar@fa.ac,id

Peer-review under responsibility of the organizing committee of Indonesian Food Technologist Community
doi:10.1016/j.profoo.2015.01.018

carbon chains by elongation reactions and adding the number of double bonds by desaturation reactions. Fatty acids with a carbon number of 18, 20 and 22, with 2 to 6 double bonds in the *cis* position and the position of the first double bond is located between C3 and C4 and also in position C6 and C7 are classified as essential fatty acids for humans, for instance linoleic acid and α-linolenic acid [1]. Several studies have also reported the function of fatty acids on brain development and to control membrane function in the nervous system. Intake of monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs) could assist to delay the decline in cognitive function in both animals and humans. α linolenic acid (ALA, 18: 3n-3) and linoleic acid (LA, 18: 2n-6) also showed an increase in performance of the Morris water maze test in rats [2]. Supplements rich unsaturated fatty acids such as oleic acid and linoleic acid derived from olive oil could be used to prevent coronary heart disease [3].

In general, fatty acids are found in triglycerides. Chemical, physical and biochemical characteristics of a triglyceride composition is determined by the composition of fatty acids and stereospecific structure in positions sn-1, sn-2 and sn-3 [4], therefore it is important to determine the position or stereospecific distribution and composition of fatty acids in triglyceride. This will be linked to the process of digestion and absorption of fatty acids in the body. For nutritional purposes, there is an interest to produce structured lipid by locating medium chain fatty acids at sn-1 dan sn-3 positions and functional long chain fatty acids at sn-2 position. This structure is claimed have a beneficial value on human health because less accumulation of fats in the body as well as a reduction in serum cholesterol. Structured lipid with eocasapentaenoic acid (EPA, 20:5n:3) and docosahexaenoic acid (DHA, 22:6n:3) in position sn-2 were more readily absorbed than other structured lipid with similar fatty acid composition but with a random fatty acid distribution [5].

Structured lipids (SL) or structured triacylglycerols (STAGs) are triglycerides that have been modified by changing the composition and or distribution of the fatty acid position on the glycerol backbone that could be done by chemical or enzymatic catalysts or genetic engineering. The general objective of structured lipids product is to improve the nutritional value and the physical properties that can be used for food applications as expected. Structured lipids have been also widely used for therapeutic purposes, for instance to increase the function of the immune system, reduces the risk of cancer, thrombosis prevention, lowering cholesterol and others [6].

Synthesis of SL was carried by modification of natural triglycerides or native state by incorporating a new fatty acids into triglycerides in order to obtain a new triglyceride structure or restructuring