CHAPTER I

INTRODUCTION

1.1 Background

Breadfruit (*Artocarpus altilis*) is one of the important crops especially in Polynesia and has grown widely in tropical, Pacific, Caribbean, and African countries (Ragone, 1997). Breadfruit is an energy-rich food high in complex carbohydrates, low in fat, and a good source of high-quality protein, fibers, and minerals, and considered to be an excellent dietary staple (Ragone, 2018). Breadfruit also can be eaten in many ways such as steamed, boiled, and fried. In Indonesia, based on the data from Indonesia's Central Bureau of Statistics, the production of breadfruit reached 104.966 tons in 2017. However, utilization of breadfruit is limited by its perishability due to its rapid respiration rate, in which the untreated fruits stored under 26-28°C only has a possible shelf life of 2-3 days after harvest which indicated by rapid weight and volume loss, softening, and increase in soluble solids (Badrie and Broomes, 2010). Hence, Post-harvest management should be implemented to increase its shelf life thus reducing food loss and one of the methods that can be utilized is by lowering the respiration rate by applying an edible coating.

Edible coating has the ability to inhibit oxygen penetration, avoid aroma and moisture loss, convenient to use, and also considered as safe (Jianglian and Shaoyin, 2013). Many materials of polysaccharides may economically serve as an edible coating, one of them is chitosan, derived from chitin which is one of the most abundant nature polysaccharides (Jianglian and Shaoying, 2013). Chitosan has a good antimicrobial and antifungal properties and could form a coating on fruit and vegetables easily and reducing the respiration rate of the produce (Jianglian and Shaoying, 2013). Chitosan is also has a generally recognized as safe (GRAS) status by the Food and Drug Administration (FDA) of the USA, and also approved by the European authorities.

Breadfruit can be consumed at any level of maturity. It can also be consumed with many ways of processing such as by boiling, steaming, and frying. Frying is one of the oldest and most popular

methods of processing food due to its simplicity and affordable price. Frying foods also produced a unique texture and taste that the majority of people love. The high temperatures and high solid fat content of the frying fat started the Maillard reaction in which lead to the desired texture and flavor of the food (Mellema, 2003). Many methods of frying can be done, with the most common one is by deep-frying

Deep frying is process that involves simultaneous heat, water, and oil transfer between the product and the frying medium that happened during the entire process (Oke et al, 2017). There are four stages of deep frying according to Mehta and Swinburn (2001) which are the initial heating stage, surface boiling stage, falling rate, and the bubble endpoint stage. Deep-fried foods contain a lot of fat due to the mass transfer phenomena between the water inside the core, which then evaporates, and then replaced by the oil (Zeb, 2019). Fat absorption also occurs when the food was removed from the frying medium. More than 80% of oil is absorbed in potato chips after the food was removed from the frying medium (Ufheil and Escher, 1996).

High-fat content has raised concern among consumers who in today's society, prefer to a healthier food choice. Oke et al (2012) stated that when the fat enters the food, it may have an effect on the nutritional value depending on the characteristics of the food, composition of the frying fat, and frying condition. Frying process reduces the amount of amino acids in foods (Oluwaniyi et al, 2010), and also vitamins of vitamin c, and vitamin b group (Reda, 2004). Other than that, several health risks also has been linked with the consumption of high-fat food. Some studies have found a connection between high-fat consumption with diabetes (Chao et al. 2007; Osorio-Yanez et al. 2007; Bao et al. 2014; Cahill et al. 2014), Cardiovascular diseases (CVDs) (Zeb, 2019; Sudargo et al. 2017; Ng et al. 2014), obesity (Tiwari et al. 2009; Guallar-Castillon et al. 2012; Qi et al. 2014), and coronary heart disease (Mozaffarian et al. 2006). To reduce this risk, several processing methods and pretreatments has been done. One of the processes that have been done as an alternative is by using an air fryer, and pre-treatment by using edible coating prior to the frying process.

Air Frying emerges as one of the frying methods that have been widely used in home kitchens. Air frying is a technique to fry foods through direct contact between an external emulsion of oil droplets in hot air and the product into a frying chamber (Andres, Arguelles, and Castello. 2012). An air fryer can be used with little-to-none oil as it relies on circulating air. Mass loss in air fryer is higher compared to deep frying method due to no oil used in this process. The heat and mass transfer phenomena are also slower in air frying, as it is faster when oil is used. Therefore, water transport is affected by this difference and causing longer processing times (Andres, Arguelles, and Castello. 2012). Characteristics of the food wise, air fryer produces a lot less fat content in foods with no significant differences in terms of organoleptic properties when compared with deep frying (Santos et al. 2017; Teruel et al. 2015).

To further lower the fat content, a pretreatment by using edible coating before the frying process could be done. There are several studies regarding this issue, by using methylcellulose (Lalam et al. 2013), hydroxymethylcellulose (Duran et al. 2007), carboxylmehylcellulose (Chen et al 2009), and hydrocolloids (Kim et al. 2011) which all resulted in lower oil content of the product. However, there are limited studies regarding the effect of chitosan coating on the quality of fried fruit products. As it has only been found to have an effect during frozen storage (Osheba et al. 2013), lowering moisture loss and fat uptake by using chitosan nanocoating (Ansarifar et al. 2015), and inhibiting acrylamide formation (Sansano et al. 2016)

1.2 Objective

- To compare and analyze the effect of deep frying and air frying towards the physicochemical and organoleptic properties of breadfruit chips, encompassing the moisture content, oil content, color, texture, and sensory acceptability.
- To analyze the effect of chitosan coating towards the physicochemical and organoleptic properties of breadfruit chips, encompassing the moisture content, oil content, color, texture, and sensory acceptability.

1.3 Scope of Work

The scope of work that was done in this research includes the preparation of breadfruit by cutting it into a uniform shape, applying pre-treatment that were divided into four groups which are control (untreated), and coated, with two different methods of frying which is deep and air frying, physicochemical analysis which includes the moisture content, oil content, color, texture, and 5-scale hedonic sensory evaluation test which includes crispiness, oiliness. flavor, color, and overall acceptability.

1.4 Importance of the research

This study is conducted in order to obtain a low-fat breadfruit chips with desirable organoleptic properties. The final results are expected to reduce the amount of fat in breadfruit chips without sacrificing the organoleptic properties.