Stability and Microstructure of Emulsion System in Sterilized Kai-yor (Thai Chicken Sausage)

Nut Thephuttee[1,2*] and Prapasri Theprugsa[1,2]

[1]Department of Food Science and Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12120, Thailand
[2]Thammasat University Center of Excellence in Food Science and Innovation, Thammasat University, Pathum Thani 12120, Thailand

**Corresponding author. E-mail: nutthephuttee@gmail.com*
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ABSTRACT

Stability and microstructure of meat emulsion in Kai-yor (Thai chicken sausage) formulated with 4 different lipids and subjected to 2 levels of heat treatment were evaluated. Types of lipids included chicken fat (control), frozen rice bran oil (RBO), pre-emulsified RBO with soy protein isolate (SPI), and pre-emulsified RBO with a mixture of sodium caseinate and microbial transglutaminase (SC+MTG). The heat treatments were cooking and cooking followed by sterilization (cook-sterilization). Meat emulsions were prepared, steamed cooked, packaged in a retort pouch and sterilized. The results showed that frozen and pre-emulsified RBO with SC+MTG increased the stability of meat emulsion indicated by a reduction in fluid release. Hardness and chewiness of all reformulated Thai chicken sausages were higher than those of the control heated by cooking and cook-sterilization. The sterilization process negatively affected texture of all samples, nevertheless the meat emulsion formulated with pre-emulsified RBO with SC+MTG exhibited the lowest percentage decrease in hardness and chewiness. Scanning electron micrographs indicated that differences in the lipid phase affected the microstructure of meat emulsions. Sterilization altered and disrupted the protein matrix to different extents depending on the type of lipid. Replacing chicken fat with pre-emulsified RBO with SC+MTG resulted in greater formation of a protein matrix which was less severely damaged after sterilization than other lipids. It can be concluded that substitution of chicken fat by both frozen and pre-emulsified RBO (with SPI or SC+MTG) showed the potential for producing a cooked meat emulsion with better quality.

However to achieve a satisfactory quality of sterilized meat emulsion, pre-emulsified RBO with SC+MTG offered superior alternative.

Keywords: Microstructure, Sterilization, Meat emulsion, Rice bran oil, Pre-emulsified oil

INTRODUCTION

Kai-yor or Thai chicken sausage is an emulsion-type meat product and contains a fairly large amount of lipid commonly as high as 30%. Consumption of this product could pose an adverse health effect for the consumer. It has been indicated that consumption of high lipid content diets especially those that contain high saturated fatty acids and cholesterol is related to various health problems such as obesity, high blood pressure, and heart disease. World Health Organization has recommended that 15-30% of energy in our daily diet should come from lipids and not over than 10% of those should come from saturated fats. Thus, the consumer demand for reduced fat meat products has been continuously escalating. (Jimenez-Colmenero et al., 2001; Vural and Javidipour, 2002; Oezvural and Vural, 2008; Jimenez-Colmenero et al., 2010a)

Replacement of animal fat in meat products by different types of vegetable oil is one of the methods to help reduce saturated fat and cholesterol contents in the product and this method has less effect on meat emulsion stability than replacing animal fat with other types of fat replacers (Choi et al., 2010; Jimenez-Colmenero et al., 2010a; Shao et al., 2011; Youssef and Barbut, 2011). Previous studies have shown different patterns in utilization of vegetable oil to replace animal fat in emulsion-type meat products including chilled oil (Youssef and Barbut, 2011), frozen oil (Saksomboon and Theprugsa, 2015), pre-emulsified oil (vegetable oil-in-water emulsion) using various non-meat proteins as an emulsifier such as soy protein or casein and possibly with the use of microbial transglutaminase enzyme (Herrero et al., 2012). Rice bran oil is one of the suitable choices of vegetable oil that can be substituted for animal fat in meat products. This oil is comprised of large quantities of mono- and polyunsaturated fatty acids and also contains phytosterol and oryzanol that exhibit health promoting functions such as anti-free radical and reduction of low density lipoproteins (LDL). Rice bran oil is domestically produced from abundant rice bran, a by-product from rice milling industries which are the major agro-business in Thailand and consumer demand for this oil has risen in the healthy food segment. Previous research has indicated that rice bran oil can be used as a chicken fat replacer in Thai chicken sausage (Saksomboon and Theprugsa, 2015).

Currently, the consumers are more interested in ready-to-eat food with extended shelf-life and produced by a sterilization process, especially those that are packed in a retort pouch. However, most of the meat product including Thai