

สารที่มีฤทธิ์ทางชีวภาพจากเปลือกต้นตุมกาแดง

นายอุทัย ไสชนะพันธ์



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**BIOACTIVE COMPOUNDS FROM**  
***Glyptopetalum sclerocarpum* STEM BARK**



Mr. Uthai Sotanaphun

สถาบันวิทยบริการ  
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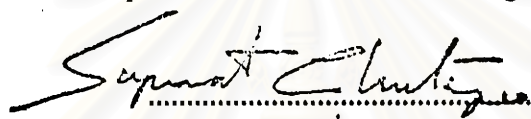
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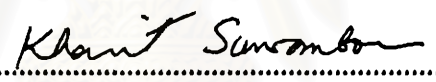
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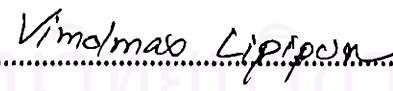
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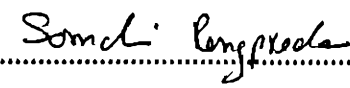
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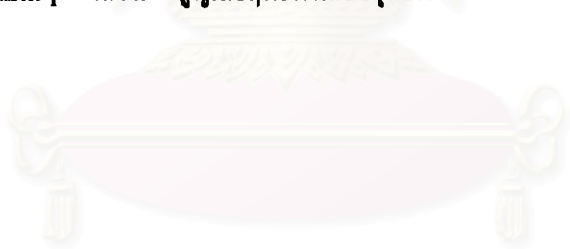
  
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พิมพ์ต้นฉบับบทคัดย่อวิทยานิพนธ์ภายในกรอบสี่เหลี่ยมนี้เพียงแผ่นเดียว

อุทัย โสชนะพันธุ์ : สารที่มีฤทธิ์ทางชีวภาพจากเปลือกต้นชุมกาแดง (BIOACTIVE COMPOUNDS FROM *Glyptopetalum sclerocarpum* STEM BARK) อ. ที่ปรึกษา : รศ. ดร. รพีพล ภาโวาท, อ. ที่ปรึกษาร่วม : รศ. ดร. วิมลมาศ ลิปิพันธ์, อ. ดร. รุทธ์ สุทธิศรี, 291 หน้า. ISBN 974-636-768-4.

จากการสกัดแยกสารจากเปลือกต้นชุมกาแดง (*Glyptopetalum sclerocarpum* Laws.) ได้พบสารจำพวก quinone-methide triterpenes ชนิดใหม่ 9 ชนิด คือ 20-hydroxy-tingenone, 20,22 $\beta$ -dihydroxy-tingenone, 20,22 $\beta$ -dihydroxy-20-epi-tingenone, 20-hydroxy-22-oxo-tingenone, 20-hydroxy-22-oxo-20-epi-tingenone, 20,21 $\alpha$ -dihydroxy-22-oxo-21-desoxotingenone, 21 $\alpha$ -hydroxy-20,22-dioxo-30(20 $\rightarrow$ 21)abeo-21-desoxotingenone, 20-oxo-20,21-seco-tingen-21-oic acid และ 20-oxo-21-nor-20,21-seco-tingen-22-al นอกจากนี้พบสารที่เคยมีรายงานแล้ว 3 ชนิด คือ tingenone, 22 $\beta$ -hydroxy-tingenone และ 20-hydroxy-20-epi-tingenone การพิสูจน์โครงสร้างทางเคมีของสารเหล่านี้ใช้การวิเคราะห์ข้อมูลทางสเปกโตรสโคปีอย่างละเอียด สารทั้งหมดแสดงความเป็นพิษต่อ brine shrimp และแสดงฤทธิ์ต้านเชื้อแบคทีเรียแกรมบวก และเชื้อรา หมู่ฟังก์ชันบนโครงสร้างในส่วน of ring E และความชอบในการละลายในไขมันของสาร มีอิทธิพลต่อฤทธิ์เหล่านี้ โครงสร้างของ tingenone, 22 $\beta$ -hydroxy-tingenone และ 20-hydroxy-20-epi-tingenone จะเปลี่ยนแปลงอย่างรวดเร็วในสภาวะที่เป็นกรด กลายเป็น isotingenone III, 20 $\beta$ -hydroxy-isotingenone III และ 20-hydroxy-20-epi-isotingenone III ตามลำดับ ซึ่งทำให้ความเป็นพิษต่อ brine shrimp ลดลง และสูญเสียฤทธิ์ต้านเชื้อจุลินทรีย์



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ภาควิชา .....  
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ลายมือชื่ออาจารย์ที่ปรึกษาร่วม .....  
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พิมพ์ต้นฉบับบทคัดย่อวิทยานิพนธ์ภายในกรอบสี่เหลี่ยมนี้เพียงแผ่นเดียว

## C475353 : MAJOR PHARMACEUTICAL CHEMISTRY AND NATURAL PRODUCTS

KEY WORD: *Glyptopetalum sclerocarpum* / CELASTRACEAE / STEM BARK / QUINONE-METHIDE TRITERPENES / ANTIMICROBIAL ACTIVITY / BRINE-SHRIMP LETHALITY / STRUCTURE-ACTIVITY RELATIONSHIP

UTHAI SOTANAPHUN : BIOACTIVE COMPOUNDS FROM *Glyptopetalum sclerocarpum* STEM BARK. THESIS ADVISOR : ASSOC. PROF. RAPEPOL BAVOVADA, Ph.D. THESIS COADVISOR : ASSOC. PROF. VIMOLMAS LIPIPUN, Ph.D. RUTT SUTTISRI, Ph.D. 291 pp. ISBN 974-636-768-4.

From the stem bark of *Glyptopetalum sclerocarpum* Laws., nine new quinone-methide triterpenes: 20-hydroxy-tingenone, 20,22 $\beta$ -dihydroxy-tingenone, 20,22 $\beta$ -dihydroxy-20-epi-tingenone, 20-hydroxy-22-oxo-tingenone, 20-hydroxy-22-oxo-20-epi-tingenone, 20,21 $\alpha$ -dihydroxy-22-oxo-21-desoxotingenone, 21 $\alpha$ -hydroxy-20,22-dioxo-30(20 $\rightarrow$ 21)*abeo*-21-desoxo-tingenone, 20-oxo-20,21-*seco*-tingen-21-*oic* acid and 20-oxo-21-nor-20,21-*seco*-tingen-22-*al*, were isolated together with three known compounds, tingenone, 22 $\beta$ -hydroxy-tingenone and 20-hydroxy-20-epi-tingenone. Elucidation of their structures was based on detailed spectroscopic examination. All compounds were toxic to brine shrimp and exhibited antimicrobial activities against gram-positive bacteria and fungi. These activities were influenced by functional groups on ring E of their pentacyclic triterpene structure and their lipophilic nature. Tingenone, 22 $\beta$ -hydroxy-tingenone and 20-hydroxy-20-epi-tingenone rapidly rearranged under acid condition to isotingenone III, 20 $\beta$ -hydroxy-isotingenone III and 20-hydroxy-20-epi-isotingenone III, respectively. These acid-rearranged compounds were less toxic to brine shrimp and lost their antimicrobial activities.



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*รุต สุตติศรี*

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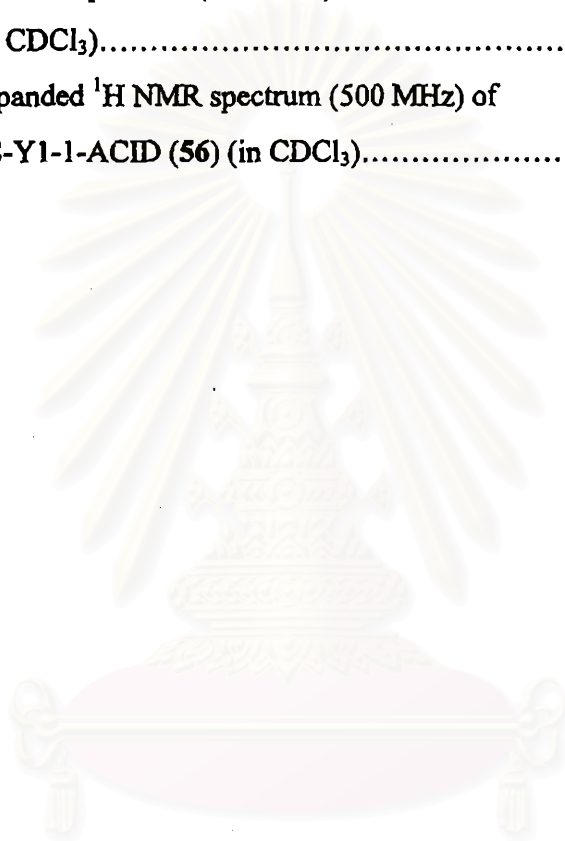
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## ABBREVIATIONS

<i>br</i>	= broad (for NMR spectra)
BSL	= brine-shrimp lethality
<i>c</i>	= concentration (g/100 ml)
°C	= degree Celsius
cc	= column chromatography
CCl <sub>4</sub>	= carbon tetrachloride
CDCl <sub>3</sub>	= deuteriochloroform
CHCl <sub>3</sub>	= chloroform
cm	= centimeter
<sup>13</sup> C-NMR	= carbon-13 nuclear magnetic resonance
cosy	= correlation spectroscopy
<i>d</i>	= doublet (for NMR spectra)
<i>dd</i>	= doublet of doublet (for NMR spectra)
<i>ddd</i>	= doublet of doublet of doublet (for NMR spectra)
<i>ddq</i>	= doublet of doublet of quartet (for NMR spectra)
DEPT	= distortionless enhancement by polarization transfer
DMSO	= dimethyl sulfoxide
<i>dt</i>	= doublet of triplet (for NMR spectra)
EIMS	= electron impact mass spectrum
Et <sub>2</sub> O	= diethyl ether
EtOAc	= ethyl acetate
EtOH	= ethanol
eV	= electron volt
fc	= flash chromatography
g	= gram
HCl	= hydrochloric acid
HMBC	= proton detected heteronuclear multiple bond connectivity
HMQC	= proton detected heteronuclear multiple quantum coherence
<sup>1</sup> H-NMR	= proton nuclear magnetic resonance

$\text{H}_2\text{SO}_4$	= sulfuric acid
Hz	= hertz
IR	= infrared
$J$	= coupling constant
KBr	= potassium bromide
kg	= kilogram
$\text{LD}_{50}$	= 50% lethal dose
$m$	= multiplet (for NMR spectra)
$[\text{M}]^+$	= molecular ion
MeOH	= methanol
MH	= Muller Hinton
MHz	= mega hertz
mg	= miligram
MIC	= minimum inhibitory concentration
ml	= milliliter
mm	= millimeter
MM	= molecular machanic
MS	= mass spectrum
$m/z$	= mass per charge ratio
nm	= nanometer
NMR	= nuclear magnetic resonance
No.	= number
<i>NOE</i>	= nuclear overhauser effect
NOESY	= nuclear overhauser effect spectroscopy
ppm	= part per million
$R_f$	= retardative factor, relative front
$R_m$	= Martin-ralation
$s$	= singlet (for NMR spectra)
S	= Sabouraud dextrose
SAR	= structure activity relationship
$\text{SiO}_2$	= silica gel
$t$	= triplet (for NMR spectra)

$td$	= triplet of doublet (for NMR spectra)
TLC	= thin-layer chromatography
TMS	= tetramethylsilane
UV	= ultraviolet
v/v	= volume by volume
$[\alpha]_D$	= specific rotation at 589 nm
$\epsilon$	= molar absorptivity
$\delta$	= chemical shift
$\lambda_{\max}$	= wavelength at maximum absorption
$\mu\text{g}$	= microgram
$\mu\text{l}$	= microliter
$\nu_{\max}$	= wavenumber at maximum absorption



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