

UNIVERSITI TEKNOLOGI MARA

**ANTIMICROBIAL ACTIVITY OF PLANT
EXTRACTS AGAINST PATHOGENIC
MICROORGANISMS**

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ABSTRACT

Aim- Methanolic extracts of 15 traditional medicinal higher plants were selected and evaluated. Antibacterial screening test was done to evaluate their antimicrobial activities against *Staphylococcus aureus* (*S. aureus*), *Escherichia coli* (*E. coli*), methicillin-resistant *Staphylococcus aureus* (MRSA) and extended spectrum β -lactamase (ESBL) *Escherichia coli* (RESCO 1) strains.

Method- The ground dried leaves or seeds were extracted with 70 % aqueous methanolic solution for 48 hours. The extracts were then filtered and the whole cycle was performed for three times. The combined methanol extracts were then dried *in vacuo* using a rotary evaporator. The dried methanolic extracts were later dissolved in 4 % DMSO and subjected to antimicrobial evaluation using the microdilution plate method. The 50% Minimal Inhibitory Count (MIC₅₀) of microorganisms against standard antibiotics was determined prior to antibacterial screening by using the microdilution plate and the agar-well diffusion method. Imipinem and vancomycin were tested against Gram-negative and the Gram-positive bacteria respectively.

Conclusion- This study elucidated that most of the plants extracts have antimicrobial activities against at least one type of microorganism with the exception for *Radix astragali* and *Antidesma stipularis* (leaves) which have no antimicrobial activities. However, only six of them were able to show significant values of inhibition index. These medicinal plants inhibited the growth of selected bacterial strains with inhibition index ranging between 0.36 to 0.84 with reference to vancomycin at the concentration of 31.99 $\mu\text{g/ml}$ for *S. aureus* and 13.34 $\mu\text{g/ml}$ for MRSA 2 or with reference to imipinem at the concentration of 0.98 $\mu\text{g/ml}$ for *E. coli* and 3.24 $\mu\text{g/ml}$ for RESCO 1. According to the results, *Melastoma malabathricum* (fruit) has the highest value of inhibition index towards *S. aureus*, with the value of 0.84 while *Azadirachta indica* has the lowest value against *S. aureus* which is only 0.36. The antimicrobial activity profile of all species of plants [except *Radix astragali*, *Antidesma stipularis* (leaves) and *Centella asiatica*] against the tested strains indicated that *S. aureus* was the most susceptible bacterium of all the bacterial test strains. On the other hand, *E. coli* was only inhibited by *Cassia surattensis* and *Antidesma stipularis* (seed). In general, it was observed that sensitive strains of Gram-negative bacteria are less susceptible to the plant extracts compared to sensitive strains of Gram-positive bacteria. However, for the case of the multi-resistant strains for both Gram positive and Gram negative bacteria, the antimicrobial activities of the plant extracts were almost similar. Besides that, the MIC₅₀ determination showed that the microdilution plate method is more sensitive than the agar-well diffusion method and is able to produce reproducible results.

CHAPTER 1

INTRODUCTION

For the past years, one of the principal areas of medical concern has been the emergence and transmission of multi-drug resistant (MDR) bacteria in humans, since the wide use of antibiotics has increased the number of resistant bacteria in the environment. These MDR pathogens were the extended broad spectrum beta lactamase (ESBL) producing organism which were mainly *Escherichia coli* (*E. coli*) and *Klebsiella pneumoniae* (*K. pneumoniae*) and methicillin-resistance *Staphylococcus aureus* (MRSA) (Alfizah *et al*, 2002).

Infection due to the mentioned MDR pathogen, present a major therapeutic concern as the choice of antibiotics is extremely limited. For the time being, vancomycin is the only drug effective against MRSA (Ariffin *et al*, 2004) while imipinem and ciprofloxacin are drugs of choice to combat ESBL producing organisms (Norazah *et al*, 2002). However, there is fear that the bacterial will eventually become resistant to these antibiotics.

The antimicrobial era has reached a level where the incidences of resistance microorganisms existing is increasing, while the development of new drugs and other alternatives are somehow, decreasing. Therefore there is a global urgency for the development of MDR pathogens drugs.