CHAPTER 1

INTRODUCTION

1.1   Problem Background

Cookies are sweet snacks product that are commonly consumed worldwide. Based on Statista (n.d.), 245.53 million Americans consumed ready-to-eat cookies in 2018 and predicted to increase to 247.05 million in 2020. Several factors make cookies predominate in food market: its long shelf life, as a great convenience as food products, the personal liking and weakness for sugar and chocolate, and their relatively good value for money (Manley, 2011).

Cookies possess a complex cellular structure whose breakdown mechanics mainly rely upon its heterogeneity, the presence of voids as well as the multiplicity of defects from that cracking can develop (Hedjazi et al. 2011, as cited in Devi & Khatkar, 2016). This complexity is mainly affected by the ingredients of the cookies itself. The ingredients of cookies commonly consist of wheat flour, milk, leavening agent, flavoring agent, and high content of sugar and fat. The amount of each ingredient in cookie formulation may vary, one of the examples is shown in **Table 1.**

Table 1. Example of cookies formulation (Davidson, 2016)

Ingredients	Amount (%)*
Flour	100.00
Shortening	55.98
Granulated sugar	50.05
Brown sugar	0.76
Whole egg powder	1.24
Vanillin	0.10
Invert syrup	1.24
Salt	0.96

Ammonium bicarbonate	0.29
Sodium bicarbonate	0.67
Chocolate chips	30.00
Water	19.14

*based on flour weight

Butter or shortening is usually used as a fat ingredient in cookies. Butter made of milk fat through churning process (Deosarkar et al., 2016), meanwhile shortening is mostly made from a mix of animal fat and vegetable oil or hydrogenated vegetable oil (Haryati, 2002). Butter contains high saturated fats (Kwak et al., 2013; Deosarkar et al., 2016), while shortening is high of saturated fat and trans fatty acid which is caused by hydrogenation process (Institute and Shortening and Edible Oils, Inc., 2006). These fat products are unhealthy if they are consumed too much. Saturated fat and trans fatty acid are harmful since they increase low-density lipoprotein cholesterol /LDL ("bad" cholesterol) levels in blood and may induce heart disease and stroke (Deosarkar et al., 2016; Institute and Shortening and Edible Oils, Inc., 2006). According to the Heart & Stroke Foundation (2015), fats in the cookies become one of the most significant sources of saturated fats in the Canadian diet and American diet. Due to the health concern, consumption of fats in food must be low in saturated fat and high in mono- and poly-unsaturated fatty acids (i.e., healthier fats).

Based on the problem stated above, the utilization of shortening or butter in cookies is better to be replaced by fats that are high in healthy fats. The common fats which are used for replacing butter and shortening in cookies are coconut oil, olive oil, avocado, and more (Elliott, 2016). Alonso et al. (2005) suggested to apply olive oil to prevent hypertension; as olive oil contains high content of monounsaturated fat, which is namely oleic acid. Mishra (2016) utilized olive oil to replace saturated fat in biscuits for lowering blood lipid level. Rangrej et al. (2014) used flaxseed oil to replace shortening in the cookies; meanwhile, Jacob & Leelavathi (2007) also investigated

the application of sunflower oil as a fat ingredient for cookies. These polyunsaturated fats can offer beneficial effects on heart health, cancer, diabetes, and neurological disorders (Kaur et al., 2012). Considering the benefits of unsaturated fat and market value (i.e. price) of oils, this research will utilize sunflower oil to replace butter and shortening in cookies production.

1.2   Problem Formulation

This research will focus on the physical properties and sensory properties that are resulting from the oil. According to paper reviews, using oils as fat substitution in cookies produce hard texture, thus, utilization of emulsifier was recommended by Rangrej et al. (2014) and Jacob & Leelavathi (2007) in order to improve the cookies texture. The utilization of emulsifiers will also be applied in this research.

Hence, problem formulations of this research can be composed, such as:

- Is there any effect of the addition of different emulsifier on physical and sensorial properties of cookies?

- Which formulation is the most acceptable for the sensory panelists?

1.3   Research Objective

The objectives of this research are:

- To examine the impact of emulsifier incorporated in cookies containing oil

- To investigate which formulation containing the oil that most acceptable to the panelists

1.4 Scope of the Research

Sunflower oil was used in this research. There are 7 formulations will be used: control (i.e., cookies without emulsifier) and cookies with the addition of soy lecithin and citrus fiber, each at different concentrations (0.5%, 1%, and 1.5%). This research involves physical and sensory analysis on each of cookie formulation. The physical analysis consists of a percentages of weight loss, diameter, thickness, ratio spread, color, hardness (by using Texture Analyzer), water activity and moisture content. As for sensory analysis, a 9-scale hedonic test will be conducted with several parameters: appearance/color, flavor, texture and overall acceptability.

1.5 Importance of the Research

This research offers several benefits, such as:

- This research provides insight and analysis regarding the effect of oil as replacement of fat with utilization of different emulsifier in cookies.

- This research can be used to improve the formulation of healthier cookies.