INDIVIDUAL AND COMBINATORIAL ANTIBACTERIAL PROPERTIES OF *Plectranthus amboinicus*, *Murraya koenigii*, *Acorus calamus* and *Azadiractha indica* AGAINST ACNE CAUSING BACTERIA *Staphylococcus aureus*, *Propionibcaterium acnes* and *Staphylococcus epidermidis*

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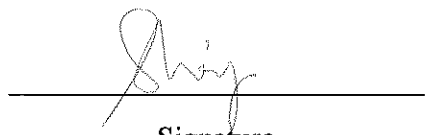
Sharanya Laxmi M.P Krishnasamy	
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ABSTRACT

Bacteria have developed resistance against various antibiotics. The aim of this study is to test for antibacterial properties of *Murraya koenigii, Plectranthus amboinicus, Azadirachta indica* and *Acorus calamus* crude extracts against clinically important bacteria *Staphylococcus aureus, Staphyloccocus epidermidis* and *Propionibacterium acnes*. A preliminary test was done to test individual and also combinatorial ethanolic extract formulas using the disk diffusion assay and agar diffusion assay against the pure bacterial cultures and also acne samples that had been obtained with the consent of volunteers. The disk diffusion assay carried out allowed less amount of extracts of *M. koenigii, P. amboinicus, A. indica* and *A. calamus* compared to the agar diffusion assay. The negative control used was 80% ethanol to confirm that the ethanol in the extraction preparation did not affect the antibacterial activity. It was noticed that all four extracts had antibacterial activity. However, in combination with *A. calamus*, there is an antagonistic effect that decreases the diameter of the zone of inhibition produced. The combination of *M. koenigii* and *A. indica* showed promising results and was further tested against pure bacterial cultures and acne sample cultures and provided a rather satisfying zone of inhibition for several sample especially Acne sample 5. Each combination of extract had different effect on different bacteria. ANOVA analysis also showed the mean difference is significant at the 0.05 level for *P. acnes*, Acne sample 5, 6, and 7 where else no significance was generated at 0.05 level for *S. aureus, S. epidermidis* and Acne sample 4. The tests also suggested that for topical application of these antibacterial agents, the crude plant extracts are best individually and not in combination.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

°C	degree Celsius
CFU/mL	colony forming per unit millilitre
Rpm	revolutions per minute
H_2O_2	Hydrogen peroxide
S. aureus	*Staphylococcus aureus*
S. epidermidis	*Staphylococcus epidermidis*
P. acnes	*Propionibacterium acnes*
P. amboinicus	*Plectranthus amboinicus*
E. coli	*Escherichia coli*
B. subtilis	*Bacillus subtilis*
S. typhi	*Salmonella typhi*
M. koenigii	*Murraya koeinigii*
A. indica	*Azadirachta indica*
A. calamus	*Acorus calamus*
AS 4	Acne sample 4
AS 5	Acne sample 5
AS 6	Acne sample 6
AS 7	Acne sample 7

CHAPTER 1

INTRODUCTION

Before the use of conventional drugs, man relied on natural ways to treat diseases such topical application of ground leaves on wounds. Medicinal plants have been known to embody very promising antimicrobial agents according to Bhagat et al. (2015). In Malaysia, the diversity of plants that provide therapeutic properties has been astonishing. With about 2000 or more have been proven to have medicinal purposes based on Arifullah et al. (2014). Traditional practices are still carried out in Malaysia and the use and effects of medicinal plants give enhancement to it. The main reason of using medicinal plants for therapeutic purposes is because modern medication contains too much chemicals and there also has been an over exploitation of antibiotic usage reported by Kazemipoor et al. (2012). According to Njoroge & Bussmann, (2006), the misuse of antibiotics has led to increased occurrence of bacterial resistance. The continuation of this has led to a build-up of resistance in bacteria and thus proving conventional drugs are beginning to not work anymore. Therefore, the use of medicinal plants have justified that phytochemicals present in plants are just as good as accomplishing antimicrobial activities as conventional drugs.

Plant based therapeutics are less expensive, easily biodegradable, harmless to the environment and have also been proven as non-narcotic (Fullerton et al., 2011). Medicinal plants not only provide antibacterial activities but have been proven to show other activities as well such as anti-cancer, anti-ulcer, antioxidant, anti-inflammatory, anti-septic and anti-pyrogenic (Bhatt, 2014). According to Moghadamtousi et al. (2014), due to rise in drug resistant microbes, there is a need to study the antimicrobial activity in a combination of the plants constituents. Since individual plant extracts have been proven to show certain antimicrobial effects, the synergistic properties is posed to have more promising effects on clinically vital bacteria (Ncube et al., 2012).

The present study has been intended to test for antimicrobial activity of plants valued to Indians and found abundantly in Malaysia. This research is to test antimicrobial properties of value added plants namely *Azadirachta indica*, *Ocimum*

tenuiflorum, *Murraya koenigii* and *Acorus calamus*. The antimicrobial test is determined by disk diffusion method against bacteria causing acne namely *Propionibacterium acnes*, *Staphylococcus aureus* and *Staphylococcus epidermidis*. This study also investigates the effects of a combination of plant extracts against the bacteria causing acne. The tendency to carry out antimicrobial activities by the plant extracts are also compared to that of antibiotics namely penicillin, tetracycline and erythromycin as positive controls. These extracts will be assayed using the disk diffusion method and agar diffusion method.