

CHAPTER I

INTRODUCTION

1.1. Background of Research

Typhoid fever is a systemic infectious disease characterized by fever and headache around for 3 weeks and accompanied by stomach symptoms, lymph enlarged spleen, and skin eruption caused by *Salmonella typhi* (Budikafa, 2014). *Salmonella typhi* is a pathogenic gram-negative bacterium. This bacterium is the main cause of typhoid fever that can enter the human body through the food and drink which contaminated with feces or typhoid stools. In Indonesia, typhoid fever is a health problem that needs serious attention because its complex problems which complicate treatment and preventium efforts. The prevalence of typhoid fever is estimated at 21 million cases with 128,000 to 161,000 deaths each year, the most cases occurring in South and Southeast Asia. Eighty to ninety percent of this figure are children aged 2-19 years old (WHO, 2018).

Efforts to treat typhoid fever are treated with antibiotic therapy but due to high cases of bacterial resistance to synthetic antibiotics are higher such as chloramphenicol, amoxicillin, ampicillin, cotrimoxazole, azithromycin, cefixime, ceftriaxone, and cefotaxime which also cause several problems related to toxic effects and residues of medicine, resulting in increased use of traditional medicine as an alternative. Some natural compounds that can be used as an antibacterial are alkaloids, flavonoids, saponins, steroids, and phenolics (Rabbaniyah, 2018).

Calabash (*Lagenaria siceraria* (Molina) Standl.) is one of the natural ingredients that have been used by the community to treat typhoid fever. Calabash (*Lagenaria siceraria* (Molina) Standl.) contains calcium, iron, vitamin C, saponins and polyphenols (Robinson, 1995). These chemical compounds as saponins and polyphenols are used as medicine for high fever due to typhoid disease or other infections (Depkes, 1997). Based

on Marlina and Saleh's research (2011) the results obtained indicate that ethanol extract of calabash contains saponins, steroids, and phenols which can inhibit the growth of *Bacillus cereus* and *Salmonella typhi* bacteria.

Flavonoids work by inhibiting the synthesis of macromolecules and then damaging bacterial cell membranes. Saponins have an antibacterial effect by damaging the permeability of bacterial cell membranes, causing damage to the cell membrane and remove important components from the cell such as proteins, nucleic acids, and nucleotide (Rabbaniyah, 2018). Phenols work by damaging lipids in the bacterial plasma membrane, causing cell components to come out (Pratiwi, 2008). Steroids inhibit bacterial growth by reacting to the lipid membrane and changing it, causing cell membrane leakage (Rabbaniyah, 2018).

Calabash (*Lagenaria siceraria* (Molina) Standl.) is one type of plant that has special features. Allah SWT says it clearly in the Qur'an in the 37th Surrah, surah As-Saffat verse 146:

وَأَتْبَتْنَا عَلَيْهِ شَجَرَةً مِّنْ يَّقْطِينٍ (الصَّافَّاتِ: ١٤٦)

«And we grow for him a tree of the pumpkin type»

In addition to creating plants as medicine, Allah also created animals in which there is medicine. In the Al-Qur'an Surah An-Nahl verse 69, Allah SWT says that in the bees stomach there is a drink of honey which has medicinal properties for humans. Moreover, honey has been used for treatment since the time of Prophet Muhammad.

Multiflora honey is a natural substance produced by honey bees from flower nectar derived from several types of flowers, therefore this honey has superior flavor, content, and benefits that are more diverse than monofloral honey. The main ingredients are sugars (glucose, fructose, sucrose), vitamins, mineral water, carbohydrates, and protein. Besides, multiflora honey contains flavonoids and organic acids which have an antibacterial effect. Based on the results of Hudri's research (2014) proved that pure multiflora honey can inhibit the growth of *Salmonella typhi* bacteria. The antibacterial

activity found in honey is determined by three systems. The three systems include acidity, osmotic pressure, and an inhibitor/antibacterial substances.

As the development of science and technology, combination therapy began to be used for the treatment of diseases caused by aerobic or anaerobic bacterial infections. Interactions result from antibacterial combinations can be antagonistic, additive or synergistic (Alhimsyah, 2017). Based on the results of Fitriani's et al (2016) study showed that the combination of lime juice 100% and 50% honey has greater inhibitory power than the single preparation against *Streptococcus*. Nowadays, the research about the combination of calabash extract and multiflora honey in inhibiting the growth of bacteria, especially *Salmonella typhi*, has never been done. Based on this matter, researchers are interested in conducting research on the antibacterial activity test of calabash extract (*Lagenaria siceraria* (Molina) Standl.) and multiflora honey combination against *Salmonella typhi* bacteria in vitro.

1.2. Problem Formulation

Based on background, above problem can be formulated as follows:

1. What are the secondary metabolites contained in calabash extract (*Lagenaria siceraria* (Molina) Standl.) and multiflora honey?
2. Does the combination of calabash extract (*Lagenaria siceraria* (Molina) Standl.) and multiflora honey have an antibacterial activity on the growth of *Salmonella typhi* in vitro?
3. What are the most active concentration of combination of calabash extract (*Lagenaria siceraria* (Molina) Standl.) and multiflora honey on the growth of *Salmonella typhi* in vitro?

1.3. Research Purposes

Judging from problem formulation, the existence of this study aims to:

1. Analyzing secondary metabolite compounds contained in calabash extract (*Lagenaria siceraria* (Molina) Standl.) and multiflora honey.

2. Analyzing the antibacterial activity of combination of calabash extract (*Lagenaria siceraria* (Molina) Standl.) and multiflora honey on the growth of *Salmonella typhi* in vitro.
3. Analyzing the most active concentration of calabash extract (*Lagenaria siceraria* (Molina) Standl.) and multiflora honey combination on the growth of *Salmonella typhi* in vitro.

1.4. Benefits of Research

1.4.1. Theoretical Benefits

This research can be used as reading material and input for all students especially students of Faculty of Health Science University of Darussalam Gontor and also can be used as a basis or reference for further research.

1.4.2. Practical Benefits

Provide information and increase public knowledge about the benefits of calabash and multiflora honey as an alternative treatment for typhoid fever (typhus) which is caused by infection of *Salmonella typhi* bacteria.