UNIVERSITI TEKNOLOGI MARA

ANTIMICROBIAL ACTIVITY OF SELECTED AROMATIC PLANTS AND QUALITATTIVE ANALYSIS OF THEIR COMPOUNDS

BAZLEE ABU BAKAR

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science
(Applied Biology)

Faculty of Applied Sciences

August 2023

ABSTRACT

Aromatic plant is a type of plant with nice aroma and also used as an ingredient in cooking. Natural based products are now used in many applications which include food preservatives. The antimicrobial activity of *Murraya koenigii* leaves, *Citrus hystrix* leaves, *Ocimum basilicum* var *thyrsiflora* and *Cymbopogon citratus* stalk were tested against *Staphylococcus aureus, Bacillus cereus, Salmonella typhi, Escherichia coli, Aspergillus niger, Candida albicans Microsporum canis* and *Cryptococcus neoformans*. Plant extraction was done by using distilled water as a solvent. Agar disc diffusion and microbroth dilution methods were used for the antimicrobial activity study while Ultra High- Performance Liquid Chromatography (UHPLC) and Liquid Chromatography Mass Spectrometry (LCMS) were used for the chemical compound analysis. It was found out that at the lowest concentration of 150 mg/ml, *M. koengii* displayed the largest diameter of inhibition zone against *S. aureus* measuring at 8.00 ± 0.57 mm while at the highest concentration of 300 mg/ml *O. basilicum* var *thyrsiflora* extract was observed to produce largest diameter of inhibition zone against *S. aureus* measuring at 12.33 ± 0.33 mm. *C. hystrix* extract and *O. basilicum* var *thyrsiflora* extract did not show any antibacterial activity against *B. cereus* but *C. citrarus* extract was only sensitive to *B. cereus* whereby 8.5 ± 1.0 mm was the largest diameter of inhibition zones produced. Unfortunately, no antifungal activity observed when it was tested with all extracts. Based on the minimum bactericidal concentration/minimum inhibitory concentration ratio, *M. koenigii* extract is bactericidal to all of the foodborne pathogens while *C. hystrix* and *O. basilicum* var *thyrsiflora* are bactericidal to *S. aureus, E. coli* and *S. typhi*. *C. citratus* is only bactericidal against *B. cereus*. Based on the chromatogram obtained from the UHPLC there were peaks on the chromatogram which showed active compounds. These show the extracts contain bio active compound.

ACKNOWLEDGEMENT

Firstly, I wish to thank ALLAH for giving me the opportunity to embark on my Master and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor Dr Wan Razarinah Wan Abdul Razak and my co supervisor Dr Che Puteh Osman for their guidance, moral support and help in my research

My appreciation goes to the lab assistants at Faculty of Applied Sciences UiTM Shah Alam and Atta-ur-Rahman Institute for Natural Product Discovery (AuRins) UiTM Puncak Alam for their help as well.

Finally, this thesis is dedicated to my mother for the vision and determination to educate me. This piece of victory is dedicated to her. Alhamdulilah.

Thank you.

TABLE OF CONTENT

CHAPTER ONE
INTRODUCTION

1.1 Research Background

An antimicrobial is a type of agent that can kill and slow down the growth of microbes. In the past few years, there has been a gaining interest to search and develop new antimicrobial drugs from many resources especially plant to fight with microbes with antibiotic or antifungal resistance. Infections by microbes to human are getting more common in these years. Food poisoning can occur in any country including Malaysia. These infections are usually either caused by bacteria, fungus, viruses and also parasites. Foodborne pathogens are microorganisms that can cause illness through contaminated food or water. One of the major problems that cause harm to human and food spoilage are microorganisms contaminating the food. In addition, outbreaks of foodborne illness are also common. Foodborne illness outbreaks occur when more than two people get sick from the same source of contaminated food and beverages (U.S Food & Drug Administration (FDA), 2022). The survival of microbes in food is a crucial issue which can lead to spoilage and reduce the quality of food products and also cause harm to human if ingested (Celiktas *et al*., 2007). A study has shown that in the United States, 9.4 million cases of diseases are caused by pathogens considered as foodborne agents (Scallan *et al*., 2011). In South Korea, the approximate number of patients warded for foodborne diseases is estimated to be 20 times higher than the number of reported cases by the Ministry of Health of South Korea (Kim *et al*., 2013). In Malaysia, the main cause of food infection is caused by poor food hygiene and also unhealthy food handling system. It has been reported that in Malaysia the cases of food poisoning are increasing by the rate of 62.47 cases in 100,000 people (Soon *et al*., 2011).

Foodborne illness is one of the most common diseases in the world which is caused by food infection or food intoxication. Food poisoning is usually caused by ingesting food contaminate with live microbes or its toxins. The bacteria would usually produce toxin and also gas in which will give bad effects to humans. One example of bacteria that had caused outbreak of food poisoning in the commercial airline industry is *Salmonella* spp. The incubation period of the bacteria would depend on what kind of bacteria that have been ingested by a human. The symptom of food poisoning can only be seen after the