

CHAPTER 1

INTRODUCTION

1.1 Background

Escherichia coli is a type of species from the genus *Escherichia* that contains mostly motile Gram-negative bacilli that fall within the family *Enterobacteriaceae*. It is the predominant facultative anaerobe of the human colonic flora. The organism typically colonizes the infant gastrointestinal tract within hours of life, and thereafter *Escherichia coli* and the host derive mutual benefit for decades (Kaper et al., 2004).

The species *Escherichia coli* comprises gram-negative, rod-shaped, non-spore forming, motile bacteria which are about 2 μm long and 0.6 μm in diameter, with a cell volume of 0.6-0.7 μm^3 . It is facultative anaerobes, oxidase-negative, glucose, lactose and sucrose fermenting, with an optimum growth at pH of 6.0-7.0 and temperature of 37°C. However, some laboratory strains can multiply at temperatures up to 49°C (Jawetz., 2003).

Escherichia coli are bacteria that normally can be found in the intestines of animals, including humans. Actually, the presence of *Escherichia coli* and other kinds of bacteria within the intestines is necessary to help human body develop properly and to remain healthy. Although *Escherichia coli* strains are termed commensals and part of the normal intestinal micro flora of human and warm-blooded animals, that maintains a healthy intestinal ecosystem, under certain circumstances it may cause diseases. Diseases caused by any *Escherichia coli* strains are either a result of specific or non specific infections. Unspecific infections

occur where the non-pathogenic, commensal *Escherichia coli* strain become harmful, because of the weakened immune system of the host such as preterm infants, elderly, malnourished and immunocompromised person. *Escherichia coli* has been identified causing severe outbreak in more than 10 countries worldwide even affecting United States and United Kingdom. Most of the infections occur through contaminated food products. Specific infections are caused by some subsets of *Escherichia coli* strains that represent a versatile and diverse group of microorganism with several highly adapted clones. These strains have acquired specific virulence factors, which confer them ability to adapt to new environments and make them capable to cause a broad range of infections in healthy person. Three general clinical syndromes can result from infection with pathogenic *Escherichia coli* strains: enteric/diarrhoeal disease, urinary tract infection and sepsis/meningitis. As long as these bacteria do not acquire genetic elements encoding virulence factors, they remain benign commensal. (CDC, 2014)

According to a *Centre for Disease Control and Prevention* (CDC) pathogenic *Escherichia coli* are grouped into strains causing disease within our intestinal tract and the ones causing extra intestinal diseases. Diseases such as GIT (gastrointestinal infection) and UTI (urinary tract infection) occur because they can disseminate around our body system. The main mechanism of this pathogen entering into our body is through food and hence it is called 'food borne disease'. Diarrhea is the most common effect of this highly infectious disease. (CDC, 2014)

A lot of research has been done on the microbial activities from various species of plants from various geographical areas to find a new 'elixir'. The

importance of antimicrobial from plants has not been looked into until recently because most of the antibiotics in the market now is based on bacteria and also fungi. Due to the uprising of resistance and the awareness on the limited antibiotic effectiveness, new source of antibiotics from plants are being studied at an alarming rate. (Abdel-Massih, et al., 2010)

Oregano, scientifically named *Origanum vulgare*, is a common species of *Origanum*, a genus of the mint family (Lamiaceae). It is native to warm-temperate western and southwestern Eurasia and the Mediterranean region. The plant consist of leaves, stalk and root. It can be cultivated in Indonesia and relatively cheap as well. Only the leaves are used commonly in cooking. It is used in cooking especially for roasting and also possesses its own medicinal value.

Oregano is very high in nutritional content, particularly certain vitamins, minerals, and dietary fiber or roughage. As a good source of fiber, it works in the body to bind to bile salts and cancer-causing toxins in the colon and remove them from the body. This forces the body to break down cholesterol to make more bile salts.

Oregano also emerged from our food ranking system as a bountiful source of many nutrients. It qualified within our system as an excellent source of vitamin K, a very good source of manganese, and a good source of iron and calcium. *Oregano* is also known to be source of omega 3 fatty acids, which help stimulate and regulate the cardiovascular system of the body. This plant also possesses anti inflammatory, anti metatstatic properties that can inhibit growth of tumor cells. (Al Dhaheiri, 2013)

Previous study has been done to evaluate the potency of antimicrobial from plants towards various gram negative and positive bacteria. The result shows a positive outcome and hence provides the healthcare component a newer alternative in terms of medicine to treat various bacteria infections. The true potency of *oregano* leaves for bacterial infection treatments are still underway and undocumented yet and hence this shows that we must do further study on this particular leaves.

The purpose of this study was to determine the effectiveness of *oregano* leaves (*Origanum vulgare*) ethanolic extract on the growth of *Escherichia coli*.

1.2 Research Problem

Does *oregano* leaves (*Origanum vulgare*) ethanolic extract inhibit the growth of *Escherichia coli* in vitro ?

1.3 Objectives

1.3.1 General Objective

1. To determine the effect of *oregano* leaves ethanolic extract towards *Escherichia coli* growth in vitro as antibacterial (inhibiting growth).

1.3.2 Specific Objectives

1. To determine the minimum inhibitory concentration (MIC) of ethanol extract from *oregano* leaves that will inhibit the visible growth of *Escherichia coli*.

2. To determine the minimum bactericidal concentration (MBC) of *oregano* leaves ethanolic extract that will kill the *Escherichia coli*.
3. To determine the relationship between different concentration of *oregano* leaves ethanolic extract and its effect towards *Escherichia coli*.

1.4 Research Significances

1.4.1 Academic significance

1. Based on the non toxic doses ascertained and yet can still be explored, *oregano* leaves ethanolic extract was studied to find the real effective dose and ways of inhibiting *Escherichia coli* bacteria. Further test has to be done example IN VIVO test before it be used widely in humans as an antimicrobial agent and hence eradicate pathogenic *Escherichia coli* bacteria.
2. To diversify the usage of traditional medicines in leading worldwide diseases.

1.4.2 Practical advantages

1. Able to discover newer, cheaper and more reliable medicines which can cure pathogenic *Escherichia coli* infection.
2. The purpose of this research is to educate public about the importance of *oregano* leaves especially in the content of maintaining normal health wellbeing.