

การศึกษาทางพฤษเคมีของเปลือกต้นส้มแขก

นางสาวจงดี โกสินทร์



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาเฒัฒศาสตร์มหาบัณฑิต

ภาควิชาเฒัฒศาสตร์

บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2539

ISBN 974-635-940-1

ลิขสิทธิ์ของบัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย

117288494

PHYTOCHEMICAL STUDY ON
THE STEM BARK OF *GARCINIA ATROVIRIDIS*

Miss Jongdee Kosin

**A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Pharmacy**

Department of Pharmacognosy

Graduate School

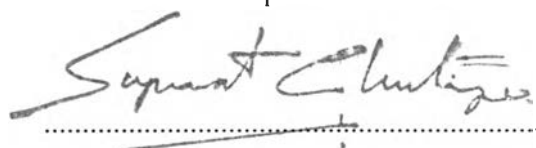
Chulalongkorn University

Academic Year 1996

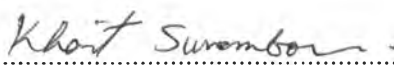
ISBN 974-635-940-1

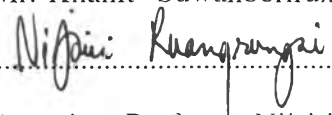
Thesis Title Phytochemical Study on the Stem Bark of *Garcinia atroviridis*
By Miss Jongdee Kosin
Department Pharmacognosy
Thesis Advisor Associate Professor Nijsiri Ruangrunsi, Ph.D.

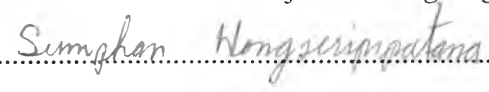
Accepted by the Graduate School, Chulalongkorn University in
Partial Fulfillment of the Requirements for the Master's Degree .

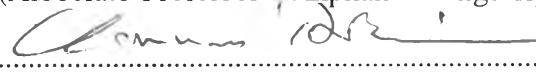

.....Dean of Graduate School
(Professor Supawat Chutivongse, M. D.)

Thesis committee


.....Chairman
(Mr. Khanit Suwanborirux, Ph.D.)


.....Thesis Advisor
(Associate Professor Nijisiri Ruangrunsi, Ph.D.)


.....Member
(Associate Professor Sunphan Wongseripipatana, Ph.D.)


.....Member
(Assistant Professor Channan Patarapanich, Ph.D.)

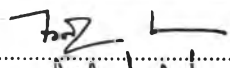
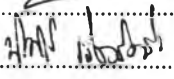


พิมพ์ต้นฉบับบทความวิจัยวิทยานิพนธ์ภายในกรอบสี่เหลี่ยมนี้เพียงแผ่นเดียว

จงดี โกสินทร์ : การศึกษาทางพฤกษเคมีของเปลือกต้นส้มแขก (PHYTOCHEMICAL STUDY ON THE STEM BARK OF *GARCINIA ATROVIRIDIS*) อาจารย์ที่ปรึกษา : รศ.ดร. นิจศิริ เรืองรังษี, 113 หน้า, ISBN 974-635-940-1

การศึกษาทางพฤกษเคมีของเปลือกต้นส้มแขก (*Garcinia atroviridis* Griff.) วงศ์ Guttiferae สามารถแยกองค์ประกอบทางเคมีเป็นสารกลุ่มสเตียรอยด์ คือ β -sitosterol และ กลุ่มแซนโทนชนิดใหม่ คือ 5,8,12-trihydroxy-2,2-dimethyl-2H,6H-pyrano[3,2-b]xanthene-6-one (atroviridin) การหาสูตรโครงสร้างทางเคมีของสารประกอบที่แยกได้นี้ โดยอาศัยการวิเคราะห์ ข้อมูลร่วมกับสเปกตรัมของ NMR ทั้งระบบเอกมิตี และทวิมิตี

ภาควิชา เภสัชเวท
สาขาวิชา เภสัชเวท
ปีการศึกษา 2539

ลายมือชื่อนิสิต 
ลายมือชื่ออาจารย์ที่ปรึกษา 
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม -

C875357 : MAJOR PHARMACOGNOSY

KEY WORD: XANTHONE / *GARCINIA ATROVIRIDIS* / GUTTIFERAE / STEM BARK

JONGDEE KOSIN : PHYTOCHEMICAL STUDY ON THE STEM BARK OF
GARCINIA ATROVIRIDIS. THESIS ADVISOR : ASSOC. PROF. NIJSIRI
RUANGRUNGSI, Ph.D., 113 PP., ISBN 974-635-940-1

Phytochemical examination of the stem bark of *Garcinia atroviridis* Griff. (Guttiferae) revealed the presence of a steroid and a xanthone. The steroid was appeared to be β -sitosterol whilst the xanthone was identified as a novel tetraoxygenated linear pyranoxanthone ; 5,8,12-trihydroxy-2,2-dimethyl-2H,6H-pyrano[3,2-b]xanthene-6-one, named atroviridin. Its structure elucidation and unambiguous NMR spectral assignment were achieved by the aid of the combination of 1D and 2D-NMR techniques.

ภาควิชา..... เกษตรเวช

สาขาวิชา..... เกษตรเวช

ปีการศึกษา..... 2539

ลายมือชื่อนิสิต..... 

ลายมือชื่ออาจารย์ที่ปรึกษา..... *Nijsiri Ruangrungsi*

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....

ACKNOWLEDGEMENTS

I am deeply indebted to my thesis advisor, Associate Professor Dr. Nijsiri Ruangrunsi of the Department of Pharmacognosy, Faculty of Pharmaceutical Sciences, Chulalongkorn University, for his guidance, suggestion, encouragement and kindness throughout my period of study.

I am very grateful to NMR-operators of the Scientific and Technological Research Equipment Center, Chulalongkorn University, for their helpful assistance, and to Dr. Chihiro Ito, Research Associate of the Department of Medicinal Chemistry, Faculty of Pharmacy, Meijo University, Japan, for his kindness in providing additional UV, MS and NMR data.

I would like to thank the Graduate School of Chulalongkorn University, for granting partial financial support to conduct this investigation.

I would like to thank all my friends and staff members at the Department of Pharmacognosy, Faculty of Pharmaceutical Sciences, Chulalongkorn University, for their contributions and unforgettable friendships.

Finally, I wish to express my infinite gratitude to my family for their love, understanding and encouragement.

CONTENTS

	page
ABSTRACT (Thai).....	iv
ABSTRACT (English).....	v
ACKNOWLEDGEMENTS.....	vi
CONTENTS.....	vii
LIST OF TABLES.....	ix
LIST OF FIGURES.....	x
LIST OF SCHEMES.....	xi
ABBREVIATIONS.....	xii
CHAPTER	
I INTRODUCTION.....	1
II HISTORICAL	
1. Chemical Constituents of the Genus <i>Garcinia</i>	8
2. Xanthones from the Genus <i>Garcinia</i>	
2.1 Introduction to Xanthones.....	32
2.2 Biosynthesis of Xanthones.....	33
2.3 Classification of Xanthones.....	35
III EXPERIMENTAL	
1. Source of Plant Material.....	64
2. General Techniques.....	64
3. Extraction Procedure.....	67
4. Isolation Procedure.....	68
5. Characterization of the Isolated Compounds.....	71

IV RESULT AND DISCUSSION	
1. Structure Elucidation of GA-1.....	74
2. Structure Elucidation of GA-2.....	78
V CONCLUSION.....	85
REFERENCES.....	86
APPENDIX.....	94
VITA.....	113

LIST OF TABLES

Table	Page
1. Distribution of compounds in the genus <i>Garcinia</i>	8
2. Simple oxygenated xanthenes of the genus <i>Garcinia</i>	36
3. Prenylated xanthenes of the genus <i>Garcinia</i>	40
4. Dimeric xanthenes of the genus <i>Garcinia</i>	62
5. Xanthone glycosides of the genus <i>Garcinia</i>	63
6. The combined fractions from crude chloroform extract.....	69
7. The combined fractions from F-07.....	70
8. The combined fractions from FA-02.....	71
9. IR spectrum assignment of GA-1.....	75
10. The ¹³ C-NMR chemical shifts of β -sitosterol and isolate GA-1.....	76
11. The carbon and proton assignments with long-range correlations observed in HMBC spectrum.....	82

LIST OF FIGURES

Figure	Page
1 The EIMS spectrum of GA-1.....	95
2 The IR spectrum of GA-1 (KBr disc).....	96
3 The 500 MHz ^1H -NMR spectrum of GA-1 (in CDCl_3).....	97
4 The expansion of ^1H -NMR spectrum of GA-1 (in CDCl_3).....	98
5 The expansion of ^1H -NMR spectrum of GA-1 (in CDCl_3).....	99
6 The 125 MHz ^{13}C -NMR spectrum of GA-1 (in CDCl_3).....	100
7 The expansion of ^{13}C -NMR spectrum of GA-1 (in CDCl_3).....	101
8 The expansion of ^{13}C -NMR spectrum of GA-1 (in CDCl_3).....	102
9 The EIMS spectrum of GA-2.....	103
10 The IR spectrum of GA-2 (KBr disc).....	104
11 The UV spectrum of GA-2 (in methanol).....	105
12 The 600 MHz ^1H -NMR spectrum of GA-2 (in $\text{DMSO}-d_6$).....	106
13 The expansion of ^1H -NMR spectrum of GA-2 (in $\text{DMSO}-d_6$).....	107
14 The 150 MHz ^{13}C -NMR spectrum of GA-2 (in $\text{DMSO}-d_6$).....	108
15 The DEPT spectrum of GA-2 (in $\text{DMSO}-d_6$).....	109
16 The HMBC spectrum of GA-2 (in $\text{DMSO}-d_6$).....	110
17 The expansion of HMBC spectrum of GA-2 (in $\text{DMSO}-d_6$).....	111
18 The HMQC spectrum of GA-2 (in $\text{DMSO}-d_6$).....	112

LIST OF SCHEMES

Scheme	Page
1. Biosynthesis of xanthones in the Guttiferae.....	34
2. Mass fragmentation of GA-1.....	83
3. Mass fragmentation of GA-2.....	84

ABBREVIATIONS

ϵ	= Molar absorptivity
br	= Broad (for NMR spectra)
$^{\circ}\text{C}$	= Degree Celsius
CDCl_3	= Deuterated chloroform
CHCl_3	= Chloroform
cm	= Centimeter
$^{13}\text{C-NMR}$	= Carbon-13 nuclear magnetic resonance
COSY	= Correlation spectroscopy
1-D	= One dimensional
2-D	= Two dimensional
d	= doublet (for NMR spectra)
dd	= doublet of doublets (for NMR spectra)
DEPT	= Distortionless Enhancement by Polarization Transfer
$\text{DMSO-}d_6$	= Deuterated dimethylsulfoxide
δ	= Chemical shift
EIMS	= Electron Impact Mass Spectrum
g	= Gram
$^1\text{H-NMR}$	= Proton nuclear magnetic resonance
HMBC	= ^1H -detected Heteronuclear Multiple Bond Coherence
HMQC	= ^1H -detected Heteronuclear Multiple Quantum Coherence
HRMS]	= High Resolution Mass Spectrum
Hz	= Hertz
IR	= Infrared spectrum
J	= Coupling constant

KBr	= Potassium Bromide
kg	= Kilogram
L	= Liter
λ_{\max}	= Wavelength at maxima absorption
M^+	= Molecular ion
m	= multiplet (for NMR spectra)
MeOH	= Methanol
mg	= Milligram
MHz	= MegaHertz
min	= minute
ml	= Milliliter
mm	= Millimeter
m/z	= Mass to charge ratio
MS	= Mass spectrometry
No.	= Number
nm	= Nanometer
NMR	= Nuclear Magnetic Resonance
ppm	= part per million
ν_{\max}	= Wave number at maxima absorption
spp.	= Species
TLC	= Thin Layer Chromatography
TMS	= Tetramethylsilane
UV	= Ultraviolet