



**EFFECTS OF *Andrographis paniculata* (HEMPEDU BUMI) METHANOLIC
LEAVES EXTRACT on SUPEROXIDE
DISMUTASES (SodA & SodM) EXPRESSION in *Staphylococcus aureus*
(ATCC 25923) *IN VITRO*.**

By

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ABSTRACT

Andrographis paniculata (*A. paniculata*) or “Hempedu Bumi” is known for its antimicrobial properties and is widely used as traditional medicine worldwide. The main objective of this study is to determine the antimicrobial effects of *Andrographis paniculata* methanolic leaves extract against *S. aureus* (ATCC 25923) by determining the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC), killing potential and the expression of superoxide dismutase (SodA and SodM) enzymes in *Staphylococcus aureus* after treatment with MIC of *Andrographis paniculata* methanolic leaves extract. Serial dilutions of the *Andrographis paniculata* methanolic leaves extract were performed to determine the lowest concentration that inhibited growth of *S. aureus* and followed by determination of MBC. Time-kill assay was done in reference of 10mM methyl viologen (paraquat) to determine the effectiveness of killing of *S. aureus* by *Andrographis paniculata* methanolic leaves extract. SDS-PAGE analysis was used to determine the expression of superoxide dismutase (SodA and SodM) enzymes in *S. aureus* after treatment with MIC of the extract compared to the untreated *S. aureus*. The *A. paniculata* methanolic extract showed antimicrobial effects against *S. aureus* as MIC and MBC of 50mg/ml and 100mg/ml respectively. It also enhanced killing potential of *S. aureus* in the presence of 10mM methyl viologen where only 24.07% bacteria survive. However, the extract did not affect the expression of superoxide dismutases (Sod) in *S. aureus*, therefore it does not induce oxidative stress compared with sample treated with 32µg penicillin thus other enzymes should be tested.

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CHAPTER ONE

INTRODUCTION

1.1 Background

For many years, plants have been widely used as healthcare therapies or products to treat diseases such as common cold, fever, diarrhoea and many more. It is also believed that medicinal plants show antioxidant properties. According to Hossain et al., (2014), there are more than 1,300 species of plants used traditionally in Malaysia from more than 80,000 species of plants that have been identified as medicinal plants. The benefits and usage of the medicinal plants is being passed down from generation to generation. One of the medicinal plant that is used in Malaysia and other Asian countries is *Andrographis paniculata*.

In Malaysia, *Andrographis paniculata* (*A. paniculata*) (Figure 1) is also known as “King of Bitters” or “Hempedu Bumi” due to its bitter property (Kumar et al., 2012). This plant grows to height of 30-110cm with dark green stem, is about 8 cm long with 2.5 cm wide of leaves and has small white with purple strip flowers and brownish colour seed. It contains high amounts of minerals and phytochemicals (Akbar, 2011). It also shows antibacterial, antifungal, antiviral, hypocholesterolemic, hypoglycemic, and choloretic properties (Kumar et al., 2012). Sareer, Ahad and Umar, (2012) state that, *A. paniculata* is commonly used as a treatment for diabetes, hypertension and common colds in Malaysia. In a previous study, the antithrombotic action of this plant suggests that it may give benefit in cardiovascular disease and it may also give have effects in diseases such as cancer and HIV infection based on the pharmacological and clinical studies (Akbar, 2011).

Staphylococcus aureus (*S. aureus*) is a gram-positive bacteria which belongs to the family of Micrococaceae. It known as a major pathogen in human with more than one-third of the world’s population colonized and causes boils, impetigo, food poisoning, cellulitis and toxic shock syndrome (TSS) (Ballal and Manna , 2009). According to Lowy (2003), *S. aureus* causes more life-threatening infections as it can survive in a limited nutrient, stressful environment and is highly adaptive to different