

CHAPTER I

INTRODUCTION

1.1 Background

Vegan and vegetarian is a lifestyle that involves little none consumption of animal and animal derived products. Nowadays, there has been a rise of veganism worldwide with the reduced consumption of animal-based products such as dairy in Europe and the USA. With 15% of Europeans refraining from consuming dairy products in 2014, shows that the market for plant-based alternatives may be on the rise (Haas *et al.*, 2019). Plant-based alternatives are a good substitute to animal-based products especially to those who have allergies. Vegan protein sources are known to have lower antigens and it is more environmentally friendly as it's production's carbon footprint is smaller than that of animal protein sources (Shim *et al.*, 2018).

Aquafaba is the wastewater that is obtained from boiling chickpeas in water. Aquafaba is known to have a good foaming ability which resembles that of egg white and therefore is known to be the alternative of it. Due to the foaming ability of aquafaba, it is then able to produce meringues as an egg substitute (Buhl *et al.*, 2019). With the variety of legumes available in the market, research could be conducted to determine other legumes that can be utilized to create foam from the bean water. As chickpea have a distinct higher amount of protein compared to fat, around 12.6 to 29.0% compared to 3.4 to 8.8% which is different to soybean where there is more fat content compared to protein (Wood and Grusak, 2007). Yellow

lentils and yellow split peas also share the same characteristics of having higher protein content when compared to the fat content.

Previous studies was done on the effect of different ways of cooking, water to legume ratio as well as cooking time on the aquafaba of chickpea that was produced. It is shown that the longer the chickpea was cooked, the more protein content will be present in the aquafaba produced. It is also worth mentioning that the amount of protein that leached out is very low at around 0.5% to 1%. Tannin is known to be an antinutrient that is found in plants, especially in legumes. Tannin is able to bind to minerals present in the aquafaba as well as proteins and carbohydrates, lowering the solubility of both protein and carbohydrate. To reduce the concentration of tannin, soaking or boiling the legumes in water is needed as tannin is soluble in water (Alsaman *et al.*, 2020). Foaming properties of aquafaba shows an increase as the boiling time increases. The result shown by Alsaman *et al.* (2020), which shows that aquafaba that is boiled for 60 minutes have a higher foaming capacity and foaming ability compared to that boiled for 15 minutes only. As the interval used in the research is 15 minutes between each boiling time, this research would like to test the effect of longer boiling time with larger boiling time interval on the foaming capacity and foaming stability of aquafaba as well as the effect of boiling time on the components of the aquafaba itself.

This research aims to produce bean water or aquafaba from legumes that share a similar characteristics to that of chickpea, mainly yellow lentils and yellow split peas. As well as determining the best boiling time of aquafaba based on its components present and the foaming capacity and foaming stability. Best type of legumes along with the boiling time will be determined.

1.2 Research Problem

Aquafaba is obtained from bean water that has been boiled, it serves as a good alternative to egg white as it has similar properties to that of egg white where it has foaming ability. Legumes have been known to contain high amount of proteins and therefore is consumed as the plant based protein. Although beans are known to be the vegan alternative to animal based proteins, there are little to no research on the functionality of bean water resulted from boiling the beans in water other than that of chickpeas. As there are a variety of beans that have similar qualities to chickpeas, such as yellow lentils and yellow split peas, there may be a possibility that the bean water produced also have the same capability to that of bean water produced from chickpeas. However, beans are known to contain antinutritive compounds such as tannin hence, it is favourable that the compound is reduced or removed from the final product through treatments. Tannin concentration can be reduced by boiling the beans in water. Different boiling time when producing aquafaba may also affect the composition of aquafaba as longer boiling time can lead to higher concentration of protein which increases foaming capability.

1.3 Objectives

1.3.1 General Objectives

The general objective of this research is to test the foaming ability of aquafaba obtained from yellow lentils and yellow split peas and compare it to that of chickpeas.

1.3.2 Specific Objectives

The specific objectives of this research:

1. To determine the best boiling time in the production of aquafaba made from chickpea, yellow lentils and yellow split peas respectively.
2. To compare the foaming capacity and foaming stability of foam produced from aquafaba of chickpea, yellow lentils and yellow split peas in comparison to egg white.

