CHAPTER I

INTRODUCTION

1.1 Background

Over the past decades, there has been an increasing popularity in plant-based eating patterns such as vegan and vegetarian diets. Plant-based diet focuses on maximizing the consumption of nutrient-dense plant foods while reducing the consumption of meat, processed foods, oils, and other animal-based products such as eggs and dairy products. Whether it is due to health benefits, environmental factors, ethical or religious reasons, and sustainability, people all around the world are shifting towards eating more plant-based foods (Tuso et al., 2013). The vegan consumers and communities are also rapidly increasing in Indonesia. According to a market research conducted by Euromonitor International, Indonesia is the second largest vegetarian market in Asia after India. Along with the increasing interest in plant-based diets, there is a need to develop and innovate new plant-based meat alternatives or meat analog that satisfies consumers' demand in terms of the quality, nutritional value, and sensory properties (Fiorentini et al., 2020).

Plant-based meat alternatives are traditionally made from soy protein such as tofu and tempeh, before texturized vegetable protein (TVP) was introduced in the mid and late 20s century. TVP has an elastic and sponge-like texture which is favorable to be used as various meat analogue products (Ismail et al., 2020). However, there is a challenge in creating plant-based meat products that are able to exhibit the characteristics of the real animal based products, especially for the textural properties. Taste can be achieved to mimic the real product, but it is difficult to get a meat-like texture and juiciness from plant-based protein (Fellet, 2015).

To overcome this problem, hydrocolloids are commonly added to the formulations to improve the quality attributes. Hydrocolloids are defined as a heterogeneous group consisted of long chain polymers that are able to form gels or viscous solutions in the presence of water. The main functionality of hydrocolloids in foods is their ability to alter the rheology of a food system, which is important to achieve the desired texture. The functional properties of hydrocolloids include thickening, gelling, stabilizing, and emulsifying, though the basic properties which are frequently used are thickening and gelling. Most hydrocolloids are able to form high viscosity dispersions at concentration below 1% (Saha & Bhattacharya, 2010). Some examples of hydrocolloids that are suitable for plant-based meat applications are kappa carrageenan, methylcellulose, and xanthan gum. Kappa carrageenan has been reported to improve the water-holding capacity, texture, overall acceptability, and reduce the cooking loss of plant-based sausages (Majzoobi et al., 2017). When added in appropriate quantities, methylcellulose is an effective binder that aids in maintaining the shape and firm texture while providing a structure to give a desirable meat-like textural properties at the consumption temperature of the product. Thermal gelation binds the ingredients altogether and prevents moisture loss during cooking. Other than that, methylcellulose can also help to prevent oil separation by emulsifying the fat (Ergun et al., 2016). The addition of xanthan gum to plant-based nugget can improve the water content, water holding capacity, cohesiveness, springiness, and juiciness of the product (Yulina, 2017).

In Indonesia, poultry is the most consumed meat (USAID, 2013). Chicken processed products such as chicken nuggets is a very popular snacks and fast food restaurant item. The texture and surface appearance of chicken nuggets are the important factors for consumer acceptability. Fried nuggets derived from animals contain a high amount of oil and fat. However, consumer demand for healthier products has been increasing since the consumption of high animal fat content (saturated fats) increases the risk of getting various diseases such as cardiovascular disease, coronary heart disease, hypertension and obesity (Kim et al., 2015). Many consumers are looking for products with high nutrition and sensory attributes similar to meat products but only contain small amounts or even do not contain real meat (Sharima-Abdullah, 2018). Due to these reasons, plant-based chicken products that are able to meet public expectations have to be further developed. In addition, the study regarding plant-based chicken nuggets is still preliminary and less investigated compared to other meat products. Kumar et al. (2011) had previously conducted a study about the comparison of analogue nuggets versus chicken nuggets, it was reported that the moisture, sensory scores, textural properties, juiciness, and overall acceptability of chicken nuggets were significantly higher than the analogue nuggets. This study aims to investigate the effect of adding different types and concentrations of hydrocolloids on the physical properties of plant-based nugget in order to contribute in improving the quality attributes of plant-based nugget to be able to resemble the characteristics of real chicken nugget.

1.2 Problem Formulation

a. What is the effect of adding different concentrations of methylcellulose, kappa carrageenan, and xanthan gum on the physical properties of plant-based nugget?
b. What is the difference between commercial chicken nugget and plant-based nuggets added with methylcellulose, kappa carrageenan, and xanthan gum?

1.3 Objective

a. To investigate the effect of adding methylcellulose, kappa carrageenan, and xanthan gum at different concentrations on the physical properties of plant-based nugget
b. To compare the physical properties of plant-based nuggets added with methylcellulose, k-carrageenan, and xanthan gum with commercial chicken nugget

1.4 Research Scope

This study focused on investigating the effect of adding different types and concentrations of hydrocolloids on the physical properties of plant-based nugget. Starting from (1) preparing the formulation of plant-based nugget. The hydrocolloids used were methylcellulose, kappa carrageenan, and xanthan gum, each at three different concentrations (0%, 1%, and 2%). (2) Steaming, battering, freezing, and followed by deep frying the plant-based nugget samples. (3) Analyzing the physical properties of plant-based nugget. Cooking loss, moisture loss, and water holding capacity {WHC} was measured before and after cooking, whereas texture profile analysis (TPA) was done after cooking. The plant-based nugget samples were also compared with commercial chicken nugget. The correlation coefficients between cooking loss, moisture loss, WHC, and TPA were measured and discussed as supporting data to validate the relationship between the physical properties.

1.5 Hypothesis

Null Hypothesis: The addition of methylcellulose, k-carrageenan, and xanthan gum at different concentrations do not significantly affect the physical properties of plant-based nugget

Alternative Hypothesis: The addition of methylcellulose, k-carrageenan, and xanthan gum at different concentrations significantly affects the physical properties of plant-based nugget

Null Hypothesis: Plant-based nuggets added with methylcellulose, k-carrageenan, and xanthan gum is significantly different to commercial chicken nugget

Alternative Hypothesis: Plant-based nuggets added with methylcellulose, k-carrageenan, and xanthan gum is not significantly different to commercial chicken nugget

1.6 Significance of the Study

The findings of this study will contribute to the development and improvement of plant-based nugget formulation since the study regarding this topic is still very limited. The study is expected to benefit other researchers or food producers to be able to gain understanding regarding the effects of adding different concentrations of methylcellulose, k-carrageenan, and xanthan gum on the physical properties of plant-based nugget. It will aid in the development of plant-based nugget formulation that is acceptable for public consumption, which is able to mimic the characteristics of the currently available chicken nugget.