CHAPTER I

INTRODUCTION

1.1. Background

Bread is one of the foods that is consumed all around the world. Breadmaking technology is one of the oldest food makings that is known. Bread has many shapes and forms and is one of the staple foods consumed by people across the world. Traditional bread is based on wheat flour. Many other types of cereals, pulses, and even legumes can be milled to give a 'flour.' However, the ability of the proteins presents in wheat to transform a gruel of flour and water into a glutinous mass, which becomes bread, is currently limited to wheat and a few other commonly used cereal seeds (Mondal and Datta, 2008).

The technology of breadmaking has improved over the years to produce bread with better quality. Indonesia's bread market is expected to grow annually by 5.0% (CAGR 2020-2023) (Statista Market Forecast, n.d.). However, fresh bakery products have a relatively short shelf life since, during their storage, some physical and chemical changes occur, a process known as staling (Selomulyo et al., 2007). Because of these problems in the conventional breadmaking process and the increasing market demand, have led to more efficient methods to produce freshly baked products while having an extended shelf life.

The frozen dough market has steadily grown in recent years due to consumer demand for convenience and high-quality baked products since frozen dough products do not demand specialized workers and raise the possibility making ''fresh'' bread available at any time of the day (Bhattacharya , 2003; Matuda et al., 2005). The quality of bread made from frozen dough is influenced by dough formulation, as well as process parameters such as dough mixing time

(Rouille et al., 2000), freezing rate, storage duration, and thawing rate (Inoue and Bushuk, 1991; Le Bail et al., 1998; Lu and Grant, 1999). The frozen dough has been used for puff pastry products such as viennoiseries and croissants (Le-Bail, Nicolitch, & Vuillod, 2010).

However, the frozen dough bread system causes several problems in both the production and quality of the final product. Frozen dough required a longer proof time, and its bread had a lower specific volume and harder texture (Inoue and Bushuk, 1992). These problems may cause a reduction in carbon dioxide (CO_2) production and damage the gluten network, which results in poor retention of CO_2 gas and poor baking performance (Lucas et al., 2005). Additionally, according to Selomulyo and Zhou (2007), several more problems can arise from the production of frozen dough such as the reducing retention capacity of carbon dioxide, longer fermentation time, decrease the activity of yeast, reduce dough strength, and the texture of the product that can deteriorate over time.

To overcome these problems, manipulation of processing parameters such as mixing time, freezing rate, storage duration, and thawing rate has been attempted (Inoue & Bushuk, 1991). Moreover, the use of additives such as emulsifiers and hydrocolloids in dough formulation has also been used to strengthen the dough matrix and increase gas pressure (Ribotta, Pérez, León, & Añón, 2004; Selomulyo et al., 2007). The additives are used to facilitate processing, to compensate for variations in raw materials, to guarantee consistent quality, and to preserve freshness and food properties. In scientific literature, different additives and ingredients have been used to modify the dough behavior during freezing (Ribotta et al., 2001). Therefore, a more in-depth investigation of the effects of additives on frozen dough properties is needed.

In particular, alginate from seaweed has been used as an additive in the bread industry (Tabara *et al*., 2016). Rosell *et al*. (2001a) showed that alginate had a pronounced effect on dough

properties, resulting in the strengthened dough. Davidou *et al*. (1996) studied the influence of alginate on starch retrogradation by analyzing the possible interactions between hydrocolloids and starch or gluten. Rosell *et al*. (2001b) showed that the addition of Propylene Glycol Alginate (PGA) improved wheat dough stability during proofing. These studies show that alginate and its derivatives have specific properties that can improve breadmaking stability.

Additionally, chemically modified starch such as acetylated starch (AS) is widely used in the food industry because of their useful properties such as anti-staling, thickening ability, better light transmittance, stability in high shear and low temperature (Singh, Kaur and McCarthy, 2007; Tharanathan, 2005; Toufeili *et al*., 1999). Some of these properties can be beneficial to the breadmaking industry, especially frozen dough. Therefore, the use of Acetylated starch and Propylene Glycol Alginate in the frozen bread dough will be investigated further in terms of baking performance after one month of storage time.

1.2. Problem Formulation

Based on the research background, the problems that would like to be addressed is formulated by the following question:

1. What is the effect in the addition of Acetylated Starch to the baking performance of frozen bread dough after one month of storage time?
2. What is the effect in the addition of Propylene Glycol Alginate to the baking performance of frozen bread dough after one month of storage time?

1.3. Objective

The objective of this thesis research is to investigate the effect of Acetylated Starch and Propylene Glycol Alginate to the baking performance of frozen bread dough after one month of storage time.

1.4. Hypothesis

The hypothesis of this research is the addition of Acetylated Starch and Propylene Glycol Alginate will improve the baking performance of frozen bread dough after one month of storage time.

1.5. Scope of Work

There are lots of essential laboratory techniques that will be included in the scope of work of this project. The techniques will include:

- Frozen dough formulation in the form of bread with different proportion of Acetylated starch, and Propylene Glycol Alginate
- Physical analysis such as the volume of bread, firmness of bread, and colorimetry analysis
- Chemical analysis such as moisture analysis