CHAPTER I

INTRODUCTION

1.1 Background

Jackfruit (*Artocarpus heterophyllus* Lam.) belongs to Moraceae family, has an aromatic smell and taste (Hunter, 2014). Jackfruit is widely grown in many countries in Asia such as India, Malaysia, Philippines, Thailand and Indonesia, commonly called as nangka. The fruit is only adapted to tropical and sub-tropical climates with high humidity (Akinmutimi, 2006). Jackfruit pulp usually eaten fresh or used in processed food such as salad or pizza’s topping and possessed high nutritional value. It has starch, dietary fiber and rich of vitamins and minerals (Hunter, 2014). Jackfruit consist of 10-15% of seeds from the total fruit weight. Unlike the pulp, jackfruit seed has less functional properties and usually is thrown away although the seeds, was reported, has high concentration of carbohydrate (38%), especially starch and protein (6.6%) (Tulyathan, *et al.*, 2002; Tadayyon, 2013). Due to the high starch content in jackfruit seed, development of jackfruit seed functional properties could be conducted. One of its development in food industry is starch-based edible coating.

One of the preservation methods for fresh products, such as fruits, is the application of edible coating. The functions of edible coating on food products are to control moisture transfer by preventing moisture loss, gas exchange or oxidation processes, and improve appearance of the product which could extend the product shelf life. Edible coating can be made from polysaccharide, proteins,
and lipids. In order to develop more functional properties of edible coating, composite edible coating or combination of edible coating components was made (Embuscado and Huber, 2009).

Starch-based edible coating are hydrophillic and intermediate in gas exchange properties but poor as moisture barrier and create brittle structure (Baldwin, Hagenmaier and Bai, 2012). To decrease the brittleness, polyols plasticizers such as glycerol, sorbitol and propylene glycol is added. However, polyols are also hygroscopic which makes the coating to absorb moisture from the atmosphere (Skurtys, et al., 2010). Baldwin, Hagenmaier and Bai (2012) mentioned that waxes are more permeable to gasses and has a good moisture barrier when it is form into edible coating but it usually has brittle structure. Composite edible coating from starch and waxes will provide better barrier (Santos, et al., 2014).

Beeswax is one of the waxes that usually used to make edible coating and secreted by honeybees for comb building. It is a highly hydrophobic wax and reported as the most effective wax to improve moisture barrier properties in edible coating but the coating will be opaque, weak and easily disintegrated in water. Addition of starch will increase strength of the edible coating and maintained its transparency (Gontard, et al., 1994).

Based on the contradictory characteristics of starch and wax, the combination can not be done unless emulsifier is used. Emulsifier will create dispersion of hydrophobic lipid material in the solution which will improve the stability and increase particle distribution in the emulsion. Lecithin is one of the
emulsifier with the same characteristics and commonly used in edible coating (Baldwin, Hagenmaier and Bai, 2012).

Edible coating usually apply in fresh fruits such as strawberry. Based on USDA (2016), strawberry ideally stored at 32 °F (0 °C) can last up to 2 weeks in 95% relative humidity. Patricia (2013) reported shelf life of 27 days in refrigerator of strawberry when it is coated with jackfruit seed starch-based edible coating with glycerol before mould spoilage occur. As to compared Patricia’s (2013) results, different plasticizer was applied by Steven (2014) resulted in three best combinations (3.5% starch–2.5% glycerol, 3.5% starch–2.5% sorbitol and 5.5% starch–2.5% sorbitol) that increase strawberry shelf life to 29 days in refrigerator. Addition of stearic acid or oleic acid gave 30 days of strawberry shelf life and increase in physical and mechanical properties of the edible film when stored at refrigeration temperature (Elana, 2014). The combination of jackfruit seed starch with beeswax and different plasticizers may result in different edible coating characteristics and affect to strawberry’s shelf life and quality.

1.2 Research Problem

Jackfruit seed has a high starch content and has been used for edible coating on strawberry to prolong its shelf life. Previous studies about jackfruit seed starch-based edible film and coating have been done and prolonged strawberry shelf life for 27 to 30 days. However, the best formulations from Steven (2014) are without the addition of wax, therefore composite edible coating from jackfruit seed starch and beeswax with different plasticizers will be conducted. It is interesting to know whether there is an improvement of physical and chemical characteristics of the
edible film and the application as edible coatings could extend strawberry’s shelf life and its characteristics than the previous research by Steven (2014).

1.3 Objectives

1.3.1 General Objectives

The general objective of this research were to investigate effect of jackfruit seed (*Artocarpus heterophyllus* Lam.) starch, beeswax, and plasticizers concentration on characteristics of composite edible film and use as edible coating to enhance strawberry shelf life and quality.

1.3.2 Specific Objectives

The specific objectives of this research were:

1. To isolate jackfruit seed starch and analyze its chemical characteristics and yield.

2. To determine effect of jackfruit seed starch, beeswax, and plasticizer concentration on composite edible film physical and mechanical characteristics; and to select formulation of composite edible film with suitable characteristics.

3. To determine effect of these selected composite edible film to be used as coating on shelf life and physicochemical characteristics of the coated strawberry.