CHAPTER I

INTRODUCTION

1.1 Background

Vegan diets in which did not consume meat, fish, dairy, and eggs have increased in popularity (Craig, 2009). The benefits that vegan diets offer includes improving human health and taking care of the environment (Hopwood *et al.*, 2020). Therefore, the demand for plant-based products also increased. Aquafaba, which intended to expand the production of plant-based products has caught the public's attention as the replacement of animal-based protein (Alsalman, 2020).

Aquafaba or bean water is a viscous liquid obtained from boiling legumes or the liquid present in canned legume products. Legumes have been recognized for their functional properties and high protein content thus are able to replace animal protein such as egg white. Aquafaba has been used in the production of vegan products to replace egg white due to the similar characteristics in which it has emulsifying, gelling, thickening, and foaming ability (Mustafa *et al.*, 2018). The demand for egg replacer has increased due to several reasons such as health considerations, personal dietary preferences, religious beliefs, environmental considerations, and egg allergies. The protein content of egg which is mostly present in the egg white is the second most serious food allergen thus predominantly occurring in children (Alsalman, 2020). Despite the adverse effect, egg white plays an important role as a foam agent in the food industry. Therefore, alternatives that have similar functional properties with egg white such as aquafaba are needed (Razi

et al., 2019). Utilization of aquafaba aims to reduce wastewater and expand the production of plant based products with lower price. The legumes used to make aquafaba can vary but typically use chickpea. The composition of aquafaba that influence the foaming and emulsifying ability are proteins, carbohydrate, and saponins thus dependent to the types of legumes used (He *et al*., 2021; Meurer *et al*., 2020; Raikos *et al*., 2019). Legumes used for the production of aquafaba should have similar composition to chickpea in which it has low fat and high protein and carbohydrates (Yegrem, 2021). Pigeon pea and red kidney bean have similar composition with chickpea thus have the possibility to be used to produce aquafaba (Audu and Aremu, 2011; Sharma *et al*., 2011).

Different processing methods can also influence the chemical composition and functional properties of aquafaba. To produce a good quality aquafaba, the proteins, carbohydrate, and saponins content must be maximized. Meanwhile the anti-nutritional composition such as the tannin content should be minimized because it can affect the foaming ability of protein content (Alsalman, 2020; Mustafa *et al*., 2018). Therefore, the best processing method to produce high quality aquafaba which is the boiling time was determined in this research. Furthermore, this research also determines the foam properties of aquafaba obtained from chickpea, pigeon pea, and red kidney beans.

1.2 Research Problem

Egg white replacer demand has increased due to the limitation of egg consumption for some people due to egg allergy, personal dietary preference, and

others. Aquafaba which is the wastewater from boiling or canned legumes can be an option to be an egg white replacer due to the similar functional properties such as the foaming ability. Aquafaba functional properties are influence by the composition of water soluble carbohydrates, protein, and tannin contents extracted into the aquafaba. Factors that might influenced the amount of these multi components extracted is the processing method which is the boiling time of the legumes. There is little or no research regarding how these components and processing method affect the functional properties of aquafaba. Therefore, in this research different boiling time will be applied to produce the best quality of aquafaba. In addition, this research also aims to produce and compare the foam characteristics of aquafaba obtained from chickpea, red kidney bean, and pigeon pea.

1.3 Objectives

1.3.1 General Objective

The general objective of this research was to identify the foaming ability of aquafaba obtained from chickpea, red kidney bean, and pigeon pea.

1.3.2 Specific Objectives

The specific objectives of this research are:

1. To observe the effect of boiling time toward the physicochemical characteristic and composition of aquafaba from chickpea, red kidney bean, and pigeon pea
2. To compare the foam characteristics of aquafaba obtained from chickpea, red kidney bean, and pigeon pea