CHAPTER 1

INTRODUCTION

1.1. Background

Vegetarian diet is a lifestyle that excludes meat, poultry and fish from the diet. This diet has further classification being lacto-ovo vegetarians which still includes dairy eggs and dairy products, and vegans which fully neglect animal products (Key, Appleby & Rosell, 2006). In recent years, interest in vegetarian diet and plant-based eating are starting to get more noticed (Medawar et al., 2019). There are higher global vegetarian markets in Asian countries, especially in Indonesia, India, China, and Pakistan; with Indonesia being the second highest. In Indonesia, the number of vegetarians increases along with the growth of Buddhists and Hindus population, health-conscious people as well as animal and nature-loving community (Muchtar, 2020). According to Indonesia Vegetarian Society (IVS), there are more than 150.000 vegetarian and vegan members registered and it is believed that there are more than 2 million people who are included in the vegetarian and vegan community. That makes Indonesia and IVS as the largest vegetarian societies in the world (Laarse, 2015). With that in mind, Indonesia holds one of the largest markets for vegetarian and vegan foods. Aside from that, the global impact of the meat production and livestock industry being the major source of global climate change (Rubio et al. 2020) also raises the awareness of a more sustainable diet such as vegetarianism. Therefore, the development of a plant-based patty can be directed for the vegetarian, vegan, flexitarian, environmentally cautious people, or even the general population.

Many of the plant-based products contain vital wheat gluten as one of its major proteins. This raises a concern due to the increasing number of people who are gluten sensitive or have other gluten related abnormalities such as celiac disease. Celiac disease is a reversible, multisystem autoimmune disorder in the human intestinal system which is caused by gluten exposure (Oktadiana et al., 2017; Alexander & Abdullah, 2017). Celiac disease may develop at any age, and new cases have increased significantly within the last 20 years due to increased awareness and

better diagnostic tools (Alexander & Abdullah, 2017). In developing countries, celiac disease cases are predicted to increase due to the rising of a high gluten diet (Oktadiana et al., 2017).

For the reasons mentioned above, there is a need to produce a more sustainable food product that not only has sufficient protein content, but also has adequate flavor meat characteristics (Sukmawati, 2016). Moreover, the increasing number of vegetarians and gluten sensitive people raises the urgency for research on vegan ingredients and the benefits of vegetarian diet (FIkawati et al., 2014) and alternative meat products that are potentially gluten free.

Plant-based meat or meat analogues are well known today, with many different varieties depending on the meat they resemble including chicken, turkey, ham, meatballs, patties, etc. These meat substitutes have chewy meat-like texture with meaty flavor and considerable nutrient aspect. Generally, the highest composition in PBM is water (50% - 80%), followed by textured vegetable protein (10% - 25%), and untextured protein (4% - 20%). The remaining smaller composition of the PBM includes flavoring (3% - 10%), fat (0 - 15%), binding agent (1% - 5%), and coloring agent (0% - 0.5%) (Kyriakopoulou et al., 2019). A proper combination and formulation of the ingredients will determine the texture, flavor, and acceptability of the final product.

There are many factors that contribute to textual properties of a plant-based meat, and protein is one of the main contributors. The main protein in meat analogues vary, but the majority used in meat analogues are made of plant protein of soybean (Zahari et al., 2020). Vital wheat gluten, texturized vegetable protein, and pea protein are some of the other main protein ingredients in plant-based meat (Curtain & Grafenauer, 2019). These plant proteins mainly contribute to the elasticity and spongy texture in meat analogue products (Ismail, Hwang & Joo, 2020). Soy proteins are used in several studies for processing of PBM as its functional properties contribute texture of the final product (Kumar. 2016). Moreover, these vegetable proteins are a less expensive source and are versatile to be used as meat substitute (Ismail et al., 2020).

Most PBMs are aimed to be commercially available products such as in supermarkets and convenience stores. Therefore, there is a need to measure how a product performs during storage

days and gain insight on how stable a product is during its shelf life. There are several attributes of concern including pH, color, cooking loss WHC, and texture. The measure of pH aims to gain insight on how VWG concentration might affect the buffering capacity of the product in storage and overall product stability. Similarly, WHC and cooking loss measurement is aimed to see the effect of VWG on the ability of the product retaining water within its matrix and how storage time affects the stability within storage. Color is aimed for product standardization and whether VWG concentration has a significant effect towards the end product. In addition, measurement of texture, namely hardness and springiness is aimed to see the effect of VWG on the textural properties of PBM and whether storage time affects the product quality in storage.

This study will focus on the formulation of beef analogue in a form of burger patties by adjusting the concentrations of vital wheat gluten in the basic formulation of Burggie. Burggie is a ready-to-cook plant-based patty made of soy protein. The goal is to find the possibility of gluten-free plant-based patty formulation with acceptable physicochemical and textural properties. The end product will be tested for the overall physicochemical and textural properties throughout 6 days of 4°C storage with observation on day 0,3, and 6.

1.2. Problem Formulation

a. What is the effect of reduced vital wheat gluten concentration on the physicochemical and textural properties of plant-based patty?

b. Does storage time affect the physicochemical and textural properties of plant-based patty?

1.3. Objectives

The objectives of this study include:

a. To analyze the effect of different vital wheat gluten concentrations on the physicochemical and textural properties of plant-based patty

b. To obtain the effect of storage time with different vital wheat gluten concentrations towards the physicochemical and textural properties of plant-based patty with reduced vital wheat gluten concentration

1.4. Hypotheses

The hypotheses of this study include:

H0: Different VWG concentration will result in significantly different physicochemical and textural properties of plant-based patty

H1: Different VWG concentration will not result in significantly different physicochemical and textural properties of plant-based patty

H0: Storage time with different VWG concentration will result in significantly different physicochemical and textural properties of plant-based patty

H1: Storage time with different VWG concentration will not result in significantly different physicochemical and textural properties of plant-based patty

1.5. Research Scope

This study focuses on developing a plant-based patty with similar textural and physical properties of a real meat patty. The scope of this study is to (1) preparing the ingredients with soy protein and vital wheat gluten (0, 12, 25, 50%) (2) Testing the treatments of adjusted formulation and analyzing the influence of those treatments on the physicochemical and textural properties of plant-based patty (3) observing the color of samples using a colorimeter and reading the L*a*b values (4) measuring the sample pH using a pH meter (5) measuring the water holding capacity (6) storing the patties in the refrigerator (4°C) (7) pan-frying the samples for 2 minutes on each side, until it reaches 80°C (8) determining the cooking loss using mass balance (9) analyzing the hardness and springiness of the sample using a texture analyzer.

1.6. Importance of Research

The findings from this study can provide insight for better formulation of plant-based patty in terms of texture. This study also helps further investigation of possible development of Gluten-free Plant-based patty as well as changes in physicochemical and textural properties of plant-based-meat during storage.