

ห้องสมุดงานวิจัย สำนักงานคณะกรรมการวิจัยแห่งชาติ



E47206

DEVELOPMENT OF TOPICAL ANTIMICROBIAL GEL
CONTAINING BEEHIVE EXTRACT

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MASTER OF SCIENCE
IN PHARMACEUTICAL SCIENCES

THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
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TANYA SONTHIKON

**A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE
IN PHARMACEUTICAL SCIENCES**

**THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY**

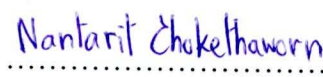
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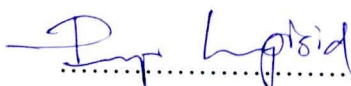
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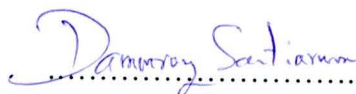
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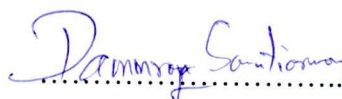
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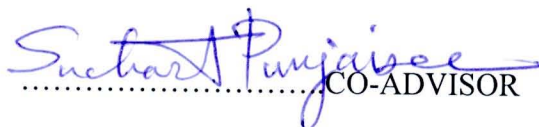
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ABSTRACT

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This study aimed to determine the antimicrobial activity of beehive extract and developed into topical gel. The beehives were extracted with 3 different solvents: distilled water (W), 50% ethanol (WE) and 95% ethanol (E), then each filtrate was evaporated by vacuum rotary evaporator to obtain concentrated crude extracts. These extracts were tested for their antimicrobial activity against five bacterial strains: *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 25923, Methicillin Resistance *Staphylococcus aureus* (MRSA) and β -hemolytic *Streptococcus* group A (GAS), then their MIC and MBC values were evaluated. The results revealed that the W, WE and E extracts were amounted to 16.25, 14.42 and 8.67% yield respectively. Whereas all of the extracts were found to be effective against *P. aeruginosa*, *S. aureus*, MRSA and GAS. The W extract exhibited the highest antimicrobial activity against all of strains with MIC of 31.25-62.50 mg/ml and MBC of 62.50 mg/ml, but all of the extracts ineffective against *E. coli*. Then the gel bases using different gelling agents such as Carbopol,

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Hydroxyethyl cellulose (HEC) and Hydroxypropyl methylcellulose (HPMC) were formulated and evaluated for their physical properties: appearance, texture, pH, spreadability and stability. The formula containing HEC was selected to incorporate with the W extract which showed dark brown color, smooth texture, good spreadability on the skin and good stability. The W gel exhibited a promising antimicrobial activity in both before and after stability test and also expressed no skin irritation.

ชื่อเรื่องวิทยานิพนธ์

การพัฒนาผลิตภัณฑ์เจลใช้เฉพาะที่เพื่อต้านจุลินทรีย์ซึ่งมีส่วนผสมของ
สารสกัดจากรังผึ้ง

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บทคัดย่อ**E47206**

งานวิจัยนี้ได้ศึกษาฤทธิ์ในการยับยั้งแบคทีเรียของสารสกัดจากรังผึ้ง โดยนำรังผึ้งมาสกัดด้วยตัวทำละลายที่ต่างกัน 3 ชนิด คือ น้ำ (W), 50% เอทานอล (WE) และ 95% เอทานอล (E) สารสกัดที่ผ่านการกรองแล้ว ถูกนำไปประเหยแห้งด้วยเครื่องระเหยแบบหมุน ได้เป็นสารสกัดรังผึ้งเข้มข้น สารสกัดดังกล่าวถูกนำไปทดสอบฤทธิ์ในการยับยั้งเชื้อแบคทีเรียก่อโรค 5 สายพันธุ์ ได้แก่ *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 25923, Methicillin Resistance *Staphylococcus aureus* (MRSA) และ β -hemolytic *Streptococcus* group A (GAS) โดยหาค่า MIC และ MBC ผลการวิจัยพบว่าการสกัดรังผึ้งได้ % yield ของสารสกัด W, WE และ E เท่ากับ 16.25, 14.42 และ 8.67 ตามลำดับ ส่วนฤทธิ์ในการยับยั้งเชื้อแบคทีเรียนั้น พบว่าสารสกัดทั้งสามชนิดสามารถยับยั้งเชื้อแบคทีเรีย *P. aeruginosa*, *S. aureus*, MRSA และ GAS ได้ สารสกัดรังผึ้ง W มีฤทธิ์ยับยั้งและฆ่าเชื้อแบคทีเรียทั้ง 4 สายพันธุ์ได้ดีที่สุด โดยมีค่า MIC อยู่ในช่วง 31.25-62.50 มก./มล. และ MBC เท่ากับ 62.50 มก./มล. แต่สารสกัดทั้งสามชนิดไม่สามารถยับยั้งเชื้อ *E. coli* ได้ สำหรับการตั้งตำรับเจลพื้นนั้นทำโดยใช้สารก่อเจลชนิดต่างๆ ได้แก่ Carbopol, Hydroxyethylcellulose (HEC) และ Hydroxypropyl

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methylcellulose (HPMC) แล้วประเมินคุณสมบัติทางกายภาพของตำรับ เช่น ลักษณะเนื้อเจล, pH, การซึมซาบรวมทั้งการทดสอบความคงสภาพทางกายภาพ และตำรับเจลพื้นที่ใช้ HEC เป็นสารก่อเจล ถูกเลือกมาผสมกับสารสกัดรังผึ้ง W ได้เป็นเจลรังผึ้ง W ซึ่งมีสีน้ำตาลเข้ม เนื้อเจลเนียน ซึมซาบเร็ว และยังคงมีฤทธิ์ในการยับยั้งเชื้อแบคทีเรียได้ดี ทั้งก่อนและหลังจากการทดสอบความคงสภาพ และไม่ทำให้เกิดการระคายเคืองต่อผิวหนังด้วย

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ABBREVIATIONS AND SYMBOLS

<i>B. alvei</i>	<i>Bacillus alvei</i>
GAS	Beta-Hemolytic Streptococci group A
Ca	Calcium
<i>C. albicans</i>	<i>Candida albicans</i>
<i>C. pseudotropicalis</i>	<i>Candida pseudotropicalis</i>
<i>C. stellatoidea</i>	<i>Candida stellatoidea</i>
<i>C. tropicalis</i>	<i>Candida tropicalis</i>
CFU/ml	Colony forming units/milliliter
°C	Degree celcius
<i>E. faecalis</i>	<i>Enterococcus faecalis</i>
<i>E. coli</i>	<i>Escherichia coli</i>
<i>et al</i>	Et alibi, and others
GC	Gas Chromatography
g	Gram
H/C	Heating-cooling
HPLC	High Performance Liquid Chromatography
Hr	Hour
HCl	Hydrochloric acid
HEC	Hydroxyethylcellulose
HPMC	Hydroxypropyl methylcellulose
i.e.	Id est, that is to say
kg	Kilogram

TEA	Triethanolamine
Mg	Magnesium
MRSA	Methicillin Resistant <i>Staphylococcus aureus</i>
μl	Microliter
μm	Micrometre
μg	Microgram
mg	Miligram
ml	Milliliter
mm	Millimetre
MBC	Minimum Bactericidal Concentration
MIC	Minimum Inhibitory Concentration
nm	Nanometer
pH	Negative logarithm of hydrogen ion concentration
N	Normality
NMR	Nuclear Magnetic Resonance
No.	Number
P	Phosphorus
PDII	Primary Dermal Irritation Index
PII	Primary Irritation Index
<i>p</i> -value	Probability value
<i>P. mirabilis</i>	<i>Proteus mirabilis</i>
<i>P. aeruginosa</i>	<i>Pseudomonas aeruginosa</i>
<i>P. pyocyanea</i>	<i>Pseudomonas pyocyanea</i>

NaOH	Sodium hydroxide
<i>S. aureus</i>	<i>Staphylococcus aureus</i>
TLC	Thin layer chromatography
THB	Todd Hewitte Broth
TSA	Tryptic Soy Agar
TSB	Tryptic Soy Broth
w/v	Weight by volume