

Chapter I

Introduction

1.1 Background

Bread is a popular food consumed globally due to its essential role as a part of a balanced diet for many years. The production of bread has shifted towards large-scale industrial markets because of increasing numbers of population and demand. Related to a more stable economic situation in Indonesia and trends in Indonesia, consumers can diversify and incorporate western-style fruits like bread instead of rice-based food. This trend resulted in high demand for a wheat-based food product (MacDonald & Meylinah, 2019).

Freshly baked bread has a limited shelf life due to starch retrogradation, commonly known as bread staling. Staling affects the economic value of the bread, as well as the quality of the bread itself. The quality of the bread is eminently dependent between baking and consumption. The use of frozen bread dough has been increasingly popular as it offers convenience, lower production cost, and is capable of delivering freshly baked products to consumers. However, the characteristics of the gluten structure are affected by frozen storage like crystallization. Crystallization can cause shorter shelf life and is not possible for long-distance distribution (Rosell & Gómez, 2007). The dough structure will collapse due to gas contraction and lower thermal properties due to the aerated structure, which allows a higher fermentation degree (Le-Bail, Nicolitch, & Vuillod, 2008). Many studies have reported that the addition of transglutaminase (TGase) and Vital Wheat Gluten (VWG) can help improve the quality of the bread made by frozen dough.

The structure of the gluten is essential to provide superior quality characteristics of the bread. The addition of the TGase enzyme between 0.5% to 1% reported by Chung, Huang, Kim, and Pan (2008) showed an improvement of the frozen dough's rheology properties re-establishment damaged gluten network. TGase catalyzes protein crosslinking through the formation of inter or intramolecular e(g-

glutamyl) lysine isopeptidic bonds. Furthermore, they found that the addition of TGASe at 1,5% specific volume was similar to the freshly baked bread.

Besides TGASe, the addition of VWG reported by Giannou and Tzia (2016) could increase the protein level, dough, and bread yields and improve the mixing tolerance and bread crumb texture. Giannou and Tzia (2016) also found that dough samples made from white flour were the most stable when 4% and 6% of VWG were added. Dough samples made from whole-wheat flour were the most stable when 4% and 5% of vital wheat gluten were added. The study also stated that gluten might raise the dough's freezing point and preserve low molecular sugar generation after prolonged storage, which is associated with the yeast viability.

In this study, the baking performance of frozen bread dough will be evaluated during one-month storage. The findings might be preliminary information for the ideal concentration of TGASe and VWG used to improve frozen dough properties.

1.2 Problem Formulation

Based on the research background, the problems are formulated by the following questions:

- What are the effects of TGASe on the volume, moisture, texture, and colour of the frozen bread dough during one month of storage?
- What are the effects of VWG on the volume, moisture, texture, and colour of the frozen bread dough during one month of storage?
- Which TGASe and VWG concentration shows better characteristics in general?

1.3 Research Objective

This experiment's objectives are to evaluate the effect of TGASe and VWG addition to the characteristic (moisture, volume, hardness, and colour) of baked frozen bread dough.

1.4 Hypothesis

TGAsE and VWG individually could improve the characteristic of baked frozen dough (volume, colour, moisture, and texture) when compared to control. Improved bread characteristics would be bigger volume, increased moisture content, and softer texture bread. As for colour analysis, it's usually perceived by sensory tests. However, bread with a golden crust colour is more favorable.

1.5 Scope of the Study

This research study focuses on TGAsE and VWG to the baking performance of frozen bread dough during one month of storage. A Preliminary test is also conducted to standardize the product and reduce the risk of bias. This study is limited to:

- The production of bread dough with TGAsE and VWG at different concentration.
- The bread characteristic analysis is limited to moisture, volume, hardness, and colour of baked bread. These analyses will be done every week and the measurement will be triplicated.