

1

ผลงานทางวิชาการ

เพื่อขอกำหนดตำแหน่ง

ในสาขาวิชา

โดย รองศาสตราจารย์ ดร.นงนุช เหมืองสิน

สังกัดภาควิชา

คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ตัวอย่างผลงาน

2

ผลงานทางวิชาการ 1 (ผลงานวิจัย)

บรรทัดแรกใส่ชื่อผู้วิจัย

“Dynamics of Microbial Community During Nitrification Biofilter Acclimation with Low and High Ammonia.”

MARINE BIOTECHNOLOGY 2021, 23(4): หน้า 671-681. จำนวน 11 หน้า

อยู่ในฐานข้อมูล ISI/Scopus (ค่า impact factor ปี 2021 = 3.727, ระดับวารสาร = Q1, citation = 0)

สถานะในผลงาน: ผู้ประพันธ์บรรณกิจ



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Original article
Section: Food Quality and Functionality

Pol. J. Food Nutr. Sci., 2017, Vol. 67, No. 2, pp. 0-0
DOI: 10.1515/pjfn-2016-0015
<http://journal.pan.olsztyn.pl>

Properties and Storage Stability of O/W Emulsion Replaced with Medium-Chain Fatty Acid Oil

Department of Food Technology, Faculty of Science, Chulalongkorn University,
254 Phayathai Road, Patumwan, Bangkok 10330, Thailand

Key words: medium-chain fatty acids, coconut oil, rice bran oil, mayonnaise, emulsion stability

The properties and changes of an o/w emulsion (mayonnaise) as affected by the replacement of long-chain fatty acid oil with medium-chain fatty acid oil were studied. Different ratios of coconut oil (CNO) and rice bran oil (RBO) (0:100, 10:90, 20:80, 30:70 and 40:60 (v/v)) were blended as the oil base for the study. The highest replacement of RBO with CNO in an o/w emulsion that could be achieved with minimal change of sensory properties was 30%. The Emulsion Stability Index and oil-phase crystallisation temperatures of mayonnaise with RBO alone and with 30% CNO replacement did not change when stored at $30 \pm 2^\circ\text{C}$ for 4 weeks. The droplet size of the mayonnaise containing only RBO increased, possibly due to droplet coalescence. In contrast, the droplet size of the mayonnaise with CNO:RBO=30:70 did not change during storage.

INTRODUCTION

Medium-chain fatty acids (MCFAs) are composed of saturated fatty acids with 6 to 12 carbons. Sources of natural medium-chain triglycerides (MCTs) include palm kernel and coconut oils, milk and butter. MCTs provide less energy than triglycerides composed of mainly long-chain saturated fatty acids (LCTs) (8.4 vs. 9.2 kcal/g). They also have lower melting points and smaller molecular sizes than LCTs. Moreover, they are liquids at room temperature [Marten *et al.*, 2006]. Recent studies have demonstrated the potential of MCTs to reduce fat mass in rats [Han *et al.*, 2003] and adiposity in overweight men [St-Onge *et al.*, 2003]. Down-regulation of the adipose gene caused the reduction in fat mass [Marten *et al.*, 2006]. The MCTs increased energy expenditure and fat oxidation [Alexandrou *et al.*, 2007; Clegg, 2010; Montgomery *et al.*, 2013]. Daily MCT oil intake (40 g/day for a month) does not result in the accumulation of fat in the liver [Nasaka *et al.*, 2002]. Including MCTs in patients' diets led to a reduction in body weight without adverse effects on their metabolic risk [Mumme & Stonehouse, 2015; St-Onge & Bosarge, 2008]. LCTs might cause problems in patients with metabolic syndromes, whereas MCTs play an important role in the dietary treatment of malabsorption syndrome. MCTs are rapidly hydrolysed and can be absorbed directly through the liver *via* the portal vein. MCFAs can be used as an energy source without requiring the use of the carnitine transport system in mitochondria [Nagao & Yanagita, 2010]. MCT/LCT emulsions were used to extract a local anaesthetic from human serum *in vitro* and reduced

the risk of hepatic dysfunction more effectively than LCTs alone [Ruan *et al.*, 2012; Abteilung & München-Schwabing, 1981]. Several studies have compared the effects of MCFAs and LCFAs in the diet [Wein *et al.*, 2009; Trevizan *et al.*, 2010; De Vogel-van den Bosch *et al.*, 2011a,b; Wycherley *et al.*, 2012]. An MCFA and LCFA oil produced from MCTs and edible vegetative oils has also been evaluated for safety [Matulka *et al.*, 2006; Ma *et al.*, 2015]. The droplets and rheology of o/w emulsions based on soybean and palm kernel olein oil blends were characterised, and their stability was determined [Hayati *et al.*, 2007, 2009a,b]. To our knowledge, studies of the effects of the MCT:LCT ratio on the physical, chemical, microbiological and sensory properties of o/w mayonnaise during storage are limited. In this work, coconut and rice bran oils were used as the oil base in o/w mayonnaises. The main MCFA in coconut oil is lauric acid (45–53 wt%), whereas the main LCFAs in rice bran oil are oleic acid (35–50 wt%) and linoleic acid (29–45 wt%) [Gunstone, 2011]. The effects of the MCT:LCT ratio on the properties and storage stability of the o/w mayonnaise were studied. The results help to elucidate the effects of replacing LCTs with MCTs in an oil base on the physical, chemical, microbiological, sensory and stability properties of the oil-in-water emulsion. Moreover, an alternative product for metabolic syndrome patients and weight-concerned patients could be obtained.

MATERIALS AND METHODS

Materials

'Parisut' cold-pressed coconut oil (CNO) and 'King' rice bran oil (RBO) were purchased from Natural Mind Co., Ltd. and Thai Edible Oil Co., Ltd., Thailand, respectively.

* Corresponding Author: Tel.: 6622185247; Fax: 6622544314;
E-mail: Sasikan.K@chula.ac.th (S. Kupongsak)

4.1.1.2

4.1.2.1

Index

5

การ

ชุมชนเมืองสิน

มหาวิทยาลัย

4.1.1.1

4
3