

CHAPTER 1

INTRODUCTION

1.1. Background

Bakery products comprise a wide range of wheat-based products, such as bread, cakes, pastries, biscuits, cookies and crackers, and many more (Cauvain & Young, 2010). Among these products, bread and cake are the most widely consumed bakery products. In Indonesia, the average per capita consumption stands at 39.4 kg in 2020, and the total revenue in the bread and bakery products segment amounts to US\$12,956m (Statista, 2020). Cake, especially sponge cake, is well-liked by consumers because it is sweet, moist, and has an airy texture. The main ingredients of sponge cake are wheat flour, sugar, fats, and eggs (Conforti, 2014). The manufacturing of sponge cakes requires aeration of the batter by mixing whole eggs, sugars, and emulsifiers into a foam-like structure (Sahi & Alava, 2003). In the sponge cake manufacture, each of the ingredients has functional roles and contributes to the cake quality. Other than that, optimum mixing and baking procedures should be achieved to obtain a good quality cake. A desirable quality cake should have high volume, tender, uniform crumb texture, and a long shelf life with tolerance to staling (Gelinas *et al.*, 1999; Sozer *et al.*, 2011). The expected shelf life of packaged sponge cakes is three weeks, depending on the formulation and packaging material (Jones, 2012).

Steamed sponge cake, or also known as *bolu kukus*, is one of the sponge cake variants that is popular in Indonesia as a dessert snack. The ingredients and the process of making *bolu kukus* are similar to sponge cake, except that sponge cake is baked in an oven above 200°C, whereas *bolu kukus* is cooked in a steamer at about 100°C (Edwards, 2007). The steaming process increases the water activity of steamed products (Huang & Miskelly, 2016). The water activity of steamed bread/cake is around 0.92-0.97 (Laohasongkram *et al.*, 2011; Lombard *et al.*, 2000). Meanwhile, a regular baked sponge cake has water activity around 0.90 (Mathlouthi, 2001). Steamed products also have considerably high levels of moisture. The water activity and moisture content are two critical factors

determining the physical quality deterioration of products during storage. High water activity provides a suitable environment for mold and bacteria growth, hence, increasing the chance of microbial contamination. Other than that, staling may occur in stored cake and bread, indicated by loss of freshness and increasing crumb firmness (Huang & Miskelly, 2019). Crumb-firming occurs due to either loss of moisture from the crumb by diffusion or intrinsic firming of the cell walls (Cauvain & Young, 2010). These quality deteriorations may lead to product rejection by consumers during its shelf life. However, limited information is available regarding the shelf life of steamed sponge cake.

Shelf life is the period from the production until the time when the product becomes undesirable and unsuitable for consumption, due to microbiological, physical, or chemical deterioration. Contamination by microorganisms is the major factor limiting the shelf life of high and intermediate moisture bakery products. Steamed cakes are susceptible to fungal spoilage due to their water activity and high moisture content. Contamination in the raw ingredients can be reduced by heat treatment. However, post-baking contamination which usually occurs from airborne spores, unclean surfaces during cooling, and poorly sanitized equipment are often unavoidable (Guynot *et al.*, 2002). The most common molds found in bakery products are *Rhizopus* sp., *Aspergillus* sp., *Penicillium* sp., *Mucor* sp., *Monilia* sp., and *Eurotium* sp. (Saranaj & Geetha, 2012). Fungal contamination causes an economic loss for both the bakery industry and consumer (Smith *et al.*, 2004). Therefore, predicting shelf life is essential in the food industry to ensure the quality and safety of food products and to prevent economic loss.

1.2. Problem Formulation

Based on the research background, the problems can be formulated as:

1. What are the quality changes occurred during storage of steamed sponge cake?
2. What are the differences between lab-made (LM) and company-made (CM) steamed sponge cake?
3. What is the estimated shelf life of steamed sponge cake?

1.3. Objectives

The objectives of this experiment are:

1. to determine the quality characteristics of steamed sponge cake during storage,
2. to compare the characteristics of LM and CM steamed sponge cake,
3. to estimate the shelf life of steamed sponge cake.

1.4. Scope of Work

This research will focus on the quality assurance field. The research is limited to (1) production of steamed sponge cake according to the formulation by supplier A, (2) quality characteristics and shelf life estimation based on measurement of water activity (a_w), moisture content, texture, and total yeast and mold every two days for nine days, (3) comparing the characteristics of LM and CM steamed sponge cake.