

CHAPTER 1

INTRODUCTION

1.1. Problem Background

Banana is a tropical fruit and is in high demand in the world particularly Asia. According to FAO (2016), 114 million tons of bananas were produced in 2017. Banana contains around 67 calories per 100g serving. Banana comes from the *Musaceae* family. There are many types of banana such as *Musa sub-species* that include *M. oranta*, and *paradisiaca*. In Indonesia there are many types of banana such as golden banana, kepok (*Saba banana*), horn (*Musa acuminata x balbisiana*), ambon (*Musa acuminata*), green banana (*Musa cavendishi*), and others. Each type of banana has different characteristics such as appearance, shape, taste, and flavor. The two types of bananas that will be used in this research study are the *Musa cavendishi* and Saba banana. These two banana are chosen because there is a high demand especially in food processing. Total production of *Saba banana* is 290,000 tonnes per year while *Musa cavendishi* is 184,000 ton per year (Cahyono. B, 2016). Those data are categorized as high production because commonly the total production for each banana type is 50,000 to 100,000 tons per year (Cahyono. B, 2016). According to the study by Apostolopoulos. V, *et al* (2017), *Musa cavendishi* possess rich in nutrients such as higher fiber, resistant starch, and potassium that cannot be found in other banana variants. The Kepok banana (Saba banana) have similar characteristic with other banana, but there are several differences such as having a richer taste and unique skin color with the combination of yellow, brown and a little bit green color that cannot be found in other banana such as the Cavendish cultivar, whereas it also possess similar nutritional values as potatoes which are known for its good sources of carbohydrate and fiber (FDA, 2008).

Bananas are commonly processed as chips, and fried banana. However, despite the high consumption in banana, its produce is not being fully utilized and a lot of them are eventually thrown away as waste. Banana usually stays fresh for 4 to 5 days. This is due to the banana

appearance or physical properties and especially the freshness of banana (Suseno. N, *et al*, 2013). According to the study by Chang. C (2017), around 40% of the 114 million tons of banana produced is thrown away or made into animal feed. Therefore, there has been various proposals to reduce banana waste such as making it into food flavorings, chips, jam, and other added value products with longer shelf life. One of them is to utilize the banana to make banana powder.

There is a market demand for banana powder especially in Western Europe (Spain, Italy, France, Germany, Belgium, and Netherland), Eastern Europe (Poland and Russia), Asia Pacific (Japan, China, SEA, India, and New Zealand), North America (U.S and Canada), Middle East, and Africa. Banana powder is usually further processed into infant food, seasonings, instant food, and puffed food. According to a study by Hapsari (2016), banana powder has lots of benefits since it has high carbohydrate and protein content. It can be used as a substitute for fresh banana as a premix or banana snacks while also providing great quality for commercialization. The importance of banana flour is to boost resistant starch content as a source of prebiotics and as a flour replacement for gluten free eaters since it is naturally gluten free and grain free. Especially in *Musa cavendischi* flour it contains 5HTP or 5-hydroxytryptophan that is not commonly found in other food products. 5HTP helps to increase the serotonin or commonly known as a supplement for some people that struggles with depression, anxiety, mood, and headaches (Irena, 2018).

Other researchers have used several methods to extend the shelf life of banana such as by using chitosan edible coating. A study conducted by Suseno. N, *et al*. (2013), used chitosan edible film to coat banana and, prolonged the shelf life of banana to just 2 to 3 days. On the other hand, banana powders have a shelf life of 1 month or 90 days when stored at room temperature (Barooah. N, *et al*, 2018)

Banana powder is usually made by using spray drying process. Spray drying has been known as a technique used in food and other industries to evaporate the solvent quickly from the droplet (Dyvelkov. K. N, & Sloth. J, 2014). Spray drying involves both particle drying and formation. According to the study by Grewal. B (2017), there are three basic steps of spray drying such as

drying air and droplet contact, atomization (formation of droplet), and powder recovery to separate drying particles from drying air.

There are several factors that need to be considered to make a good quality banana powder such as flavor, taste, moisture content and physical properties such as color and appearance. The parameters that will be measured are: LOD (Loss on Drying) to measure the moisture content of banana powder, water activity, pH measurement, and color.

The aim of this research is to produce banana powder using different banana species, formulation, and compare the physical properties (color, pH, Aw, and moisture).

1.1. Problem Formulation

Based on the background of the problem above, the problems can be formulated as:

- How are the physical properties such as pH, moisture, water activity (Aw), and color different between Saba banana and *Musa cavendischi* powders made with various concentrations of maltodextrin and water?

1.2. Research Objectives

- To produce banana powder using different formulations (type of banana (*Musa cavendischi* and Saba banana), proportion of samples : water, and maltodextrin concentration).
- To analyze and compare the physical properties (color, pH, moisture, and water activity) of *Musa cavendischi* and Saba banana powders

1.3. Research Scope

The field of this research is food processing focusing on the application of spray drying for product development. The research problem is limited to (1) Production of banana powders from different banana species and formulations using a spray dryer. (2) Analyze and compare the pH, moisture, water activity (Aw), and color between *Musa cavendischi* and *Saba banana* powders made with different formulations.