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LIST OF ABBREVIATIONS

$[\alpha]_D$	specific rotation
% v/v	% volume/volume
% w/v	% weight/volume
% w/w	% weight/weight
μg	microgram
μL	microliter
μM	micromolar
AB_q	AB quartet
ABTS	2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid)
Ac	acetate (^{13}C -NMR)
Ac_2O	acetic anhydride
AcOH	acetic acid
AcONH_4	ammonium acetate
AIBN	2,2'-azobisisobutyronitrile
AllTMS	allyltrimethylsilane
AlMe_3	trimethylaluminium
APT	attached proton test
Ar	aromatic (^{13}C -NMR)
ASAP	atmospheric pressure solids analysis probe
BnBr	benzyl bromide
BnCl	benzyl chloride
BnNH_2	benzyl amine
Boc	<i>tert</i> -butyloxycarbonyl
Boc_2O	di- <i>tert</i> -butyl dicarbonate
bp	boiling point
br	broad (^1H -NMR)
brd	broad doublet (^1H -NMR)
brs	broad singlet (^1H -NMR)

t BuOH	<i>tert</i> -butanol
Bu_3SnH	tributyltin hydride
<i>c</i>	concentration
$^{\circ}\text{C}$	degree Celsius
CAM	ceric ammonium molybdate solution
cat.	catalyst
CbzCl	benzyl chloroformate
CDCl_3	deuterated chloroform
CD_3OD	deuterated methanol
$\text{Ce}(\text{SO}_4)_2$	cerium(IV) sulphate
$\text{CF}_3\text{CO}_2\text{H}$	trifluoroacetic acid
CFU	colony forming unit
CHCl_3	chloroform
CH_2Cl_2	dichloromethane
CH_3CN	acetonitrile
CH_3NO_2	nitromethane
cm	centimeter
^{13}C NMR	carbon-13 nuclear magnetic resonance
CO_2	carbon dioxide
CrO_3	chromium(VI) oxide
$\text{Cu}(\text{OAc})_2$	copper(II) acetate
d	doublet (^1H -NMR)
DCM	dichloromethane
dd	doublet of doublets (^1H -NMR)
ddd	doublet of doublet of doublets (^1H -NMR)
DFT	density functional theory
DHAP	dihydroxyacetone phosphate
dm	decimeter
DMAP	4-dimethylaminopyridine
DMF	dimethylformamide
D_2O	deuterium oxide

DPPH	2,2'-diphenyl-1-picrylhydrazyl
δ	chemical shift
EC ₅₀	half maximal effective concentration
ED ₅₀	median effective dose
ESI + <i>et al.</i>	electrospray ionization (positive ion mode) and others
Et ₃ N	triethylamine
Et ₂ O	diethyl ether
EtOAc	ethyl acetate
EtOH	ethanol
Et ₃ SiH	triethylsilane
eV	electron volt
exp	experimental
g	gram
GC-FID	gas chromatography-flame ionization detector
GC-MS	gas chromatography-mass spectrometry
gHSQC	gradient Heteronuclear Single Quantum Correlation
Grubbs' II catalyst	benzylidene[1,3-bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro(tricyclohexylphosphine) ruthenium
h	hour
H ₂	hydrogen gas
HCl	hydrochloric acid
HCOONH ₄	ammonium formate
He	helium
H ₂ NCO ₂ Bn	benzyl carbamate
¹ H-NMR	proton nuclear magnetic resonance
H ₂ O ₂	hydrogen peroxide
HRMS	high-resolution mass spectra
H ₂ SO ₄	sulfuric acid
Hz	hertz

IC ₅₀	half maximal inhibitory concentration
i.d.	inner diameter
<i>in vacuo</i>	in a vacuum
IR	infrared spectroscopy
<i>J</i>	coupling constants (NMR)
K ₂ CO ₃	potassium carbonate
kg	kilogram
KO ^t Bu	potassium tert-butoxide
KOH	potassium hydroxide
L	liter
lit.	literature
m	meter
m	multiplet (¹ H-NMR)
MeOH	methanol
Me ₂ S	dimethyl sulfide
MeSO ₂ Cl	methanesulfonyl chloride (mesyl chloride)
mg	milligram
MgSO ₄	magnesium sulfate
MHz	megahertz
MIC	minimum inhibitory concentration
mL	milliliter
mm	millimeter
mM	millimolar
mmol	millimole
MsCl	methanesulfonyl chloride (mesyl chloride)
MS	mass spectrometry
MTT	3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide
<i>m/z</i>	mass-to-charge ratio
<i>n</i> -	normal-
N ₂	nitrogen gas

NaBH ₄	sodium borohydride
Na ₂ CO ₃	sodium carbonate
NaH	sodium hydride
NaHCO ₃	sodium bicarbonate
NaIO ₄	sodium periodate
NaOH	sodium hydroxide
NEt ₃	triethylamine
NH ₃	ammonia
(NH ₄) ₆ MoO ₂₄	ammonium molybdate
NIST	national institute of standards and technology
NISTREP	NIST replicates correction
nm	nanometer
NMO	4-methylmorpholine N-oxide
NOESY	Nuclear Overhauser Effect Spectroscopy
o/n	over night
OsO ₄	osmium tetroxide
Pd/C	palladium on carbon
PdCl ₂	palladium(II) chloride
Pd(OH) ₂ /C	Palladium hydroxide on carbon
petrol	petroleum spirit
PFU	plaque forming unit
Ph	phenyl
PhMe	toluene
Ph ₃ P ⁺ CH ₃ Br ⁻	methyltriphenylphosphonium bromide
Ph ₃ P=CHCOCH ₃	acetylmethylenetriphenylphosphorane
p.o.	per os (by mouth)
POCl ₃	phosphorus oxychloride
ppm	parts per million
PPTS	pyridinium <i>p</i> -toluenesulfonate
<i>p</i> -TsOH	<i>p</i> -toluenesulfonic acid
Py	pyridine

q	quatet (¹ H-NMR)
RA	relative area
RCM	ring closing metathesis
R _f	retention factor
RhuA	L-rhamnulose-1-phosphate aldolase
RI	Kovàts retention indices
ROESY	rotating frame overhauser effect spectrometry
rpm	revolutions per minute
rt	room temperature
s	singlet (¹ H-NMR)
t	triplet (¹ H-NMR)
TBAI	tetrabutylammonium iodide
TBDMSCl	<i>tert</i> -butyldimethylsilyl chloride
<i>t</i> BuOK	Potassium <i>t</i> -butoxide
TCDI	thionocarbonyl-1,1'-diimidazole
TES-Cl	triethylchlorosilane
THF	tetrahydrofuran
TiCl ₄	titanium tetrachloride
Ti(O ^{<i>i</i>} -Pr) ₄	titanium isopropoxide
TLC	thin layer chromatography
TMS	trimethylsilyl
TMSOTf	trimethylsilyl trifluoromethanesulfonate
TrCl	trityl chloride
UDP-Galf	uridine diphosphogalactofuranose
Yb(OTf) ₃	ytterbium(III) trifluoromethanesulfonate
Z	Carboxybenzyl group
Zn	Zinc

ข้อความแห่งการริเริ่ม

- 1) วิทยานิพนธ์นี้เป็นการศึกษาฤทธิ์ทางชีวภาพ ได้แก่ ฤทธิ์ต้านมะเร็ง ฤทธิ์ยับยั้งวัณโรค ยับยั้งเชื้อเฮอริปัส ซิมเพล็กซ์ ไวรัส ไทป์ 1 ฤทธิ์ต้านจุลชีพ และฤทธิ์ต้านอนุมูลอิสระของสารสกัดหยาบ, น้ำมัน และสารที่แยกออกมาได้จากพืชสมุนไพรไทยจำนวน 3 ชนิด ได้แก่ ใบเงิน ขนไก่ทองคำ และผักตบ นอกจากนี้ยังรายงานผลการวิเคราะห์ด้วยเทคนิค จีซี-เอฟไอดี และจีซี-เอ็มเอสของสารสกัดหยาบและน้ำมันของพืชสมุนไพรทั้ง 3 ชนิด ได้ทำการศึกษาหาโครงสร้างทางเคมีของสารสกัดบริสุทธิ์ทั้ง 6 ชนิดจากพืชสมุนไพรดังกล่าวโดยอาศัยการวิเคราะห์ด้วยเทคนิคทางสเปกโตรสโคปีและจีซี-เอ็มเอส พร้อมทั้งเปรียบเทียบข้อมูลที่ได้อีกกับข้อมูลที่เคยรายงานมาก่อน โดยการศึกษาในครั้งนี้สามารถแยกสควอลีน และสเตอรอลออกมาจากสารสกัดเฮกเซน และแยก 1,4-ไดโกลโคไลดิล-เบนซีนจากสารสกัดเอทิล อะซิเตทของต้นใบเงิน ส่วนน้ำมันหอมระเหยของต้นขนไก่ทองคำนำมาแยกสกัดและทำให้บริสุทธิ์จนได้องค์ประกอบหลักคือ คูบินอล และสปาลูลินอล ซึ่งคูบินอลแสดงฤทธิ์ต้านมะเร็งปอด และสารสกัดคลอโรฟอร์มของผักตบที่แสดงฤทธิ์การยับยั้งเชื้อเฮอริปัส ซิมเพล็กซ์ ไวรัส ไทป์ 1 นำมาแยกได้สารสโคโปเลติน ในวิทยานิพนธ์นี้เป็นการรายงานครั้งแรกขององค์ประกอบทางเคมี และฤทธิ์ทางชีวภาพของน้ำมัน และสารสกัดจากใบของต้นใบเงิน, การแยกองค์ประกอบทางเคมี และทดสอบฤทธิ์ทางชีวภาพของสารที่สกัดจากน้ำมันของใบสดจากต้นขนไก่ทองคำ และการแยกสารที่มีฤทธิ์ทางชีวภาพจากสารสกัดของกิ่งต้นผักตบ จากผลการศึกษานี้จะใช้เป็นข้อมูลในการนำพืชสมุนไพรเหล่านี้ไปศึกษาต่อ และการศึกษาค้นคว้าใหม่ต่อไป
- 2) วิทยานิพนธ์นี้ได้ทำการพัฒนาวิธีการสังเคราะห์สารจากธรรมชาติ (-) สตีเวียมิน และอนุพันธ์ของสตีเวียมิน เพื่อลดขั้นตอนและระยะเวลาในการสังเคราะห์ ลดการใช้สารเคมีในปริมาณมาก และให้ผลิตภัณฑ์ที่มีประสิทธิภาพ และมีปริมาณผลผลิตที่ดี วิธีการสังเคราะห์นี้สามารถใช้เป็นแนวทางในการสังเคราะห์สาร โพลีไฮดรอกซีเลเต็ด อินโดลิซิดีน อัลคาลอยด์ชนิดอื่นๆ นอกจากนี้ผลการทดสอบฤทธิ์การยับยั้งไกลโคซิเดสของสารที่สังเคราะห์ได้ในวิทยานิพนธ์นี้จะเป็นข้อมูลประกอบการพัฒนาโครงสร้างสาร โพลีไฮดรอกซีเลเต็ด อินโดลิซิดีน อัลคาลอยด์ เพื่อให้มีฤทธิ์ที่ดีขึ้น

STATEMENT OF ORIGINALITY

- 1) In this research, the biological activities; anticancer, antimycobacterial, anti-herpes simplex virus type-1, antimicrobial and antioxidant activities of the crude extracts, the essential oils and the isolated compounds of the three Thai medicinal plants (*Graptophyllum pictum* (L.) Griff., *Gynura divaricata* (L.) DC. and *Solanum spirale* Roxb.) were studied. Furthermore, the GC-FID and GC-MS data of the extracts and the essential oils of these plants were also revealed. The structural elucidations of six bioactive compounds from these plants were analyzed using the spectroscopic techniques and GC-MS, and then the results were compared with the previous reports. Squalene and stigmasterol were isolated from the hexane fraction, while 1,4-diglycoloyl-benzene was isolated from the EtOAc fraction of *G. pictum*. Cubenol and spathulenol were separated and purified from the essential oil of *G. divaricata*. Cubenol inhibited the NCI-H187 cell line (small cell lung cancer). The CHCl_3 extract of *S. spirale*, which showed the anti-herpes simplex virus type-1 activity, was separated and purified to obtain scopoletin as a bioactive compound. This is the first report on the chemical constituents and the biological activities of the essential oil and the extracts of the leaves of *G. pictum*, the isolation of chemical compounds from the essential oil and its biological activities of the fresh leaves of *G. divaricata* and the isolation another bioactive compound from the stems of *S. spirale* were revealed. The information from this study will be useful for further investigation and drug discovery.
- 2) A synthetic method for the preparation of natural (–)-steviamine and its analogues in order to reduce the synthetic procedure, time consuming, the large amounts of the chemical reagents and provide the effective products in good percentage yields were developed. This concise synthesis may be used as a guideline for the synthesis of other polyhydroxylated indolizidine alkaloids. Furthermore, the results of glycosidase inhibitory activities of the synthetic compounds in this study may provide the information for the structural development of the

polyhydroxylated indolizidine alkaloids to increase their glycosidase inhibitory activities.



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
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