CHAPTER I

INTRODUCTION

1.1 Background

Indonesia is a country which has extremely high plant biodiversity. Indonesia also has granted predicate as “negara megadiversitas”. Since past centuries, Indonesian people had already known many edible plants and medicinal plants. The examples of medicinal plant are tea, drumstick, and stevia leaves (Kartawinata, 2010).

Nowadays, the trend of using herbs is growing in many countries. In line with trend to use natural product, herbs could become medicine and dietary supplement. Some herbs such as drumstick (*Moringa oleifera*) and tea (*Camellia sinensis*) leaves have many health benefits. It can act as antihypertensive, diuretic, and anticholesterolemic. In addition, drumstick leaves contain high amount of minerals, particularly calcium and potassium which play role in maintaining body fluid balance. Deficiency in potassium can lead to glucose intolerance. Meanwhile, calcium also play role in signaling insulin secretion (Bent, 2008; Whitney and Rolfes, 2013; Pocket *et al.*, 2000).

Tea leaves also have many health benefits. It is known that tea can decrease cardiovascular disease risk, as well as antihypertensive, antiviral, antioxidant, antidiabetic, antibacterial, and anticancer agent. Antioxidant could help to decrease the resistance of insulin and dysfunction of beta cell (Whitney and Rolfes, 2013; Pocket *et al.*, 2000; Powell, 2015).
Stevia leaves are promising to reduce blood glucose of diabetic patients since it could give sweet flavor without contributing any calory. There are many ways to utilize herbs to obtain the health benefit. One of them is by consuming it as functional beverage. Functional beverage is beverage that has similar characteristics like conventional beverage, but can subserve physiological role beyond provision of simple nutrient requirements. Tea is one of functional beverages that become the most consumed beverage next to water. Therefore, by utilizing the herbs incorporated into tea, it is expected could increase the acceptance of functional tea (Siro et al., 2008).

Diabetes mellitus (DM) is a metabolic disorder that causes the elevation of blood glucose. There are two main categories of DM, which are type 1 and type 2 DM. Type 1 DM is caused by insulin deficiency. Meanwhile, type 2 DM occurred because of unhealthy lifestyle that allows body undergo hyperglycemia in long period. Type 2 DM covered about 80-90% of all diabetes cases. In 2014, about 9 million adult people in Indonesia are diabetic people. Therefore, formulation of herb-based product as functional tea should be done, especially on the herb that could manage or prevent type 2 DM (International Diabetes Federation, 2014).

1.2 Research Problem

Indonesia has about nine millions of adult diabetic people and they are need supply of antioxidant, antidiabetic agent, and also mineral like calcium and magnesium with aim to help them to manage the metabolic disease. Drumstick leaves have potency to supply antioxidant and also minerals. However, it has bitter taste and also has not been explored widely. Meanwhile, stevia could give
sweet flavor without contributing any calorie. However, it should be used in correct amount to avoid its bitter aftertaste which can appear when used in excess amount. Therefore, by combining drumstick and stevia leaves, as well as green tea in the making functional tea, it is expected that they could synergistically improve the acceptance of sensory attributes as well as antioxidant and antidiabetic activity. As a result, it could help to manage the DM patient.

1.3 Objectives

The objectives of this research are divided into two, which are general objective and specific objective.

1.3.1 General objective

The general objective of this research is to utilize drumstick (*Moringa oleifera*), stevia (*Stevia rebaudiana*), and green tea (*Camellia sinensis*) leaves in the making of functional tea.

1.3.2 Specific objective

The specific objectives of this research are:

1. To determine the proper fixation method in order to obtain high content of α-glucosidase inhibition activity and antioxidant activity of dried green tea leaves;

2. To determine best drying temperature of drumstick leaves in order to obtain high content of α-glucosidase inhibition activity and antioxidant activity of dried drumstick leaves;

3. To observe effect of different concentration of drumstick, green tea, and stevia leaves on physical and chemical characteristics of functional tea;
4. To determine the most preferred formula of functional tea based on sensory analysis;
5. To evaluate the nutrient content, the antioxidant activity, and \( \alpha \)-glucosidase inhibition activity of the most preferred functional tea formula.