

CHAPTER I

INTRODUCTION

1.1 Research Background

Cowpea or *Kacang Tunggak* or *Vigna unguiculata* is one of the most ancient crops originated from Africa near Ethiopia. Nowadays, it is widely adapted and grown throughout the world. In Indonesia, it is also widely grown especially in the lowlands. The production of cowpea is quite high in Indonesia, which reaches 1.5-2 ton/ha according to the variety, location, and planting season, and cultivation used. In West Africa, cowpeas are consumed as boiled seeds, as combination with other foods, such as plantain, maize, and rice, as fried paste called akara, and as steamed paste called moinmoin. In Indonesia, cowpeas are cultivated as a minor plant in many provinces. Whole dried cowpea seeds are also consumed as soup ingredients and traditional snacks. The utilization of cowpea is still limited and its popularity as food ingredients is not as popular as soybeans, red beans and mung beans. Product derivatives of cowpea is also still very few (Ratnaningsih *et al.*, 2016).

Based on the nutritional aspect, cowpea contains about 22.9% protein, 61.6% carbohydrate, 1.4% fat and 11% moisture content (Praptiningsih *et al.*). The protein content of cowpea is very high with a relatively low fat content. It is suitable for vegetarians and lactose intolerance people due to its protein, lysine, aspartic acid and relatively high glutamic acid content. Besides that, cowpea seeds

are known to be able to improve intestinal microflora. Although cowpea has a weak antioxidant activity with IC₅₀ value of 750-5710 µg/mL, it is potential to be used as a functional food ingredient (Oluremi *et al.*, 2018).

Yoghurt is a product of lactic acid fermentation of milk by *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. It provides several benefits such as reducing or killing bad bacteria in the digestive tract, normalizing bowel work, and overcoming constipation and diarrhea. Yoghurt is usually made from dairy milk such as cow milk, however nowadays, non-dairy yoghurt has also been made from soybean milk, mung bean milk, cowpea milk and others (Firmansyah, 2013).

Bitter leaf or *Vernonia amygdalina* is a small shrub plant with dark green leaves which is widely grown in Africa. It is consumed as vegetable and has a lot of application in the treatment and medicine of various diseases such as amoebic dysentery, gastrointestinal disorders, antimicrobial and antiparasitic activities. The name “bitter leaf” is due to the bitter taste of its leaf which is contributed by the anti-nutritional phytochemicals within the plants. It is also rich in vitamins and minerals which is important in human diet (Oyeyemi *et al.*, 2018). Bitter leaf is a functional food plant as it contains phenolic compounds such as phytol, vernodalol, vernodalin, ascorbic acid, luteolin, luteolin-7-*O*-glucosides and others. A study has also suggested the strong antioxidant activity of bitter leaf extract and a good correlation between the total phenolic content and the antioxidant activity of the extract, thus it can be a good source of antioxidants (Alara *et al.*, 2017). It is known for its strong antioxidant activity despite its bitter taste. According to Ekaluo *et al.* (2015), ethanolic extract of African bitter leaf

extract has an IC₅₀ value of 33.18 µg/mL. Another study by Alara *et al.* (2017) also suggested the strong antioxidant activity possessed by african bitter leaf extract and there is a good correlation between the total phenolic content and the antioxidant activity. This means that the strong antioxidant activity in African bitter leaf extract is contributed by the phenolic content.

Green grass jelly (*Cyclea barbata* Miers) leaf is known as *cincau hijau* and has been commonly consumed in Indonesia. It has been used traditionally for gastroenteritis, thyphoid, intestinal disease, high blood pressure, diarrhea, mouth sores, and peptic ulcer treatments. Studies has proved that green grass jelly leaves have several pharmacological effects such as antihypertensive. anti-ulcer and antibacterial effects. These pharmacological effects are contributed by the flavonoid content of the leaves, specifically 3-O-glycosidic flavonol with a hydroxyl group at C-4' and an o-diOH of A ring at position of either 6,7 or 7,8 (Kusmardiyani *et al.*, 2012). It is also able to destroy several types of cancer cells, such as blood cancer (leukimia), cervical cancer, lung and breast cancer due to its antioxidant activity, contributed by the flavonoid content. Green grass jelly leaf has an IC₅₀ value of 49.45±0.64µg/mL, which is considered as a high antioxidant value (Farida *et al.*, 2015). Thus, green grass jelly is a potential source of antioxidant.

1.2 Research Problem

Cowpea yoghurt is considered to exhibit weak antioxidant activity due to the low antioxidant activity of the cowpea itself (Oluremi *et al.*, 2018). The addition of sources of antioxidant may produce functional yoghurt with high

antioxidant activity. There are many sources of antioxidant that have been used in food products. African bitter leaf and green grass jelly leaf are some of the sources of antioxidant which can be used as they possess strong antioxidant activity.

The addition of African bitter leaf or green grass jelly extracts into cowpea yoghurt may increase the antioxidant activity of the final product due to the strong antioxidant activity of those plant extracts. Thus, cowpea yoghurt with the addition of African bitter leaf extract or green grass jelly extract may be a potential functional yoghurt which not only provide good nutritional properties but also antioxidant property. However, there is no study that has been conducted regarding the addition of African bitter or green grass jelly leaf extracts to cowpea yoghurt as potential sources of antioxidant. Besides that, the effect of African bitter or green grass jelly leaves extract addition on antioxidant activity of cowpea yoghurt have not been known yet as it passes through fermentation process where changes of chemical composition may take place. Therefore, in the present study, the effect of the addition of sources of antioxidant (African bitter leaf extract or green grass jelly extract) on the antioxidant characteristics of cowpea yoghurt was determined and followed by physicochemical analysis and sensory evaluation of the cowpea yoghurt.

1.3 Objectives

1.3.1 General Objectives

The objective of this research was to study the antioxidant characteristics of cowpea yoghurt mixed with African bitter or green grass jelly leaf crude extracts.

1.3.2 Specific Objectives

The specific objectives of this research were:

1. To determine effect of different concentrations of plant crude extracts mixed to cowpea yoghurt and fermentation time on antioxidant characteristics; and to select yoghurt formulation having best antioxidant characteristics.
2. To determine effect of the selected yoghurt formulations on physicochemical and sensory characteristics of selected cowpea yoghurt.