CHAPTER 1

INTRODUCTION

1.1 Background

The world's population is expected to escalate from 7.7 billion to 9.7 billion in 2050. The demand for protein food will increase along with the growing population, with a particular interest in animal protein such as red meat (Henchion et al., 2017). Global average per capita for both meat and meat products consumption has increased 58% over the last two decades. The consumption of meat is expected to escalate by 76% in 2050 (He et al., 2020).

The growing number of meat consumption can affect both health and the environment. Meat is an excellent source of protein, iron, zinc, and vitamin B12. However, high meat consumption is associated with colorectal cancer and cardiovascular diseases. The production of meat to fulfil the protein demand can also be harmful to the environment. Meat production generates Greenhouse Gas Emissions (GGE) such as carbon dioxide (CO2), methane, and nitrous oxide (N2O) that contribute to climate change (Godfray et al., 2018).

Plant-based protein is an alternative protein source that can provide protein requirements for the increasing population. Tofu, tempeh, and seitan are examples of traditional plant-based proteins. Conventional plant-based protein has been long consumed and accepted by vegetarians, vegans, and Asian people in general, but not for Western consumers who want to reduce or replace their meat intake due to health and environmental issues. Furthermore, traditional plant-based protein is not considered meat alternatives due to its unattractive form and bland taste (He et al., 2020). The modern form of plant-based protein is made from textured vegetable protein (TVP) to resemble raw meat's chemical and aesthetic characteristics from non-meats and dairy ingredients for meat consumers (Malav et al., 2013).

Modern plant-based protein from TVP can be made into burger form. In the plant-based protein market, plant-based burgers have the largest market share and are expected to grow even more (GlobeNewswire Newsroom, 2020). However, achieving a meat-like texture is still the biggest challenge for plant-based burger development to be accepted as a meat alternative (He et al., 2020). Attaining a firmer texture with a juicy burger is difficult as both characteristics are inversely related (Egberts and Borders, 2006). Fat is often added into plant-based burger formulation to achieve juiciness. However, the direct addition of fat into plant-based burgers produces undesirable properties: soft texture, oil leakage, and lack of fat structure.

Canola oil and vegetable shortening were used as fat sources and made into oil in water emulsion. Mixtures of vegetable oils are made to oil in water emulsion with soy protein isolate (SPI) as the emulsifier for fat structuring (Dreher et al., 2020). Oil in water emulsion as a fat substitute has several desirable characteristics such as better texture and decrease in cooking loss (Serdaroğlu, Nacak, & Karabıyıkoğlu, 2017). Furthermore, the addition of binding agents such as methylcellulose (MC) gives some binding support during the frying process, increases the hardness and springiness of the product, and reduces cooking loss (Ergunt et al., 2016; Bakhsh et al., 2021). Storage conditions such as chilling and freezing are often used to prolong the shelf-life of food. However, those conditions may affect the physicochemical properties of plant-based meat.

1.2 Objectives

1. To investigate the change of physicochemical properties of plant-based burger with addition of SPI as an emulsifier and MC as a binding agent in the fat emulsion.
2. To investigate the change of physicochemical properties of plant-based burger after 24 hours chilling and 24 hours freezing storage conditions.

1.3 Hypotheses

H_0: there is no significant difference of the physicochemical properties of plant-based burger added with SPI & MC compared to without addition of SPI and MC in fat emulsion.

H_1: there is a significant difference of the physicochemical properties of plant-based burger added with SPI & MC in fat emulsion.

H_0: there is no significant difference of the physicochemical properties of plant-based burger after 24 hours chilling, and 24 hours freezing conditions compared to fresh condition.

H_1: there is a significant difference of the physicochemical properties of plant-based burger in fresh, 24 hours chilling, and 24 hours freezing conditions.

1.4 Significances of the study

The finding of the study would provide benefits as follow:

- Could be the foundation of plant-based burger formulation and manufacturing regarding the use of emulsifier and binding agents in emulsion as fat substitute in plant-based burger.
- As supplementary literature in plant-based meat to be further researched and replicated.