

CHAPTER I

INTRODUCTION

1.1 Background

Development of functional foods and beverages with specific health effects are increasing recently due to higher concern toward health maintenance in the society (Pacheco-palencia *et al.*, 2007). More attention has been paid to the effects of edible plant sources, especially those rich in phytochemicals (secondary metabolites) which employ antioxidant activity. The presence of antioxidant in the diet is very important in its role to enhance body defense system and prevent various degenerative diseases such as cancer and coronary heart disease. Since the benefits imparted by phytochemicals in plant sources are very crucial in the health maintenance and disease protection, many researches regarding their antioxidant activity have been conducted and kept developed (Ahmed and Beigh, 2009).

Fruits and vegetables are the examples of several plant sources which are known to have natural antioxidant content that can lower risk of heart disease, cancer, and slow down body's natural aging process. Some considerable types of antioxidant content in fruits and vegetables are phenolic compounds including flavonoids and pigments, vitamin C and E (Conneally, 2008). Nonetheless, source of antioxidant from plant sources is not only came from fruits and vegetables. Other examples of plant that also provide antioxidant capacity are soybean and tea. Soybean is known to have isoflavones, tocopherols, vitamin C, soy peptides,

lecithin, saponins, and sterols (Kumar *et al.*, 2010), while tea contains polyphenols including flavonols and catechins (Banerjee and Chaudhuri, 2005).

One efficient and common method to consume such antioxidant sources is through drinking beverage products made out of them. Fruits and vegetables can be made into juice products. Drinking juice product can give more benefit not only because it is relatively easy to make, but also it can retain higher antioxidant quality since no severe heating process included. According to Johnson and Williamson (2003), heating may partially destroy some antioxidant compounds, thus this treatment should be avoided if possible. In the making of soy based beverage and tea beverage, when heating cannot be avoided, the time required should be minimized.

As the technology developed and higher concern toward health maintenance raised, the awareness of consuming adequate amount of antioxidant has been increased. To achieve such purpose, many researches have been conducted to learn factors that able to enhance antioxidant activity and stability. Ascorbic acid is commonly added to beverage products like fruit juices to improve the nutritional properties and prevent enzymatic browning reaction (Pacheco-palencia *et al.*, 2007). Several studies have shown the effect of ascorbic acid addition in enhancing antioxidant activity of tea products (Majchrzak *et al.*, 2004), fruit juices (Sadilova *et al.*, 2009; Pacheco-palencia *et al.*, 2007), and soy products (Hwang *et al.*, 2001). However, other studies demonstrated negative effect of ascorbic acid to anthocyanin-rich products (Shrikhande and Francis, 1974). These facts suggest different effect of ascorbic acid addition to various sources of antioxidant. Therefore, it is necessary to know what kind of samples

containing different phytochemicals group that able to react synergistically with ascorbic acid. Since different color of commodities often showing different pigment content responsible for antioxidant function (Smirnoff, 2005), the effect of ascorbic acid to certain antioxidant compounds is analyzed through the addition of it to several beverages with different color. Hence, this research is mainly focused in analyzing the effect of ascorbic acid to enhance antioxidant activity of several beverages with different phytochemical compounds.

1.2 Research Problem

Ascorbic acid is known to have both positive and negative effect toward antioxidant activity and stability. Several studies showed that it is able to enhance antioxidant activity and stability of some compounds, but some others regarding anthocyanin stability stated differently. Therefore, it becomes necessary to understand which kind of phytochemicals exhibiting antioxidant properties that can be enhanced with the addition of ascorbic acid. Since most antioxidants are derived from plant sources with various color, this research will analyze the effect of ascorbic acid addition on the antioxidant activity of juice products made of carrot, tomato, grape, strawberry, brocolli, soymilk, and green tea. Other researches that have been conducted mostly only focused on one specific item only, and no research has been conducted to analyze the effect of ascorbic acid to various products. Hence, the data provided by this research can be used as information to determine what compounds that can work well with ascorbic acid and can be used for further researches in optimizing antioxidant activity and stability.

1.3 Objective

1.3.1 General Objective

This research is mainly subjected in knowing the effect of ascorbic acid addition to enhance antioxidant activity of several common beverages in Indonesia.

1.3.2 Specific Objectives

The specific objectives of the research are:

- 1.) To observe the free radical scavenging ability and vitamin C content of all samples containing carotenoid, anthocyanin, isoflavones, and polyphenol with and without ascorbic acid addition
- 2.) To know and compare the anthocyanin concentration of samples containing anthocyanin (grape and strawberry) with and without ascorbic acid addition
- 3.) To know and compare total phenolic content of samples containing polyphenol (green tea) with and without ascorbic acid addition
- 4.) To know and compare total isoflavones content of samples containing isoflavones (soymilk) with and without ascorbic acid addition
- 5.) To know and compare the betacarotene, lycopene, and lutein content of specific samples containing each carotenoid (carrot, tomato, brocolli) with and without ascorbic acid addition.