FORMULATION AND EVALUATION OF HERBAL ANTIBACTERIAL CREAM FROM *PITHECELLOBIUM JIRINGA*

NURIN ADILA ZAKY BINTI IRFAN ZAKY

Final Year Project Report Submitted in Partial Fulfilment of the Requirements for the Degree of Bachelor of Science (Hons.) Chemistry in the Faculty of Applied Sciences Universiti Teknologi MARA

JANUARY 2019
ABSTRACT

FORMULATION AND EVALUATION OF HERBAL ANTIBACTERIAL CREAM FROM *PITHECELLOBIUM JIRINGA*

The demand of herbal cream has increased rapidly in the market due to the herbs' natural content which does not pose any side effects on the human skin. *Pithecellobium jiringa* (*P. jiringa*) also locally known as jering, has been used in various medicinal applications, either modern or traditional way such as treatment of hypertension, diabetes and removal of bladder stones. The study on stem bark of the *P. jiringa*, revealed that it possesses antioxidant and antimicrobial properties. Thus, the present study was carried out to extract *P. jiringa* stem bark by using ethyl acetate solution and to prepare and evaluate formulation of cream made from ethyl acetate extract of *P. jiringa* stem bark. The antioxidant properties of the *P. jiringa* extract were discovered and observed in antioxidant assay by using DPPH (2, 2-diphenyl-1-picrylhydrazyl) and was compared to the standard ascorbic acid. The study on antioxidant activity of *P. jiringa* extract, revealed that the highest percentage of DPPH scavenging activity of ethyl acetate extracts was 91.88% and the IC\textsubscript{50} value was 46.25 μg/mL whereas for ascorbic acid the IC\textsubscript{50} value was 11.00 μg/mL. After discovering the different types of emulsion, this study was able to prepare several antibacterial creams (oil in water) that were classified from F1 to F6, by using different concentrations of stearic acid and acetyl alcohol. The evaluation of all the formulations was done by analysing on several parameters such as pH, spread ability and stability. The formulated creams F1 to F6 were then investigated for their antibacterial activity against several bacteria such as *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumonia*, and *Bacillus cereus* by using agar disc diffusion technique. Among the six formulations F6 has been found to show good spread ability, homogeneity, appearance and pH. The formulation did not show any phase separation and easy to be removed. The F6 formulation also showed no irritations on skin such as redness, edema, or erythema in irritancy studies. In microbiological assay, F6 formulation exhibited the largest zone inhibition against *Staphylococcus aureus* which was 11.52 mm at the concentration of 2.0% w/v. Therefore, the study suggests that the composition of extract and the base of the cream of F6 are more stable and can be safely used for the consumers that have skin irritations caused by bacteria.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>ii</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF SYMBOLS</td>
<td>viii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>ix</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>x</td>
</tr>
</tbody>
</table>

## CHAPTER 1 INTRODUCTION

1.1 Background
   1.1.1 Cosmetic industry  
   1.1.2 Synthetic antifungal cream  
   1.1.3 Herbal antifungal cream  
   1.1.4 *Pithecellobium jiringa*  
1.2 Problem statement  
1.3 Significance of study  
1.4 Objectives of study  

## CHAPTER 2 LITERATURE REVIEW

2.1 Definition of cosmetic  
   2.1.1 Cosmetic products  
   2.1.2 Synthetic substances in cosmetics  
2.2 Historical review of herbal plant usage  
   2.2.1 Definition of herbal cosmetics  
   2.2.2 Herbal cosmetics  
2.3 Cream  
2.4 Emulsion  
   2.4.1 Oil in water emulsion  
   2.4.2 Water in oil emulsion  
   2.4.3 Microemulsion and nanoemulsion  
2.5 Formulation of herbal cream  
   2.5.1 Formulation of herbal cream using FAPG base  
   2.5.2 Formulation of herbal cream using Tween 80 and Span 80  
2.6 *Pithecellobium jiringa*  

## CHAPTER 3 METHODOLOGY

3.1 Materials  

---

iii
3.2 Methods
3.2.1 Plant materials
3.2.2 Preparation of extracts
3.2.3 Antioxidant activity of *Pithecellobium jiringa*
3.2.4 Cream formulation
3.2.5 Evaluation of cream
   3.2.5.1 Type of emulsion dye test
   3.2.5.2 Accelerated stability testing
   3.2.5.3 Some properties of the cream
   3.2.5.4 Irritancy test
   3.2.5.5 Microbiology assay

CHAPTER 4 RESULTS AND DISCUSSION
4.1 Antioxidant activity of *Pithecellobium jiringa* 32
4.2 Evaluation of the herbal cream 36
4.3 Microbiological assay 39

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS 46

CITED REFERENCES 48
APPENDICES 55
CURRICULUM VITAE 67
<table>
<thead>
<tr>
<th>Table</th>
<th>Caption</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Composition of <em>P. jirina</em> extract based cream (g)</td>
<td>28</td>
</tr>
<tr>
<td>4.1</td>
<td>DPPH radical scavenging activity of ethyl acetate extracts</td>
<td>34</td>
</tr>
<tr>
<td>4.2</td>
<td>IC$_{50}$ value of standard vs sample extract</td>
<td>35</td>
</tr>
<tr>
<td>4.3</td>
<td>Scavenging activity according to Ahmad and Abdullah (2013)</td>
<td>36</td>
</tr>
<tr>
<td>4.4</td>
<td>pH of formulations</td>
<td>37</td>
</tr>
<tr>
<td>4.5</td>
<td>Accelerated stability testing</td>
<td>38</td>
</tr>
<tr>
<td>4.6</td>
<td>Type of adverse effect of formulations</td>
<td>38</td>
</tr>
<tr>
<td>4.7</td>
<td>Antibacterial activities of various cream formulations on few types of bacteria at several concentrations.</td>
<td>42</td>
</tr>
</tbody>
</table>