Chapter 1

Introduction

1.1 Background

Protein is one of the macronutrients in human nutrition that is a crucial factor for growth and development. Another function of protein in human metabolism is for muscle development. Protein intake within the population can be influenced by several factors which includes age and physical routine. *Angka Kecukupan Gizi* (AKG) recommendation based on Kemenkes RI (*Kementerian Kesehatan Republik Indonesia*) for protein intake varies depending on age, gender, and pregnancy condition.

Protein requirements are higher in young people such as teenagers and young adults, male, and pregnant women. Additionally, individuals with intense or extensive workout routines are also expected to consume more protein intake to balance the protein loss from metabolism (Lin *et al*., 2010). Increasing protein intake in a diet could be done through consuming foods enriched with protein. High protein-enriched food products are therefore desirable to those in need of a high protein diet or those seeking to build muscle mass.

One method of protein enrichment in food is through the addition of protein powder, such as whey protein, into the food product formulation. Whey protein powder is readily available and accessible as a commercial food product. Some of the recognized forms of whey protein products are concentrate, isolate, and hydrolysate. Based on the Observatory of Economic Complexity (OEC) in 2018, Indonesia is included as one of the top 10 importers of whey globally, with a trade value that reaches US$ 141 million. In regards to accessibility, the market trend shows decreasing prices of whey products as is shown in Figure 1.1 which is reported by USDEC (United States Dairy Export Council (USDEC), 2017).

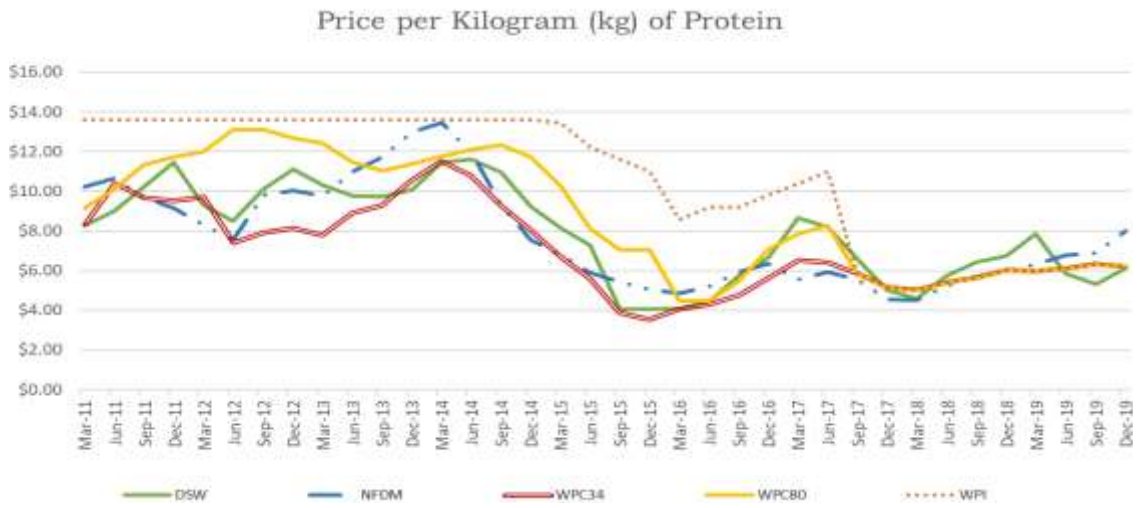

Figure 1.1 Price of Dairy Products in Dollars per Kilogram of Protein Quarterly 2011-2019

Whey Protein Concentrate (WPC) is available with varying protein levels, generally ranging from 34% to 80%, with WPC 80 used as a term for WPC with 80% protein level (Bulut-Solak & Akın, 2012). Whey products with 80% or more protein contents such as WPC 80 are a good choice to create high protein food due to the high protein content (de Wit, 1998). Additionally, the usage of whey in food formulation helps in color, texture, and flavor development of food products (Jeewanthi, Lee, & Paik, 2015). Cookies is one of the products that can be enriched with whey protein.

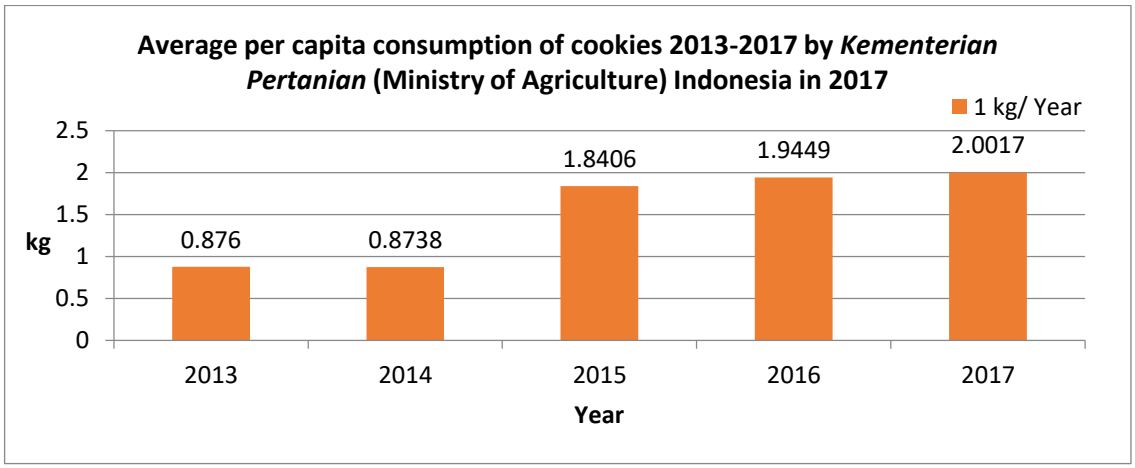

Figure 1.2 Average per Capita Consumption of Cookies for 2013-2017 in Indonesia

Cookies consumption in Indonesia has followed an increasing trend annually. Statistical data by *Sekretariat Jenderal Kementerian Pertanian Republik Indonesia* showed growth trends of cookies consumption from 2013-2017 as shown in Figure 1.2 (Komalasari *et al*., 2017). Aside from the increasing cookies consumption in Indonesia, amongst amateur athletes and fitness enthusiast, cookies also counts as one of the food types often consumed (Çöndü, Şener, & Türkoğlu, 2019).

Depending on the quantity consumed, cookies could be categorised as either discretionary food or main food group of an individual's diet. In individuals that consumed cookies in large quantity, cookies is placed as part of the main food group because it contributes to the carbohydrate intake of the individuals (Burkhart & Pelly, 2016).Therefore using cookies for protein enrichment is a desirable option when aiming for increasing protein intake amongst young adolescence.

1.2 Objectives

This research aimed at recording and evaluating the physicochemical properties and sensorial acceptance of WPC-enriched cookies. Analysis was conducted on proximate composition, texture, color, and hedonic sensory test.

1.3 Hypothesis

Increased protein content in WPC-enriched cookies will produce a darker color and tougher cookies from Maillard reaction. These changes will produce a lower sensorial evaluation for color and texture amongst panelists, but higher sensorial evaluation in flavor and aroma.

1.4 Benefits of study

The findings of this study are expected to show the effect of adding WPC to cookies on acceptance based on the physicochemical properties and sensory evaluation. Sensory evaluation results would help in determining the acceptance of WPC-enriched cookies. This would bring new options for innovations in food industries towards consumer acceptance in WPC-added baked products, especially cookies, and the development of protein enrichment food formulations.