# CHAPTER I

# INTRODUCTION

## 1.1 Background of Research

Free radicals are highly reactive compounds in the body because the molecule has no spouse. Free radicals exposure cannot be separated from daily life. Pollution from factories, vehicles, cigarettes, alcohol, and food are some of the sources of free radicals. Based on Riskesdas 2018 data, the proportion of tobacco consumption aged 15 and over has increased 1% from 32.8 at Sirkesnas 2016 in which the data is 33.8 on Riskesdas 2018 . On the proportion of alcoholic drinks, the Riskesdas data on 2018 shows 3.3 which means an increase from 2007 which has a total alcoholic 3.0 (Kemenkes, 2018). Baked and fried foods are one of the sources of free radicals from food (Kahkeshani et al, 2015).

Some degenerative diseases are caused by free radicals. Reactive and unstable free radicals cause damage to living cells. Cell function is not optimal due to damage to living cells causing long-term degenerative diseases (Sutrisna, 2013). WHO data shows that in 2008 55% from 14.5 million deaths in South Asia are caused by degenerative disease (WHO, 2011). Another study concluded that antioxidants have therapeutic value against degenerative disease (Barhe and Tchouya, 2014).

Antioxidants are compounds that can counteract and reduce free radicals activity by providing electrons to pair up with the free radicals compounds (Halliwell, 2012). There are two groups of antioxidants, i.e. natural antioxidant which is an antioxidant derived from the natural ingredients potentially preventing free radicals and antioxidant synthetic derived from chemicals (Isfahlan, 2010). The human body has an antioxidant which reserves slightly, so antioxidants from outside the body are needed to ward off radicals when the body is exposed to free radicals. The sources of natural antioxidants are derived from vegetables and fruit (Otsuki et al,

2010). Based on Riskesdas 2018 data, the proportion of consumption of fruit or vegetables lack in Indonesia has increased 2% where at Riskesdas 2013 it was 93.5% increased, to 95.5% in 2018 (Kemenkes, 2018). This is one of the reason that Indonesian people need innovation to consume sources of antioxidants, one of the ways is by using a synbiotic drink of mangosteen rind.

Mangosteen is a fruit that its utilization are still managed in a simple utilization despite the increased market potential, which some countries have long used the mangosteen fruit as a medicinal and therapeutic agents, especially the rind part (Permana, 2010). Mangosteen fruit is a plant that originated from Southeast Asia includes Indonesia, Malaysia, Thailand, and Myanmar. The mangosteen fruit is generally addressed by " Queen of Fruits " because the mangosteen fruit contains beneficial nutrient for preventing and treating various diseases such as cancer, heart disease, arthritis, diarrhea, tonsillitis, vaginal discharge, and dysentery. In addition to the utilization of the fruit, the rind is also widely used in the field of health. Mangosteen rind acts as an anti-hypertension, anti-cancer, anti-inflammatory, anti-diabetic and anti–HIV (Nugroho, 2012). Mangosteen rind which is the largest part of the mangosteen fruit is categorized as residue. Mangosteen rind contains active compounds known as xanthones. Xanthone has a role as a powerful compared to vitamin C and vitamin E to counteract free radicals, preventing cell damage, and inhibiting cell degeneration (Mardiana, 2012).

Allah says in Al - Qur ' an Surah Asy- Syu'araa : 80 :

وَإِذَا مَرِضْتُ فَهُوَ يَشْفِينِ (٨٠)

*"And when I sick, then He health me"*

The verse above explains that Allah has given all diseases to humans with the bidders and will be cured by permission of Allah. The mangosteen rind was one of the preventive agents of some diseases especially cancer because it contains antioxidant.

Synbiotic is a combination of probiotics and prebiotics (Yui, 2006). One of the agricultural commodities that contains prebiotics is mangosteen. Synbiotic drink products are developed with a dairy-based carrier because the high sugar content can be utilized by probiotics and prebiotics in the mangosteen rind so that the use of mangosteen rind as a prebiotic and *L. casei* as probiotics can produce the synbiotic drink.

Processed products and patent research about mangosteen continuesto grow such as juice, puree, concentrates, food supplement, herbal remedies and cosmetics. Mangosteen rind products have a good market prospects. Japan already developed products containing extracts of Panaxathone xanthone blend (80% α-mangostin and 20% γ-mangostin) used in breast cancer chemoterapy (Doi, 2009). Currently, in Indonesia processed products of mangosteen rind are developing such as mangosteen drink in the form of the juice using mangosteen, Mangosteen rind flour in a bag (powder bag), Mangosteen rind crumbs in capsules. The level of safety and hedonics for some ready to use commercial products cannot be guaranteed such as mangosteen rind flour in capsules which is risky for health because it still contains sap and other components that cannot be digested by the body (Permana, 2012).

The natural taste of the mangosteen rind extract is bitter when consumed since it scaused by groups of phenols compounds, xanthone compounds, including anthocyanin or tannin/catechins (Oliveira et al, 2014). Fermentation process in the making of sinbiotic drink may improve the taste and cover the bitter taste of mangosteen rind. Fermentation process leads to the increases of nutritional value of the macronutrient, micronutrient and antioxidant level on synbiotic drink of mangosteen rind (Pamungkas, 2011).

This study was designed to answer the problem lies if there are differences in antioxidant activity and pH levels of each sample with different fermentation times. Expected result are to improve the quality of life of the communities that use local natural resources, increasing the economic value of tropical fruit mangosteen particularly high in antioxidants and provide

additional insight into the potential of local materials in the environment that can be used for the treatment and prevention of degenerative diseases.

## 1.2 Statement of the Problems

1. How does the effect of fermentation time on pH level of synbiotic drink of mangosteen rind?
2. How does the effect of fermentation time on antioxidant activity of synbiotic drink of mangosteen rind?

## 1.3 Objectives of Research

### 1.3.1 General Objective

Analyzing pH level and antioxidant activity of synbiotic drink of mangosteen rind with variations of fermentation time

### 1.3.2 Special Objectives

a. nalyzing the effect of fermentation time on pH level of synbiotic drink of mangosteen rind
b. Analyzing the effect of fermentation time on antioxidant activity of synbiotic drink of mangosteen rind

## 1.4 Benefits of Research

### 1.4.1 Theoretical Benefits

a. Giving information ON the pH level and antioxidant activity of synbiotic drink of mangosteen rind
b. Becoming a reference in subsequent studies
c. Providing ideas and inputs if there are similar studies
d. Improving the ability of the author to use laboratory equipments

### 1.4.2 Practical Benefits

a. Giving information about the pH level and antioxidant activity of synbiotic drink of mangosteen rind as a functional food

b. Improving the economic value of the mangosteen rind

## 1.5 Authenticity and Formers Reasearch

**Table 1. 1 Authencity and Former Research**

| Researcher's Name | Title | Research Findings |
|---|---|---|
| W Asep Permana, Siti Mariana Widayanti, Sulusi Prabawati, Dondy A Setyabudi (2012) | Sifat Antioksidan Bubuk Kulit Buah Manggis (*Garnicia mangostana L.*) Instan dan Aplikasinya Untuk Minuman Fungsional Berkarbonasi | Mangosteen pericarp instant powder contained high levels of alpha-mangostin of 0.59 mg / g, anthocyanin 1.13 mg / g and phenolic content of 8.49 mg / g dry sample weight units. Antioxidant capacity amounted to 19.72 mg / g. |
| Stevi G, Dungir, Dewi G. Katja, Vanda S. Kamu (2012) | Aktivitas Antioksidan Ekstrak Fenolik dari Kulit Buah Manggis (*Garnicia mangostana L.*) | The highest content of phenolic compounds is in the methanol of dried samples (MK), followed by methanol of wet samples (MB), water of dried samples (AK), and the latter water wet sample (AB). The antioxidant activity is in MK is 44.49 mg / L, followed by premises MB, AK, AB with a value of 54.95; 346.73; 346.74 mg / l. |

| Researcher's Name | Title | Research Findings |
|---|---|---|
| Arum Lulu Mawar, Nur Aini, Gunawan Wijonarko (2018) | Formulasi Minuman Synbiotic dari Susu dan Ubi Jalar Menggunakan *Lactobacillus casei* | Synbiotic drink with the best formula is the percentage of *Lactobacillus casei* 2% and the ratio of sweet potato juice: skim milk (3: 1) The results are of the pH value 5.6, total dissolved solids 26o Brix, a total of 109 CFU of probiotics 1.56x, resistant to low pH 337.4%. |
| Suharyono A.S, Fibra Nurainy, Samsul Rizal, M. Kurniadi (2012) | L. *casei* Growth on Various Fermentation Time Synbiotic Drink of Green Cincau Extract (*Peremna oblongifolia merr*) | The result of obtained observation was examined its homogeneity with Bartlett test and growing data with Tuckey test, then the data were analyzed its heterogeneity to know the presence of difference between 1% and 5% of Less Significant Differential. The result showed that the appropriate and optimal duration of fermentation to produce a synbiotic drink of green cincau leaves extract was 16 hours with product characteristic possess the highest total amount of LAB at 1.78x1010 CFU/ml with pH 3.40 and acid total 3.30%. |

The authenticity of the research is based on several previous studies which have relatively similar characteristics in terms of research themes, although they differ in terms of the criteria of the subjects and variables studied. The research will be conducted on the characteristics of the synbiotic drink of mangosteen rind. Research related to mangosteen rind were conducted by Permana et al (2012) who made carbonated functional

drink products and research that have been conducted by Dungir (2012) under the title "Antioxidant Activity of Phenolic Extract from Mangosteen Rind (*Garcinia mangostana L.*)". The similarity of the research conducted by Permana et al (2012) and Dungir (2012) with the research that the researcher did was using the same ingredients of mangosteen rind and testing variables for antioxidant activity, while the differences were in the processing of mangosteen rind and the variables studied. Permana et al (2012) processes mangosteen rind into carbonated drink and Dungir (2012) by using mangosteen rind phenolic extract to study, while the researcher processes mangosteen rind into a synbiotic drink and research variables not only for antioxidant activity but also pH levels.

Another research is the formulation of synbiotic drink from milk and sweet potatoes using *Lactobacillus casei* (Mawar, 2018). The similarity of research conducted by Mawar with the researchers is in processing basic ingredients by making the synbiotic drink, in which the similarities in the use of lactic acid bacteria namely *Lactobacillus casei* and the similarity of research variables namely testing pH levels. The difference in the research is in the basic ingredients of the product which in the Arum's study the manufacture of sweet potato-based synbiotic drink, while in this study the manufacture of synbiotic drink is made from mangosteen rind. The difference in this research is also on the variables, in the Mawar's study only pH levels were tested while in this study pH levels were tested after fermentation with variations in the time of each sample and the antioxidant activity test after fermentation.

The research conducted by Suharyono et al's (2012) is *L.casei* growth on various fermentation time synbiotic drink of Green Cincau Extract. The similarity of research is in growing *Lactobacillus casei* with variations time of fermentation in the synbiotic drink. The difference with Suharyono et al's (2012) research is in the product of synbiotic drink and the variable of research was to analyse the effect of variations in fermentation time on pH level and antioxidant activity.