

CHAPTER II

HISTORICAL

Plants in the Family Meliaceae

Family Meliaceae comprises of 50 (or 51) genera with about 575 species. The family is best represented in the Malesian region for, although Africa is almost as diversified in terms of number of genera, Malaya alone has more species (91 in 16 genera) than the whole of Africa (84) and, furthermore, begins to approach the specific richness of the neotropics (122), which have merely eight genera. Almost half of the Malayan species are in the single genus *Aglaiia*, which is restricted to Indomalesia and the western Pacific, and is the largest genus in the family. (Mabberley and Pannell, 1989b)

According to Craib (1931), Smitinand (1980) and Pengklai, Niyomdham, and Ueachirakan (1991), there are about 26 species of *Aglaiia* in Thailand. These species are:

Aglaiia andamanica Hiern**

A. argentea Blume**

A. caudata Hiern**

A. chaudocensis Pierre***

A. cordata Hiern***

A. domestica Pelleg.**

A. dookkoo Griff.**

A. edulis A. Gray**

A. gigantea Pelleg.**

A. hoensis Pierre***

A. kunsteri King*

A. marginata Craib*

A. meliosmoides Craib***

A. merostela Pelleg.*

A. oblanceolata Craib*

A. odorata Lour.***

- A. odoratissima* Blume***
A. palembanica Miq.***
A. paniculata Kurz*
A. pirifera Hance***
A. pyramidata Hance***
A. quocensis Pierre*
A. rubiginosa (Hiem) Pannell****
A. submonophylla Miq.*
A. tenuicaulis Hiem*
A. trichostemon DC.*

*reported by Craib

**reported by Smithinand

***reported by both Craib and Smithinand

****reported by Pengklai, Niyomdham and Ueachirakan

Chemical Constituents of the Meliaceous Plants

Plants in Family Meliaceae are found to contain a wide range of chemical constituents: alkaloids, terpenoids and miscellaneous compounds. The following pages contain literature survey on the chemical constituents of this family.

2.1 Alkaloid Constituents of the Meliaceous Plants

The alkaloid chemistry of Meliaceous plants came to the interest of reserchers in 1979 when Shienghong and his coworkers isolated two new bisamide alkaloids, odorine (1) and odorinol (2), from the leaves of *Aglaia odorata* Lour. Further investigation on the alkaloids of Meliaceous plants were presented in Table 1.

จุฬาลงกรณ์มหาวิทยาลัย

Table1 Alkaloid Constituents of the Meliaceous Plants

Plant Name	Part	Chemical Constituents	Category	References
<i>Aglaia edulis</i> A. Gray	leaf	<i>N</i> -[4-(1-oxo-2-phenylethyl)amino butyl]phenylacetamide (3)	Bisamide	Shumsub,1996
		<i>N</i> -[4-(1-oxo- <i>trans</i> -methylthio-2-propynyl)aminobutyl]phenyl-acetamide(4)	Bisamide	
		<i>Trans</i> -3-methylthio- <i>N</i> -[4-(1-oxo- <i>trans</i> -3-methylthio-2-propenyl)aminobutyl]propenyl-amide (5)	Bisamide	
<i>A. formosana</i> (Hayata)Hayata	leaf	Dehydroodorin (6)	Bisamide	Duh <i>et al.</i> ,1993
<i>A. odorata</i> Lour.	leaf	Odorine (1)	Bisamide	Shiengthong <i>et al.</i> ,1979
		Odorinol (2)	Bisamide	Shiengthong <i>et al.</i> ,1979; Hayashi <i>et al.</i> , 1982
	flower	Odoram (7)	Piperidine	Techasavapak,1981
<i>A. pirifera</i> Hance	leaf	Piriferine (8)	Bisamide	Saifah, Jongbunprasert and Kelley, 1988
<i>A. pyramidata</i> Hance	leaf	Pyramidatine (9)	Bisamide	Saifah <i>et al.</i> ,1993
<i>A. roxburghiana</i> Hiern	leaf	Roxburghilin (1)	Bisamide	Purushothaman <i>et al</i> ,1979

วิทยาลัยพยาบาล
 จุฬาลงกรณ์มหาวิทยาลัย

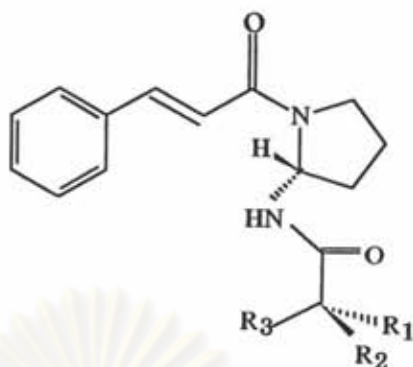
Table1 (continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>A. roxburghiana</i> Miq. var. <i>beddomei</i>	leaf	(+)-Odorine (5) (+)-Odorinol (6)	Bisamide	Joshi <i>et al.</i> ,1986
<i>Amoora rohituka</i> Wight&Arn. (<i>Aphanamixis polystachya</i> (Wall.)Parker)	leaf & stem	Rohitukine (10)	Chromone	Harmon and Weiss,1979
<i>Dysoxylum. binectariferum</i> Hook. f.	bark & leaf	Rohitukine (10)	Chromone	Vasudev <i>et al.</i> ,1985; Naik <i>et al.</i> , 1988
<i>D. grande</i> Hiern	leaf	Rohitukine (10)	Chromone	Srivilai, 1993
<i>D. lenticellare</i> Gillespie	leaf	Dysoxyline (11)	Isoquinoline	Aladesanmi, Kelley and Leary, 1983
		S-(+)-Homolaudosine(12)	Isoquinoline	
		Dysazecine (13)	Isoquinoline	
		3-Epischelhammericine(14)	Isoquinoline	
		2,7-Dihydrohomoerysotrine (15)	Isoquinoline	
	leaf	Deshomerythrine (16)	Isoquinoline	Aladesanmi <i>et al.</i> , 1984
		3-Epi-12-hydroxyschelhammericine (17)	Isoquinoline	Aladesanmi, Kelley and
	stem	18-Methoxy-2,7-dihydro-	Isoquinoline	

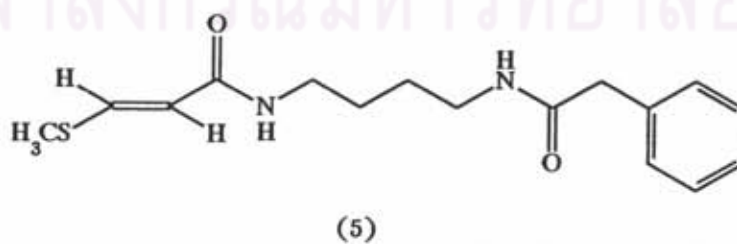
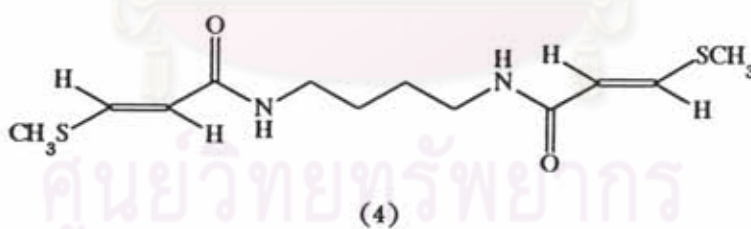
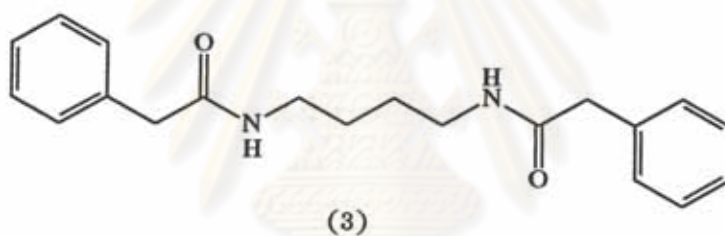
Table1 (continued)

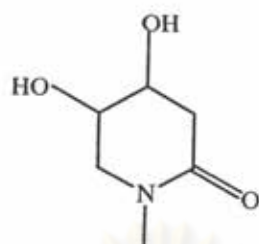
Plant Name	Part	Chemical Constituents	Category	References
	stem	homoerysotrine (18) Lenticellarine (19) 3-Epi-2,18-dimethoxy- schelhammericine (20) 3-Epi-schilhammericine(21) 2,7-Dihydrohomo-erysotrine (15) 3-Epi-18-methoxy- schelhammericine (22)	Isoquinoline Isoquinoline Isoquinoline Isoquinoline Isoquinoline	Leary,1986 Aladessanmi,1988

ศูนย์วิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย

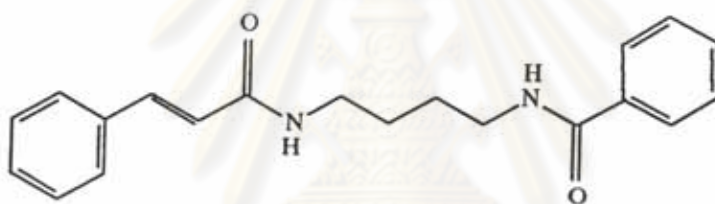


- (1) $R_1=H$; $R_2=CH_3$; $R_3=CH_2CH_3$
 (2) $R_1=CH_3$; $R_2=CH_3$; $R_3=CH_2CH_3$
 (6) $R_1=H$; $R_2=CH_3$; $R_3=CHCH_3$
 (8) $R_1=H$; $R_2, R_3=CH_3$

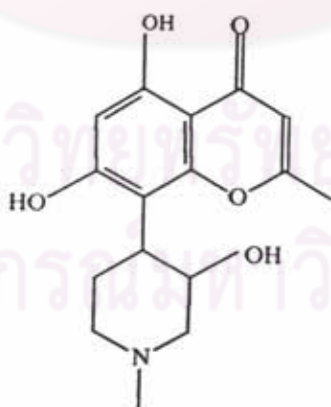




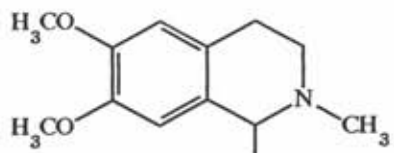
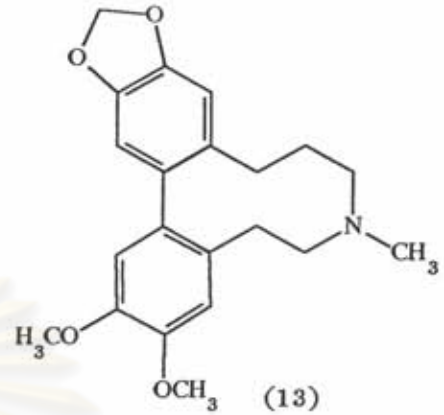
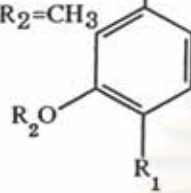
(7)



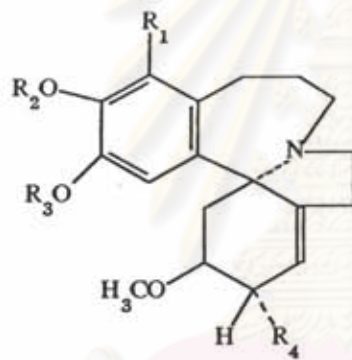
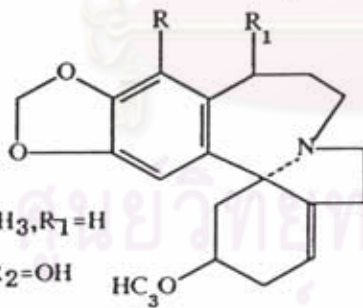
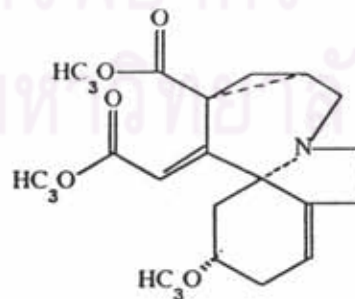
(9)



(10)

(11) $R_1, R_2 = \text{CH}_2$ (12) $R_1, R_2 = \text{CH}_3$ 

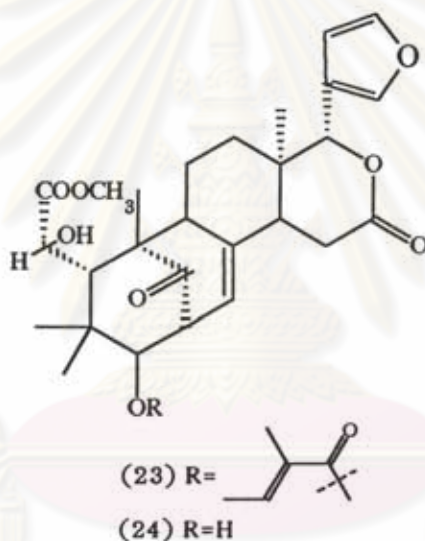
(13)

(14) $R_1, R_4 = \text{H}; R_2, R_3 = \text{CH}_2$ (15) $R_1, R_4 = \text{H}; R_2, R_3 = \text{CH}_3$ (18) $R_1 = \text{OCH}_3; R_2, R_3 = \text{CH}_3; R = \text{H}$ (20) $R_1, R_4 = \text{OCH}_3; R_2, R_3 = \text{CH}_2$ (21) $R_1, R_4 = \text{H}; R_2, R_3 = \text{CH}_2$ (22) $R_1 = \text{OCH}_3; R_2, R_3 = \text{CH}_2; R = \text{H}$ (16) $R = \text{OCH}_3, R_1 = \text{H}$ (17) $R = \text{H}, R_2 = \text{OH}$ 

(19)

2.2 Terpenoid Constituents of the Meliaceae Plants

The earliest report of terpenoids studied in Meliaceae was done by Guha-Sincar and Chakravarty (1951), on the investigation of the seed of *Swietenia macrophylla* King. In this study, two limonoids were isolated, one of which was non bitter and was named swietenine (23), the other was bitter and named swietenolide (24). The structure and stereochemistry of these limonoids were later determined by Connolly and his group (1965). Further phytochemical studies on terpenoids of the Meliaceae plants were summarized in Table 2.



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Table 2 Terpenoid Constituents of the Meliaceae Plants

Plant Name	Part	Chemical Constituents	Category	References
<i>Aglaia argentea</i> Blume	leaf	Argenteanone A (25) Argenteanone B (26) Argenteanol (27)	Triterpenoid Triterpenoid Triterpenoid	Omobuwajo <i>et al.</i> , 1995
<i>A. ferruginea</i> C. T. White & Francis	heart wood	7-Deacetylglabretal-3-acetate (28) 7-Deacetylglabretal-3-tiglate (29)	Triterpenoid Triterpenoid	Mulholland and Monkhe, 1993
<i>A. leucophylla</i> King	stem bark	(24Z)-3,4-Secotirucalla-4(28), 7,24-triene-3,26-dioic acid(30) (24Z)-3,4-Secotirucalla-4(28), 7,24-triene-3,26-dioic acid-3- monomethyl ester (31)	Triterpenoid Triterpenoid	Benosman <i>et al.</i> , 1994
<i>A. odorata</i> Lour.	leaf	Aglaiol (32)	Triterpenoid	Shiengthong <i>et al.</i> , 1965; Boar and Damps, 1973
<i>A. roxburghiana</i> Miq.	leaf&fruit	Aglaiondiol (33) Aglaitriol (34) Roxburghiadiol A (35) Roxburghiadiol B (36)	Triterpenoid Triterpenoid Triterpenoid Triterpenoid	Shiengthong <i>et al.</i> , 1974; Boar and Damp, 1977 Purushothaman Balakrishnan and Balakrisna, 1986
<i>A. roxburghiana</i> Miq. var. <i>beddomei</i> Gamble	aerial part	29-Nor-cycloartan-24,25-epoxy- 3 β -ol (37)	Triterpenoid	Vishnoi, Shoeb and Kapil , 1988

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Amoora rohituka</i> Wall.	stem bark	29-Nor-cycloartan-23-ene-3 β -25-diol (38)	Triterpenoid	Agnihotri, 1987; Agnihotri and Srivastava and Srivastava , 1987
		29-Nor-cycloartenol(39)	Triterpenoid	
		28,29-Bis-nor-cyclo-artane-24-methylene-3 β -6- α -diol (40)	Triterpenoid	
		Amoorinin (41)	Limonoid	
<i>A. grandifolia</i> Blume	dried peel	Aphanamol I (42)	Sesquiterpenoid	Nishizawa <i>et al.</i> ,1984
		Aphanamol II (43)	Sesquiterpenoid	
<i>Aphanamixis polystachya</i> (Wall.) Parker	fruit	Aphananin (44)	Triterpenoid	Kundu <i>et al.</i> ,1985
	fruit	Aphanamixin (45)	Triterpenoid	Chatterjee and Kundu ,1967
<i>Azadirachta indica</i> A. Juss.	fruit	Azadirachtol (46)	Triterpenoid	Siddiqui,Siddiqui and Faizi ,1985
	fruit	Deacetylazadirachtinol(47)	Limonoid	Kubo, Matsumoto and Matsumoto ,1986
		Azadirachtin (48)	Limonoid	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
	fruit	Salannin (49)	Limonoid	Kraus <i>et al.</i> ,1985
		3-Desacetylsalanin(50)	Limonoid	
		6-O-Acetylnimbandiol(51)	Limonoid	
	oil & fruit	Mahmoodin (52)	Limonoid	Siddiqui <i>et al.</i> ,1992
		Naheedn (53)	Triterpenoid	
	bark	Nimbionone (54)	Diterpenoid	Siddiqui <i>et al.</i> ,1988
		Nimbionol (55)	Diterpenoid	
	root bark	Margocin (56)	Diterpenoid	Ara <i>et al.</i> ,1990b
		Margocinin (57)	Diterpenoid	
		Margocillin (58)	Diterpenoid	
	stem bark	Nimbosodione(59)	Diterpenoid	Ara <i>et al.</i> ,1990a
		Nimbisonol (60)	Diterpenoid	
	kernel	Azadirachtin H (61)	Limonoid	Gonvindachari, Sandhya and Ganesh,1992
		Azadirachtin I (62)	Limonoid	
	seed kernel	Azadirachtin K (63)	Limonoid	
	seed	1-Tigloyl-3-acetyl-11-hydroxy-4 β -methyl-meliacarpin (64)	Limonoid	Rojatkar and Nagasampagi, 1993
	root	Azadirinin (65)	Limonoid	Ara <i>et al.</i> ,1992

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Carapa fisilis</i> Vell.	fruit	Demethylnimbionol (66)	Diterpenoid	Raymond and Carmen ,1966 Ayafor <i>et al.</i> , 1994
<i>C. grandiflora</i> Sprague	seed	Fissionolide (67)	Limonoid	
		Carapolide C 1 (68)	Limonoid	
		Carapolide D 3 (69)	Limonoid	
		Carapolide E 4 (70)	Limonoid	
		Carapolide F 5 (71)	Limonoid	
		Carapolide G 6 (72)	Limonoid	
		Carapolide H 7 (73)	Limonoid	
		Carapolide I 8 (74)	Limonoid	
		Evodoulone 13 (75)	Limonoid	
<i>C. procera</i> DC.	timber	Carapin (76)	Limonoid	Arene <i>et al.</i> , 1965
<i>Cedrela glaziovii</i> C. DC.	heart wood	Mexicanol (77)	Triterpenoid	Connolly <i>et al.</i> ,1967a
<i>C. mexicana</i> M. Roem.	heart wood	Mexicanolide (78)	Limonoid	Connolly, McCrindle and Overton , 1965
<i>C. odorata</i> Linn.	heart wood	Mexicanol (77) Deacetoxy-7-oxogedunin(79)	Triterpenoid Limonoid	Bevan , Powell and Taylor, 1963

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>C. toona</i> Roxb.	heart wood	Methyl angolensate (80)	Limonoid	Chan, Magnus and Mooto, 1967
	heart wood	Gedunin (81)	Limonoid	Burke <i>et al.</i> , 1969
		Photogedunin (82)	Limonoid	
	heart wood	Odoratin (83)	Limonoid	Chan, Taylor and Aplin, 1972
	timber	7-Deacetoxy-7-oxo-gedunin (84)	Limonoid	Adeoye and Bekoe , 1965; Bevan Powell and Taylor, 1963
		Mexicanolide (78)	Limonoid	
		Odoratin (83)	Limonoid	Chan and Taylor ,1966
	seed	Mexicanolide (78)	Limonoid	Okorie and Taylor,1968
		Andirobin (85)	Limonoid	
		6-Deoxyswietenolide (86)	Limonoid	
		6-Hydroxymexicanolide(87)	Limonoid	
	wood	Geranylgeraniol (88)	Diterpenoid	Nagasampagi, Yankov and Dev, 1967
seed	Cedrelone (89)	Limonoid	Chatterjee, Chakraborty and Chandrasekharan,1971	
	1,2-Dihydrocedrelone(90)	Limonoid		

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Chisocheton paniculatus</i> Hiern	fruit	1,2-Dihydro-6 α -acetoxiazadirone (91)	Limonoid	Bordoloi <i>et al.</i> , 1993
		compound 1 (92)	Limonoid	
		compound 2 (93)	Limonoid	
		compound 3 (94)	Limonoid	
<i>C. microcarpus</i> Koord.&Valet.	fruit	compound 1 (95)	Limonoid	Gunning <i>et al.</i> , 1994
		compound 2 (96)	Limonoid	
<i>Dysoxylum acutangulum</i> Miq.	seed	(+)-8-Hydroxycalamenene(97)	Sesquiterpenoid	Nishizawa <i>et al.</i> ,1983
<i>D. alliaceum</i> Blume	seed	(+)-8-Hydroxycalamenene (97)	Sesquiterpenoid	Nishizawa <i>et al.</i> ,1983
	dried peel	Bicalamenene (98)	Sesquiterpenoid	Nishizawa <i>et al.</i> ,1985b
<i>D. binectariferum</i> Hook. f.	fruit	Dysobinin (99)	Limonoid	Singh, Garg and Khanna,1976
<i>D. frazenarum</i> Benth.	wood oil	δ -Elemene (100)	Sesquiterpenoid	Gough, Powel and Sutherland, 1961; Gough and Sutherland, 1964
<i>D. lenticellare</i> Gillespie	leaf	Ferrubietolide (101)	Diterpenoid	Onan <i>et al.</i> ,1985
	leaf	Phyllocladene (102)	Diterpenoid	Aladesanmi and Ilesanmi
		8 β -Hydroxysandaracopiamarene (103)	Diterpenoid	,1987

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>D. pettigrewianum</i> F.M.Bailey	stem	8 β -Methoxysandaracopiamarene (104)	Diterpenoid	Aladesanmi ,1988
		8 β -Hydroxysandaracopiamarene (103)	Diterpenoid	
<i>D. pettigrewianum</i> F.M.Bailey	bark & wood	Phyllocladene(102)	Diterpenoid	Mulholland and Nair ,1994
		Masticaidenonic acid (105)	Triterpenoid	
		3-Oxo-7,24E-tirucalla-dien-26-oic acid (106)	Triterpenoid	
	3 α -Hydroxy-7,24Z-tirucalladien-26-oic acid (107)	Triterpenoid		
	Dysoxylic acid A (108)	Triterpenoid		
	Dysoxylic acid B (109)	Triterpenoid		
<i>D. richii</i> (A. Gray) C. DC.	fresh leaf	Dysoxylin (110)	Limonoid	Jogia and Andersen,1987
		Dysoxylin (110)	Limonoid	
	Tigloyldysoxylin(111)	Limonoid		
	Dysoxylone (112)	Limonoid		
	leaf	6 α -Acetoxyobacunolacetate (113)	Limonoid	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>D. roseum</i> C.DC.	leaf	(20 <i>S</i> ,24 <i>S</i>)-Epoxy-4-hydroxy-3,4 -seco-dammar-25(26)-en-3-oic acid (114)	Triterpenoid	Singh and Aalbersburg ,1992
	fruit	Methyl richenoate (115)	Triterpenoid	Aalbersberg and Singh ,1991
		Richenoic acid (116)	Triterpenoid	
		Richenone (117)	Triterpenoid	
		Richenol (118)	Triterpenoid	
leaf	Ocotillone (119)	Triterpenoid	Adesanya, Pais and Sevenet ,1991	
	Cabralone (120)	Triterpenoid		
	Shoreic acid (121)	Triterpenoid		
	Eicherianic acid (122)	Triterpenoid		
	Dysorone A (123)	Triterpenoid		
<i>Ekeberghia carpensis</i> Sparrm	bark	Dysorone B (124)	Triterpenoid	Nishiyama <i>et al.</i> ,1996
		Dysolone C (125)	Triterpenoid	
		Dysolone D (126)	Triterpenoid	
		Dysolone E (127)	Triterpenoid	
		2,3,22,23-Tetrahydroxy-2,6,10,15 ,19,23 hexatetrahydroxy-6,10,15,	Triterpenoid	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>E. pterophylla</i> (C. DC.)Holm	seed	19,23-pentamethyl-6,10,14,18-tetra-cosatetraene (128)	Triterpenoid	Taylor and Taylor,1984
		2-Hydroxymethyl-2,3,22,23-tetrahydroxy-6-methyl-6,10,14,18-tetracosatetraene (129)		
		E.P. 1 (130)		
	seed	E.P. 2 (131)	Limonoid	
		E.P. 3 (132)	Limonoid	
		E.P. 1 (130)	Limonoid	
<i>Entandrophragma angolense</i> (Welw.)C. DC.	timber	E.P. 3 (132)	Limonoid	Kehril,Taylor and Niven,1990
		E.P. 4 (133)	Limonoid	
		E.P. 5 (134)	Limonoid	
		E.P. 6 (135)	Limonoid	
		Gedunin (81)	Limonoid	
		Methyl angolensate (80)	Limonoid	
<i>E. caudatum</i> Sprague	bark	Phragmalin (136)	Limonoid	Arndt and Baarschers ,1972
<i>E. cylindricum</i> Sprague	stem bark	Sapalenin A (137)	Triterpenoid	Ngnokam ,1993
		Sapalenin B (138)	Triterpenoid	

Table2 (Continued)

	Part	Chemical Constituents	Category	References
<i>E. delevoyi</i> De Wild	timber bark	Sapalenin C (139)	Triterpenoid	Mulholland <i>et al.</i> ,1994
		Gedunin (81)	Limonoid	
		3,4-Secotirucalla-4(28),7,24-triene-3,21-dioic acid (140)	Triterpenoid	
		Azadirone (141)	Limonoid	
		6 α -Acetoxiazadirone(142)	Limonoid	
		14 β ,15 β -Epoxyazadirone(143)	Limonoid	
		6 α -Acetoxy-14 β ,15 β epoxyazadione (144)	Limonoid	
		6 α -Acetoxy-14 β ,15 β epoxyazadirone (145)	Limonoid	
		Delevoyin A (146)	Triterpenoid	
<i>E. utile</i> Spargue	bark	Delevoyin B (147)	Limonoid	Daniewski <i>et al.</i> , 1993b
		Utilin B (148)	Limonoid	
		Utilin C (149)	Limonoid	
<i>Heynea trijuga</i> Roxb.	leaf & fruit	Heynic acid (150)	Triterpenoid	Purushothaman and Venkatanarasimhan, 1983
		24-Methylencycloartane-3- β -21-diol (151)	Triterpenoid	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Khaya anthotheca</i> (Welw.) C. DC.	leaf	Trijugins A (152) Trijugins B (153)	Limonoid Limonoid	Purushothaman, Venkatanarasimhan and Sarada, 1987
	heartwood	Khivorin (154)	Limonoid	
<i>K. grandifoliola</i> C. DC.	heartwood	Anthothecal (155)	Limonoid	Bevan <i>et al.</i> , 1962
	seed	Grandifoliolin (156)	Limonoid	Bevan, Powell and Taylor ., 1963
<i>K. ivorensis</i> A. Chevaleir	heartwood	Methyl 6-hydroxyangolensate (157)	Limonoid	Adesogan and Taylor , 1967
	heartwood	Methyl 6-acetoxyangolensate (158)	Limonoid	Connolly <i>et al.</i> ,1967b
	heartwood	Granfolione (159)	Triterpenoid	Connolly <i>et al.</i> , 1968
<i>K. madagascariensis</i> Jum.& Perier	heart wood	Grandifoliolenone (160)	Limonoid	Connolly and McCrindle,1971
	timber	Khivorin (154)	Limonoid	Bevan <i>et al.</i> , 1962
<i>K. senegalensis</i> A.Juss.	timber	11- β -Acetoxykhivorin(161)	Triterpenoid	Taylor, 1968
	heart wood	7-Deacetoxy-7-oxo-khivorin(162)	Limonoid	Bevan, Powell and Taylor ., 1963
	timber	Methyl angolensate (80)	Limonoid	Adesida, Adesogan and Taylor ,1967
		Methyl 6-hydroxyangolensate(157)	Limonoid	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Lansium anamallayanum</i> Bedd.	stem	Methyl 1 α ,6,8 α ,14 β ,30 β -pentahydroxy-3-oxo-[3.3.1 ^{10,2} .1 ^{1,4}]-tricyclomeliac-7-oate (163)	Limonoid	Olmo <i>et al.</i> , 1996
		Methyl 1 α ,2 β ,3 α ,6,8 α ,14 β -hexa- hydroxyl[4.2.1 ^{10,30} .1 ^{1,4}]- tricyclomeliac-7-oate(164)	Limonoid	
		Methyl 1 α -acetyl-2 β ,3 α ,6,8 α ,14 β -pentahydroxy-[4.2.1 ^{10,30} .1 ^{1,4}]- -tricyclomeliac-7-oate (165)	Limonoid	
<i>L. domesticum</i> Corr.	bark	Lansitriol (166)	Triterpenoid	Purushothaman,Sarada and Saraswathy, 1987a
		Lansilactone (167)	Triterpenoid	
<i>L. domesticum</i> Jack	fruit	Lansic acid (168)	Triterpenoid	King <i>et al.</i> , 1967
<i>L. domesticum</i> Jack	seed	Dukunolide A (169)	Limonoid	Nishizawa <i>et al.</i> ,1985a
	seed	Dukunolide B (170)	Limonoid	Nishizawa <i>et al.</i> ,1985c
	seed	Dukunolide C (171)	Limonoid	Nishizawa <i>et al.</i> ,1985b
		Dukunolide E (172)	Limonoid	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Melia azadirachta</i> Linn.	seed	Dukunolide F (173)	Limonoid	Nishizawa <i>et al.</i> , 1988
		Dukunolide D (174)	Limonoid	
		Dukunolide E (172)	Limonoid	
		Dukunolide F (173)	Limonoid	
<i>M. azadirachta</i> Linn.	leaf	3-Oxo-24-cycloartane-21-oic acid (175)	Triterpenoid	Nishizawa <i>et al.</i> , 1988
	seed oil	Salannin (49)	Limonoid	Henderson, McCrindle and Overton, 1964
<i>M. azedarach</i> Linn.	bark	Kulinone (176)	Triterpenoid	Chang and Chiang, 1968
	fruit	Azadirachtin (48)	Limonoid	Morgan and Thornton, 1973
	fruit	1-Cinnamoylmelianolone (177)	Limonoid	Lee, Klock and Balandrin, 1987
	root	Salanin (49)	Limonoid	Srivastava and Gupta, 1985
		Sendanin (178)	Limonoid	
6-Acetoxy-7 α -hydroxy-3-oxo-14 β ,15 β -epoxymeliac-1,5-diene (179)		Limonoid		
		6-Acetoxy-3 β -hydroxy-7-oxo-	Limonoid	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
	bark	14 β -15 β -epoxymeliac-1,5-diene-3-o- β -D-gluronopyranoside (180)	Triterpenoid	Xie and Yuan,1985
	root bark	Isochuanliansu (181)	Limonoid	Huang <i>et al.</i> ,1995
	root bark	Azedarachin C (182)	Limonoid	Nakatani <i>et al.</i> , 1994
		Trichilin H (183)	Limonoid	
		12-Acetyltrichilin B (184)	Limonoid	
	root bark	1,12-Diacetyltrichilin B(185)	Limonoid	
		1-Tigloyl-3,20-diacetyl-11-methoxymeliacapinin (186)	Limonoid	Takeya <i>et al.</i> , 1996
		3-Tigloyl-1,20-diacetyl-11-methoxymeliacapinin (187)	Limonoid	
		1-Cinnamoyl-3-hydroxy-11-methoxymeliacapinin (188)	Limonoid	
		1-Deoxy-3-methoxycrylyl-11-methoxymeliacapinin (189)	Limonoid	
		1-Cinnamoyl-3-acetyl-11-methoxymeliacapinin(190)	Limonoid	
	stem bark	7 α -Acetoxy-14 β -15 β -epoxygedunan	Limonoid	Saxena and Srivastava, 1986

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References	
<i>M. azedarach</i> Linn. var. <i>japonica</i> Makino	seed	3-o-β-D-gluco-β-D-xylo- pyranoside(191)		Srivastava ,1987	
	seed	6, 11- Diacetoxy-7-oxo-14β,15β- epoxy-meliacin(1,5-dien-3-o -β-D-glucopyranoside (192)	Limonoid		
	seed	6-Acetoxy-11α-hydroxy-7-oxo- 14β,15β-epoxy-meliacin-1,5- diene-3-o-α-L-rhamno-pyranoside (193)	Limonoid		Srivastava, 1986
	seed	Meldenin (194)	Limonoid		Rusia and Srivastava, 1988
		Salannin (49)	Limonoid		
		Meliantriol (195)	Triterpenoid		
bark	6-Acetoxy-3β-hydroxy-7-oxo- 14β-epoxymeliac-1,5-diene-3-O -β-D-xylopyranoside (196)	Limonoid			
fruit	Sendanin (178)	Limonoid	Ochi and Kotsuki,1976		
		Ohchinolal (197)	Limonoid	Fukuyama,Miura,Ochi,1983	

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>M. dubia</i> Cav.	stem bark	Ohchinin (198) 12-Hydroxyamoorastatone (199) 12-Hydroxyamoorastatin(200) 12-Acetoxyamoorastatin (201)	Limonoid Limonoid Limonoid Limonoid	Ahn <i>et al.</i> , 1994
	fruit	Salannin (49)	Limonoid	Silva, Stocklin and Geissmann , 1969
	leaf & seed	Compositin (202) Compositolide (203)	Limonoid Limonoid	Purushothaman,Duraiswamy and Connolly ,1984
<i>M. toosendan</i> Sieb. & Zucc.	bark	Isochuanliansu (181)	Triterpenoid	Xie and Yuan,1985
	fruit	21-O-Acetyl-toosendantriol (204)	Triterpenoid	Nakanishi, Inada and Lavie ,1986
<i>M. volkensis</i> Giirke	fruit	Lipomelianol (205)	Triterpenoid	Nakanishi,Inada and Lavie
	fruit	Melianone (206)	Triterpenoid	,1986;Nakanishi <i>et al.</i> ,1986
		Salannin (49)	Limonoid	Rajab, and Bently,1988
		Volkensin (207)	Limonoid	
		1-Cinnamoyltrichilinnin(208)	Limonoid	
	1-Tigloyltrichilinin (209)	Limonoid		

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Sandoricum indicum</i> Cav.	root	1-Acetyltrichilin (210)	Limonoid	Sim and Lee, 1972
	bark	Ohchinin-3-acetate (211)	Limonoid	
	fruit	Meliavolen (212)	Triterpenoid	
<i>S. kaetjape</i> Merr.	stem	Melianinone (213)	Triterpenoid	Kaneda <i>et al.</i> , 1992
		Bryonolic acid (214)	Triterpenoid	
		Bryononic acid (215)	Triterpenoid	
<i>Swietenia macrophylla</i> King	stem bark	Koetjapic acid (216)	Secotriterpenoid	Kosela <i>et al.</i> , 1995
		3-Oxo-olean-12-en-29-oic acid (217)	Triterpenoid	
		Katonic acid (218)	Triterpenoid	
		Bryononic acid (215)	Triterpenoid	
		Secobryononic acid (219)	Triterpenoid	
<i>S. mahagoni</i> Jacq.	seed	Secoisobryononic acid(220)	Triterpenoid	Connolly <i>et al.</i> , 1965a
		Swietenine (23)	Limonoid	
<i>S. mahagoni</i> Jacq.	wood oil	Swietenolide (24)	Limonoid	Connolly <i>et al.</i> , 1965b
		Cycloecalenol (221)	Triterpenoid	
		Methyl angolensate (80)	Limonoid	
	seed			Taylor, 1969

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Toona ciliata</i> Roem.	seed	Swietenine (23)	Limonoid	Ekimoto <i>et al.</i> , 1991
		Swietenolide (24)	Limonoid	
		Swietemahonin A(222)	Limonoid	
		Swietemahonin D (223)	Limonoid	
		Swietemahonin E (224)	Limonoid	
		Swietemahonin G (225)	Limonoid	
		3-O-Acetylswietenolide(226)	Limonoid	
		6-O-Acetylswietenolide(227)	Limonoid	
		3,6-O,O-Diacetylswietenolide(228)	Limonoid	
	leaf	Cyclomahogenol (229)	Triterpenoid	Chakraborty and Basak, 1971
<i>Trichilia havanensis</i> Jacq.	seed	Toonacilin (230)	Limonoid	Neto <i>et al.</i> , 1995
		12-Deacetoxytoonacilin(231)	Limonoid	
		6 α -Acetoxy-14 β ,15 β -epoxy -azadirone (143)	Limonoid	
		Havanensin triacetate(232)	Limonoid	
fruit	Havanensin-3,7-diacetate (233)	Limonoid	Chan, Gibbs and Taylor,1973	
	Havanensin-1,7-diacetate (234)	Limonoid		

Table2 (Continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>T. heudelotii planchex</i> Oliv.	timber	Trichilenone acetate (235)	Limonoid	Okorie and Taylor,1967 Adesida and Okorie,1973 Cortez <i>et al.</i> , 1992
	bark	Heudelottin (236)	Limonoid	
		Heudebolin (237)	Limonoid	
<i>T. hirta</i> Linn.	fruit	Hirtin (238)	Limonoid	
		Deacetylhirtin (239)	Limonoid	
		Methyl-11- β -acetoxy-6-hydroxy-12 α -(2-methylpropionyloxy)-3,7-dioxo-1,5,14,20,22meliacapentaen 29-oate (240)	Limonoid	
		Methyl-11- β -acetoxy-6-hydroxyl-2 α (2-methylpropionyloxy)-3,7dioxo-1,5,14,20,22 meliacapentaen 29-Oate-23- γ -hydroxy-butenol (241)	Limonoid	
		Melianone (206)	Triterpenoid	
		Meliandiol (242)	Triterpenoid	
		Bourjotinolone A (243)	Triterpenoid	
<i>T. hispida</i> T. D. Pennington	leaf	Hispidone (244)	Triterpenoid	Jolad, Hoffmann and Cole

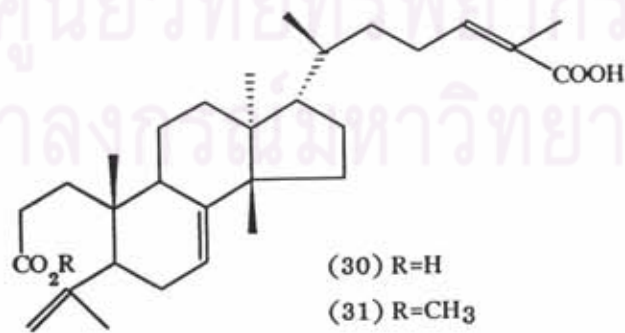
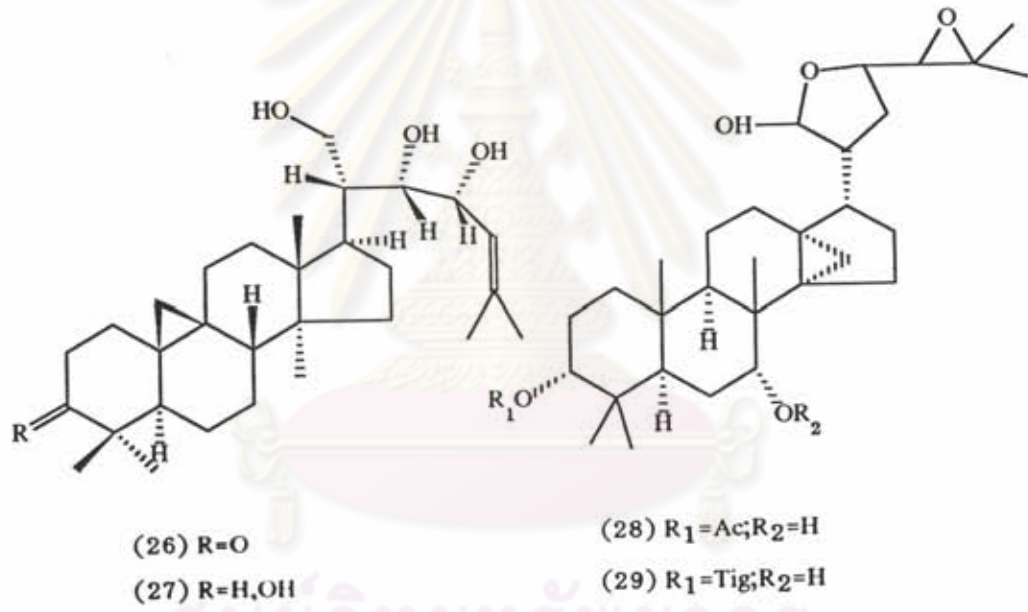
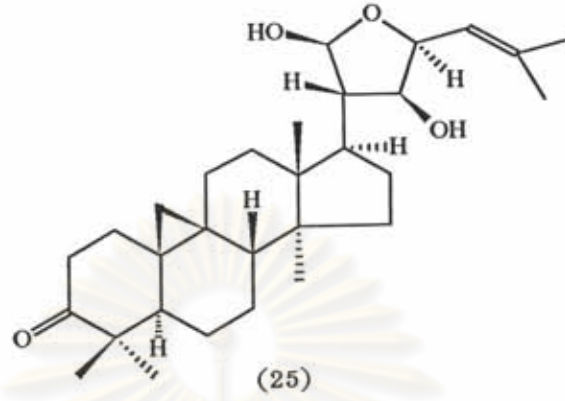
Table2 (Continued)

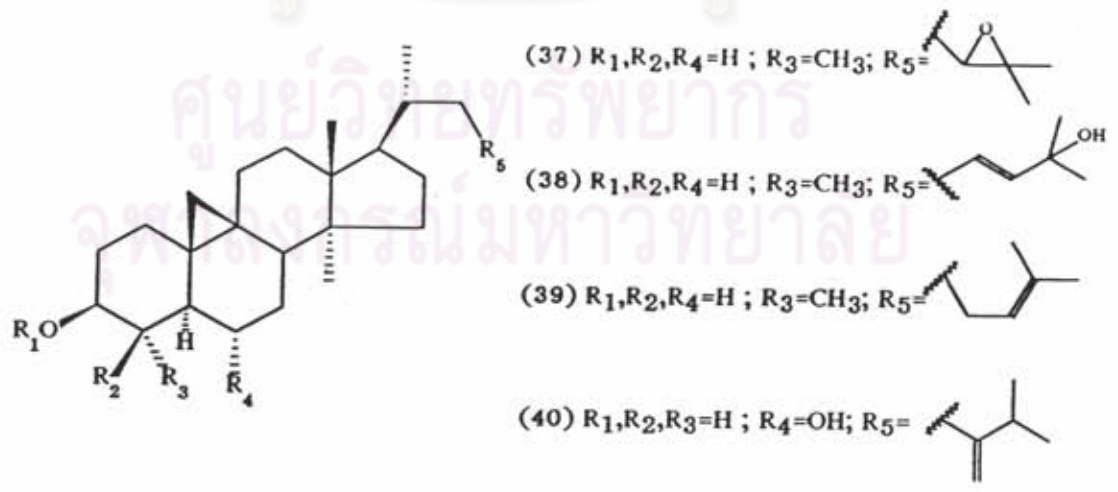
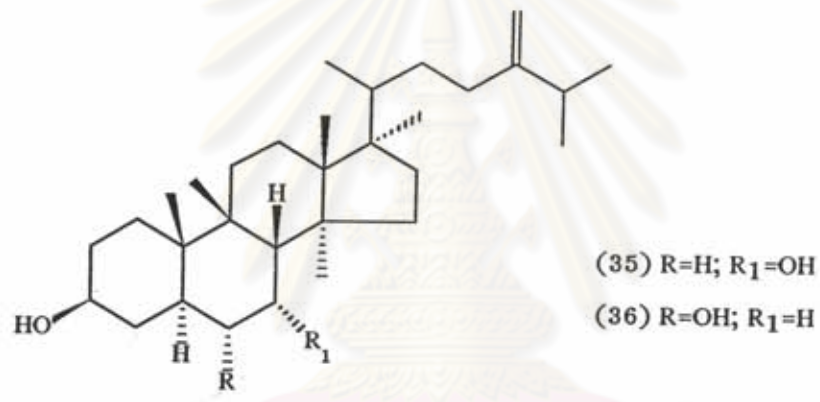
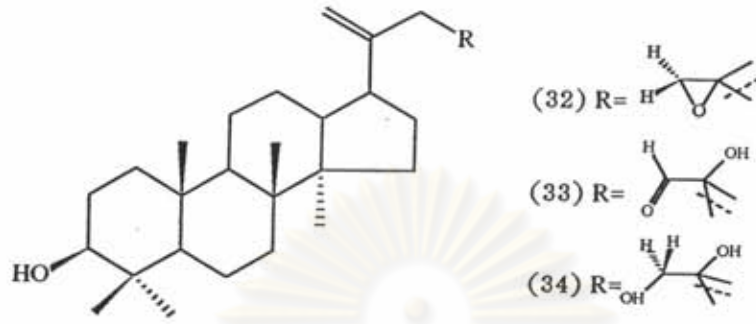
Plant Name	Part	Chemical Constituents	Category	References
<i>T. prieuriana</i> A. Juss.	leaf	Bourjotinolone A (243)	Triterpenoid	,1980
	leaf	Hispidin A (245)	Limonoid	Jolad <i>et al.</i> , 1981
<i>T. roka</i> P. Br.	leaf	Hispidin B (246)	Limonoid	
		Hispidin C (247)	Limonoid	
	leaf	Pricurianin (248)	Limonoid	Gullo <i>et al.</i> , 1975
		Prieurone (249)	Triterpenoid	Okorie and Olugbade, 1991
	root bark	29-Hydroxyprieurone(250)	Triterpenoid	
		Trichilin A (251)	Limonoid	Nakatani, James and
		Trichilin B (252)	Limonoid	Nakanishi, 1981
		Trichilin C (253)	Limonoid	
		Trichilin D (254)	Limonoid	
		Trichilin E (255)	Limonoid	
Trichilin F (256)		Limonoid		
Trichilin F (256)		Limonoid		
root bark	Aphanastatin (257)	Limonoid		
root bark	7-Acetyltrichilin A (258)	Limonoid	Nakatani <i>et al.</i> , 1985	
root bark	Trichilin A (251)	Limonoid	Nakatani and Nakanishi, 1993	
root bark	Trichilin F (256)	Limonoid		
root bark	Trichilin G (259)	Limonoid		

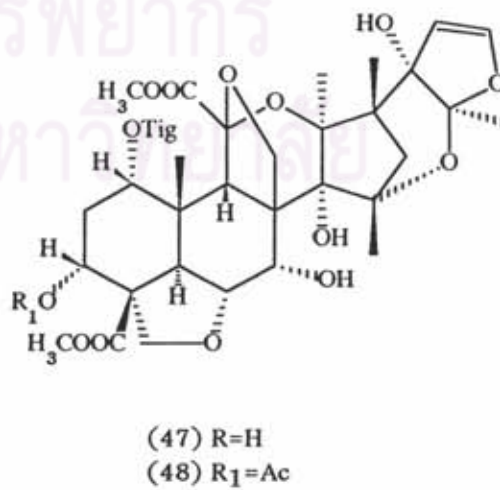
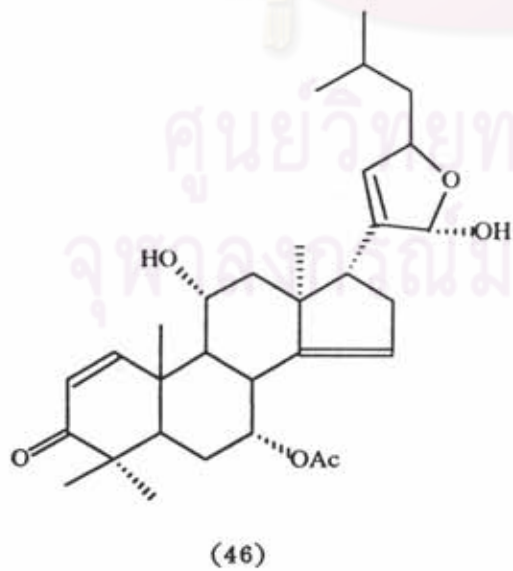
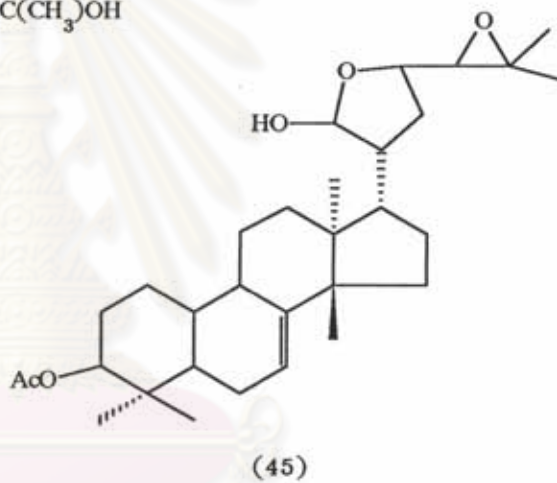
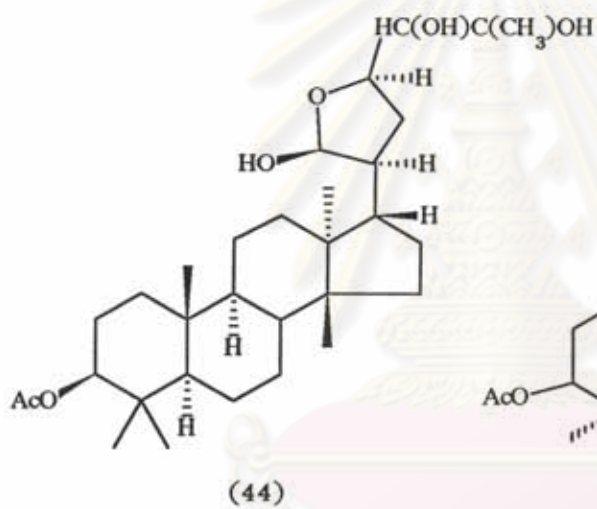
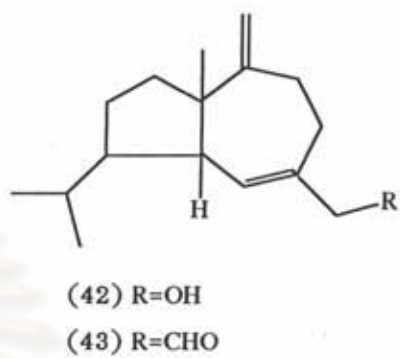
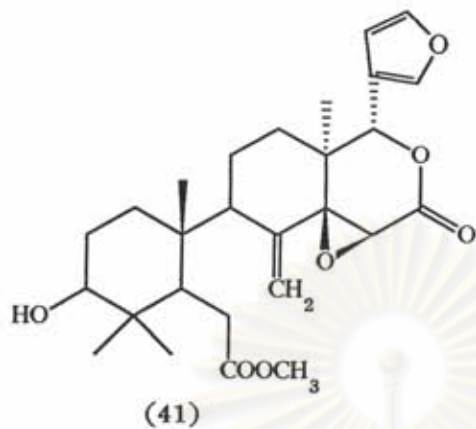
Table2 (Continued)

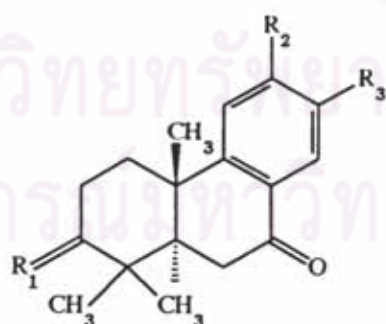
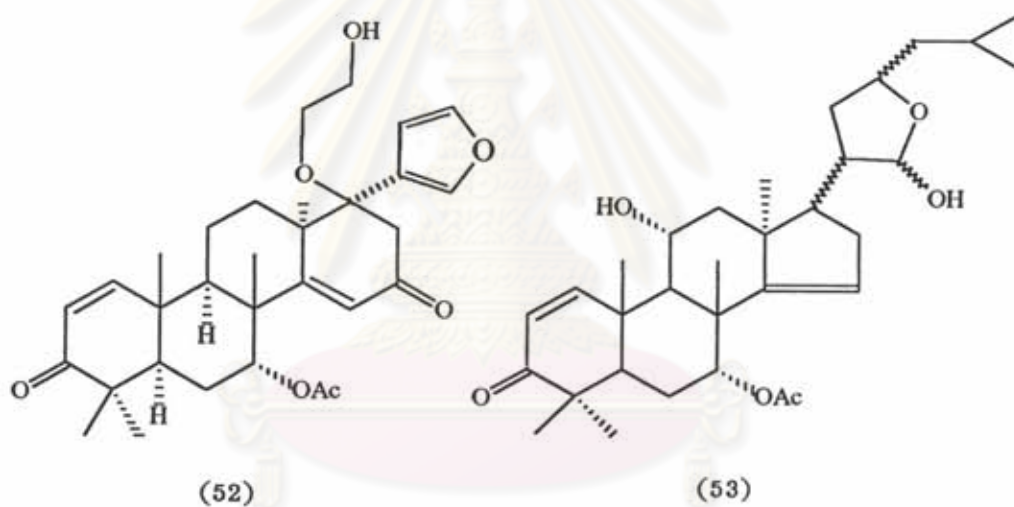
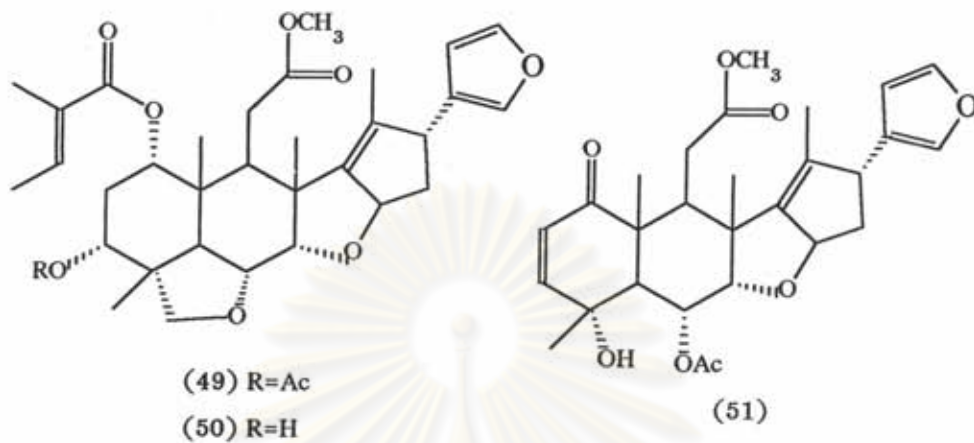
Plant Name	Part	Chemical Constituents	Category	References
<i>Turraea mombasana</i> Hiern	fruit	Sendanin (178)	Limonoid	Kubo and Klocke,1982
	root bark	Mombasone (260)	Limonoid	Adul <i>et al.</i> , 1993
		Mombasol (261)	Limonoid	
<i>T. nilotica</i> Kotschy&Peyr.	wood & bark	Niloticin (262)	Triterpenoid	Mulholland and Taylor ,1988
		Dihydrniloticin (263)	Triterpenoid	
		Triolniloticin (264)	Triterpenoid	
<i>T. robusta</i> Hiern	root bark	Mzikonone (265)	Limonoid	Rajab <i>et al.</i> , 1988
<i>Xylocarpus granatum</i> Koen.	timber	Gedunin (81)	Limonoid	Taylor, 1965


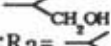

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

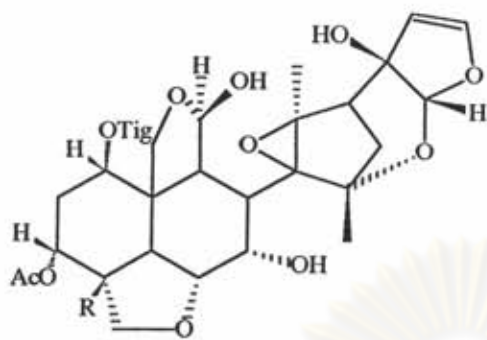
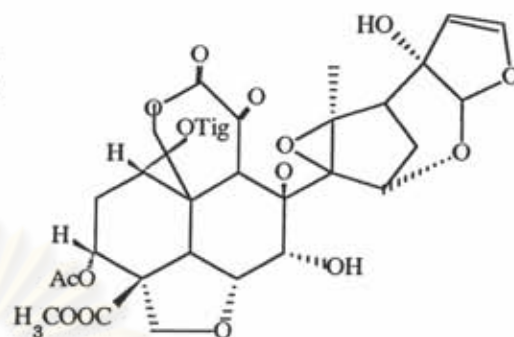




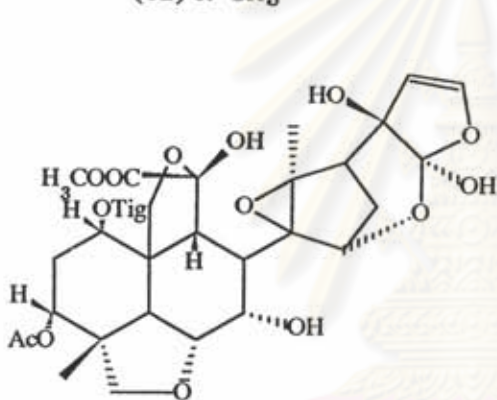




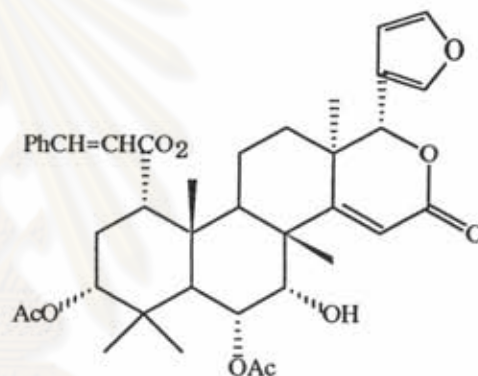
- (54) $R_1=O; R_2=OH; R_3=OCH_3$
 (55) $R_1=O, OH; R_2=OH; R_3=OCH_3$
 (56) $R_1=O; R_2=H; R_3=$ 
 (57) $R_1=O; R_2=H; R_3=$ 
 (58) $R_1=O, OH; R_2=OH; R_3=$ 
 (59) $R_1=H; R_2=OH; R_3=COCH_3$
 (60) $R_1=O, OH; R_2=OH; R_3=CH_3$
 (66) $R_1=H; R_2=OH; R_3=OH$

(61) $R = \text{COOCH}_3$ (62) $R = \text{CH}_3$ 

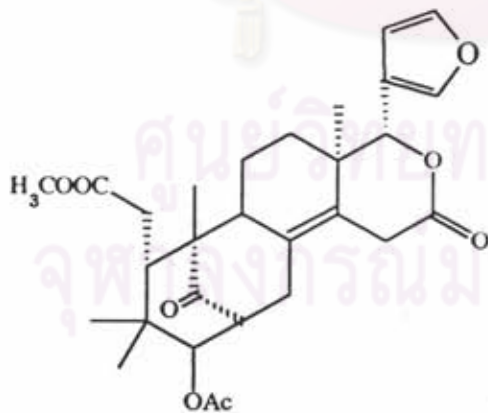
(63)



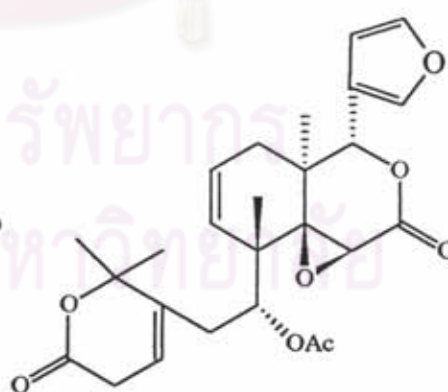
(64)



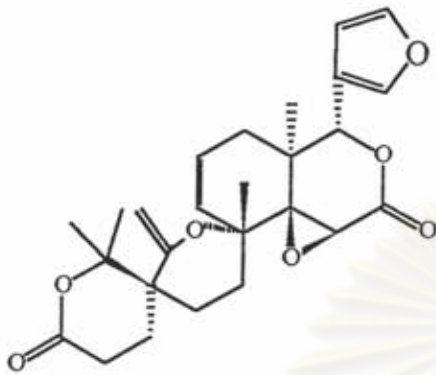
(65)



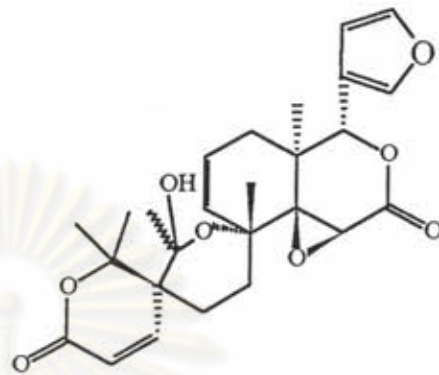
(67)



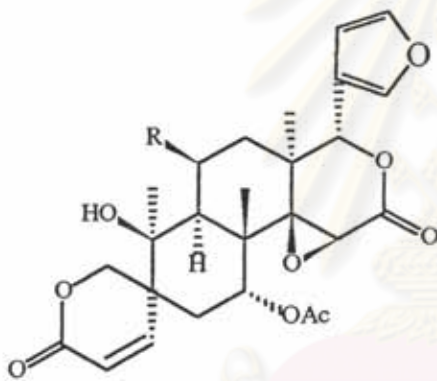
(68)



(69)

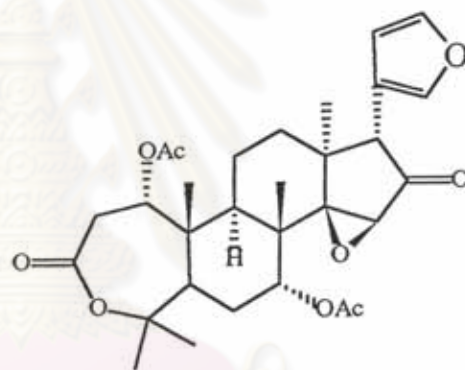


(70)

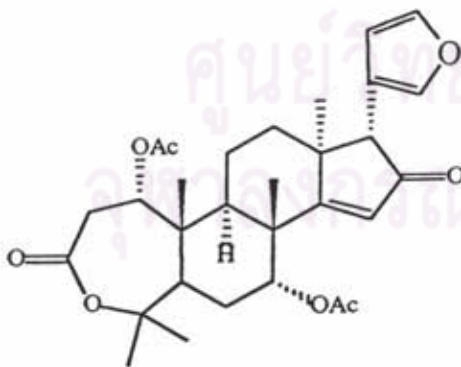


(71) R=OH

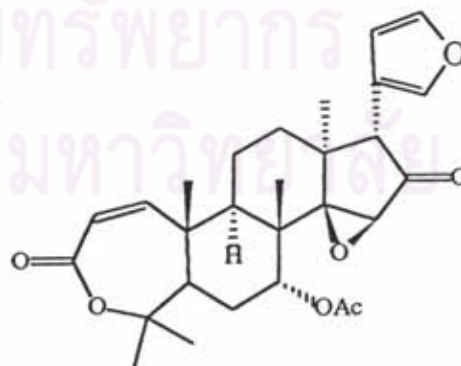
(72) R=H



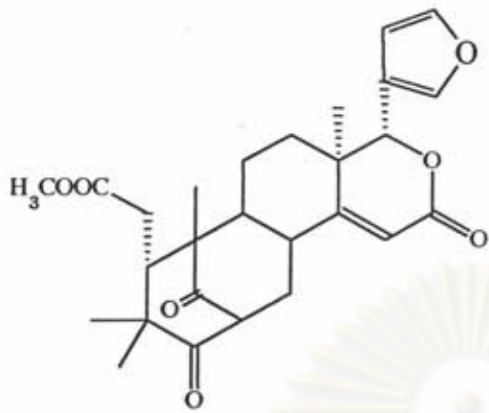
(73)



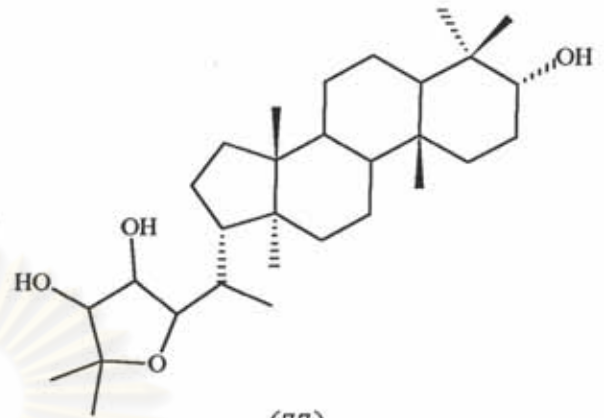
(74)



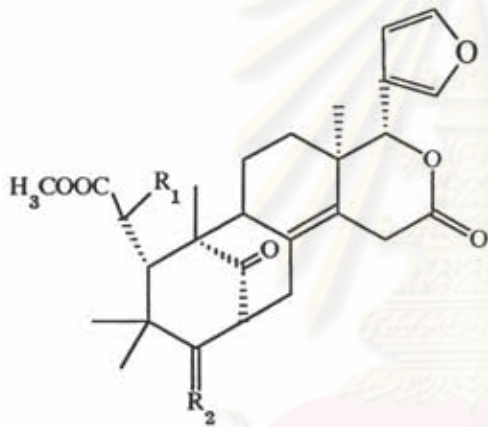
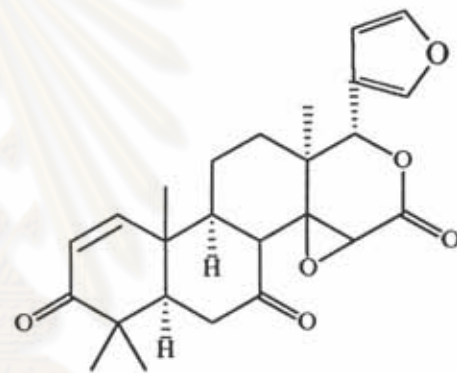
(75)



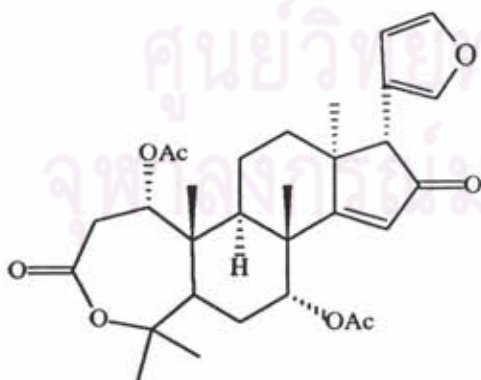
(76)



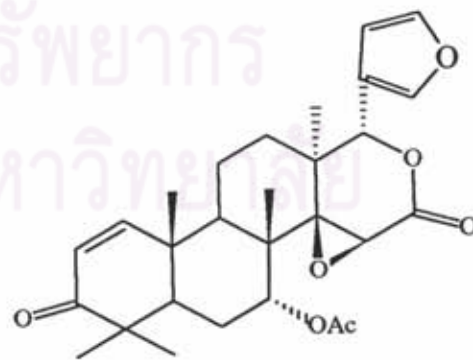
(77)

(78) $R_1=H$; $R_2=O$ (86) $R_1=H$; $R_2=OH$ (87) $R_1=OH$; $R_2=O$ 

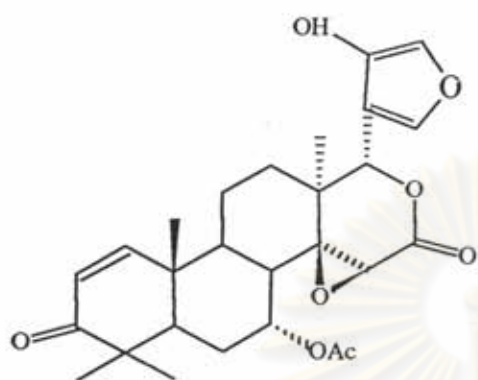
(79)



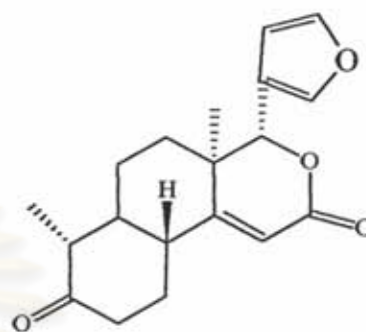
(80)



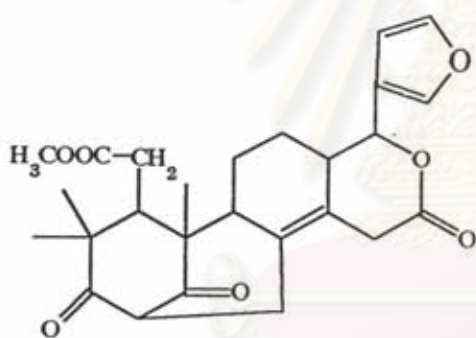
(81)



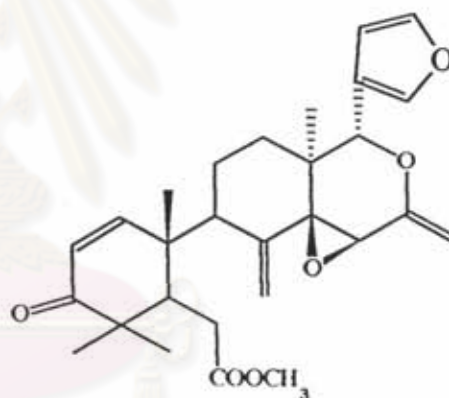
(82)



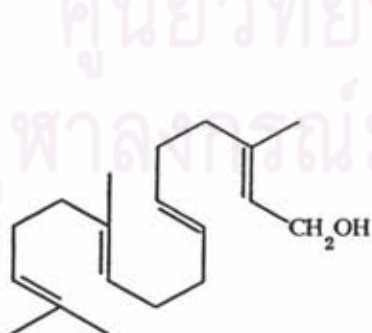
(83)



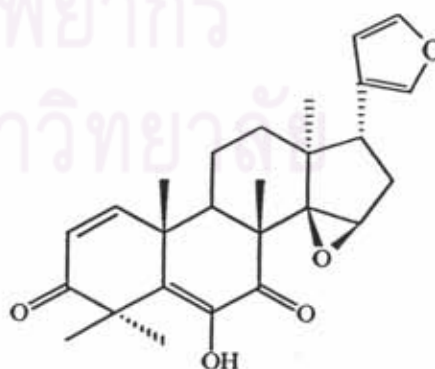
(84)



(85)

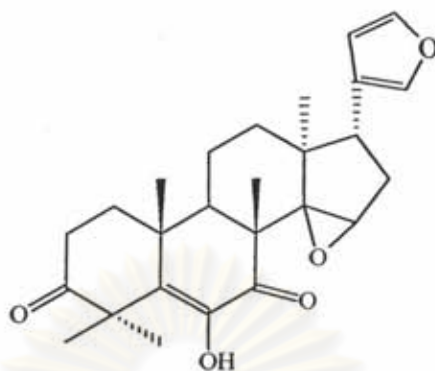


(88)

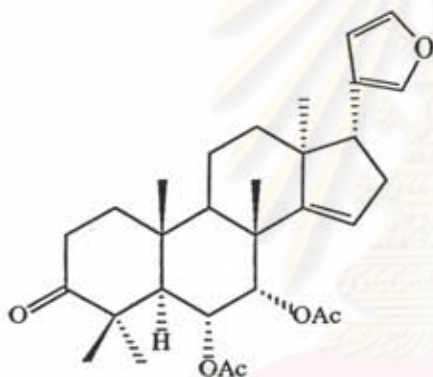


(89)

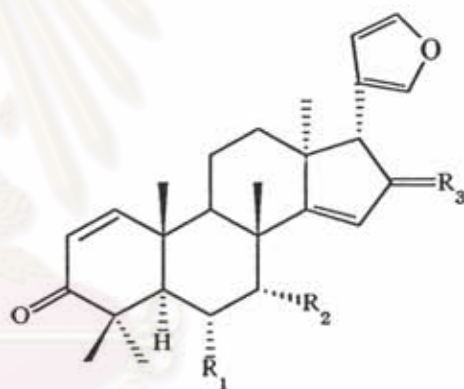
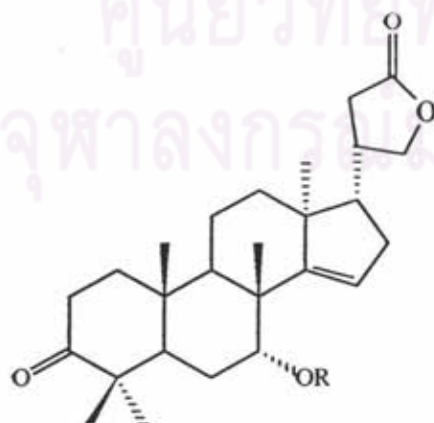
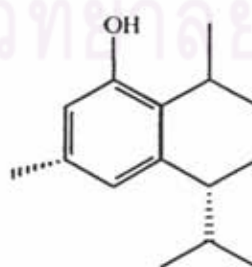
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



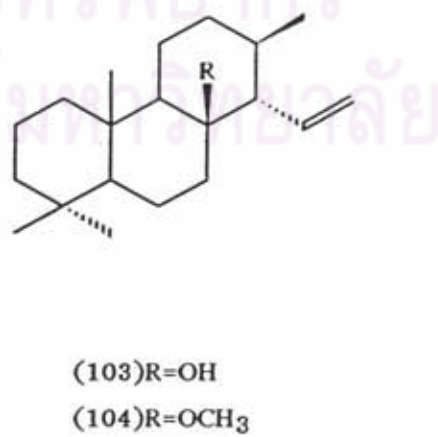
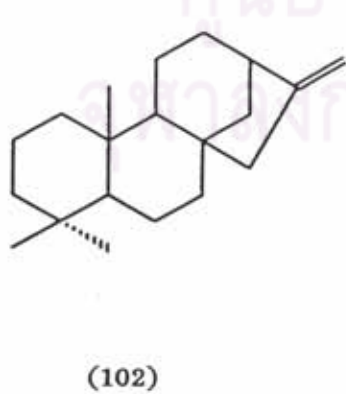
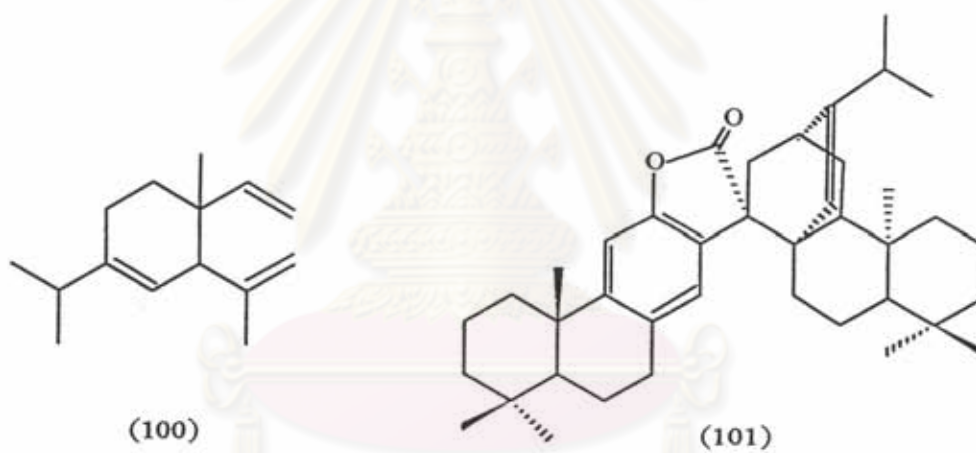
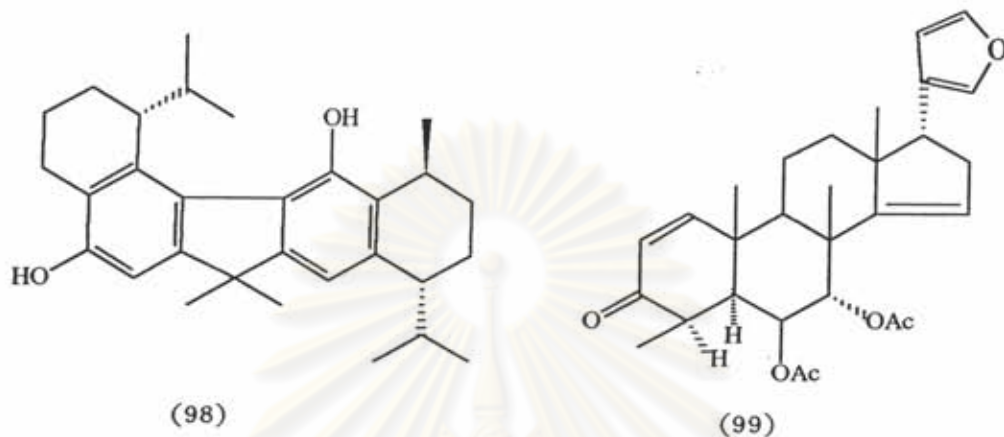
(90)

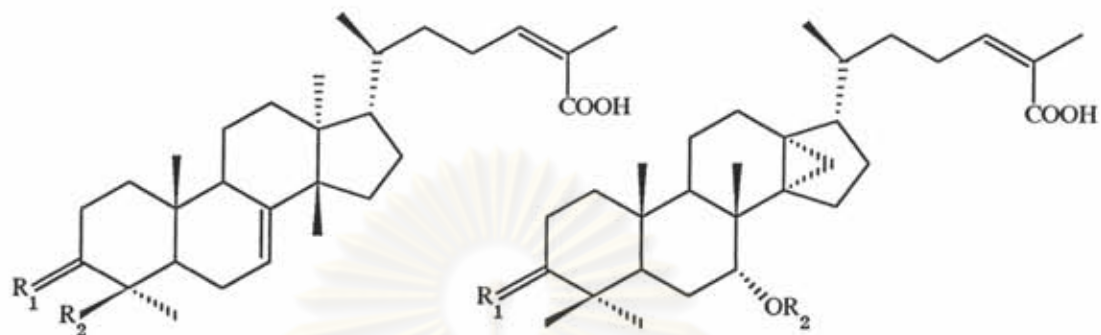
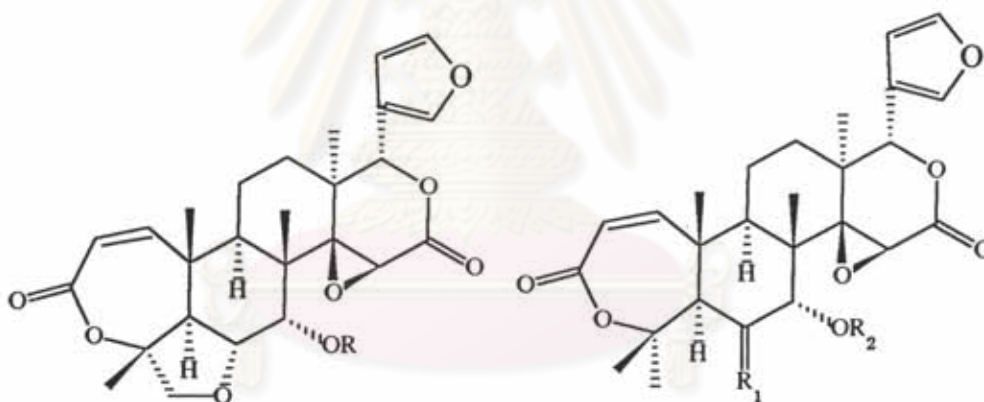
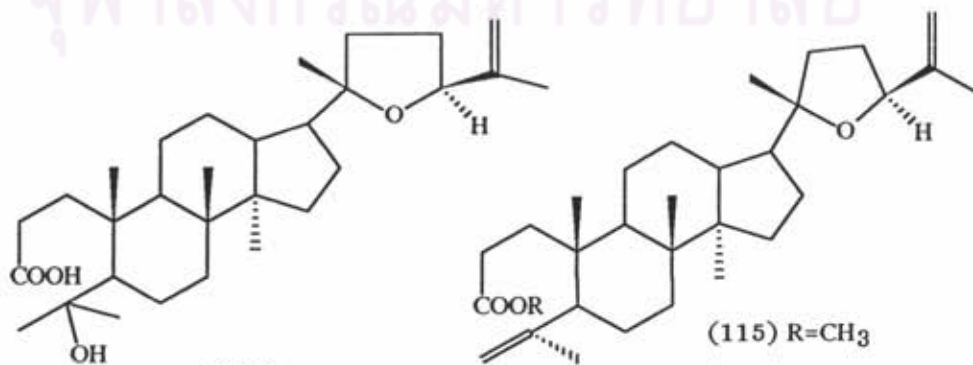


(91)

(92) $R_1=R_2=OAc$, $R_3=H_2$ (93) $R_1=R_2=OAc$, $R_3=O$ (94) $R_1=R_2=H$, $R_3=O$ (95) $R=Ac$ (96) $R=H$ 

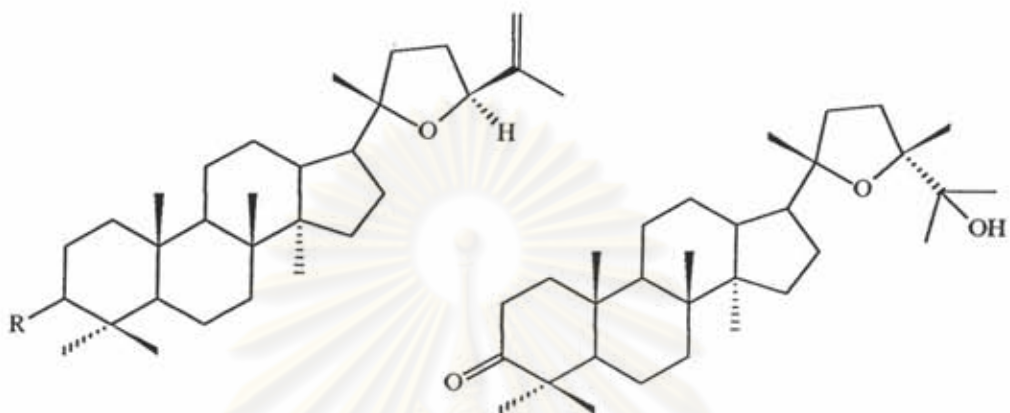
(97)



(105) $R_1=\text{H,H}; R_2=\text{O}$ (106) $R_1=\text{O}; R_2=\text{H}$ (107) $R_1=\text{H,H}; R_2=\text{H}$ (108) $R_1=\text{H,OAc}; R_2=\text{H}$ (109) $R_1=\text{O}; R_2=\text{Ac}$ (110) $R=\text{H}$ (111) $R=$ (112) $R_1=\text{H, OAc}; R_2=\text{Ac}$ (113) $R_1=\text{H,H}; R_2=\text{H}$ 

(114)

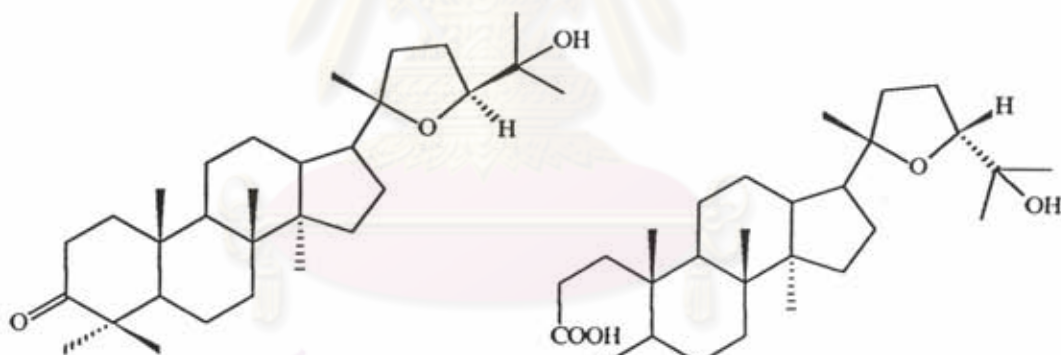
(115) $R=\text{CH}_3$ (116) $R=\text{H}$



(117) R=O

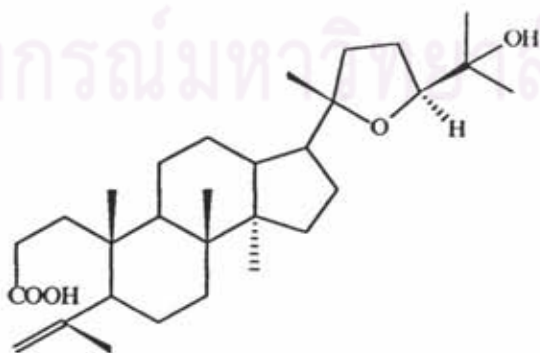
(118) R=H,OH

(119)

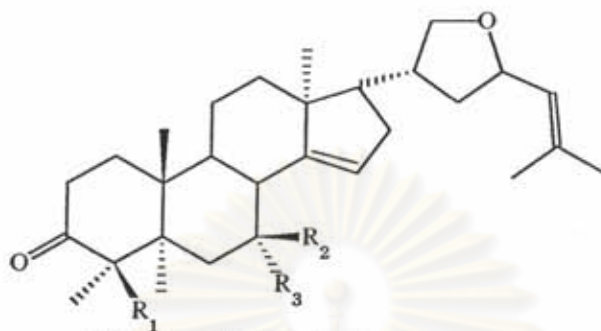


(120)

(121)



(122)



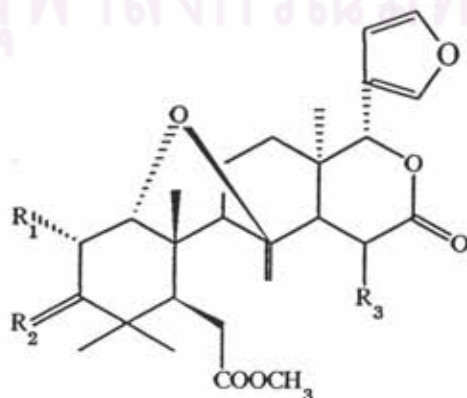
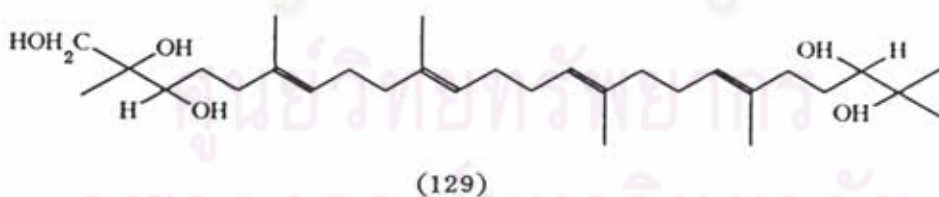
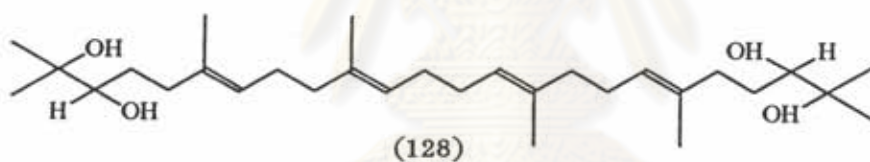
(123) $R_1 = \text{CH}_2\text{OH}$; $R_2, R_3 = \text{O}$

(124) $R_1 = \text{CH}_2\text{OH}$; $R_2 = \text{H}$; $R_3 = \text{OH}$

(125) $R_1 = \text{CH}_3$; $R_2, R_3 = \text{O}$, \triangle

(126) $R_1 = \text{CH}_3$; $R_2 = \text{H}$; $R_3 = \text{OH}$, \triangle

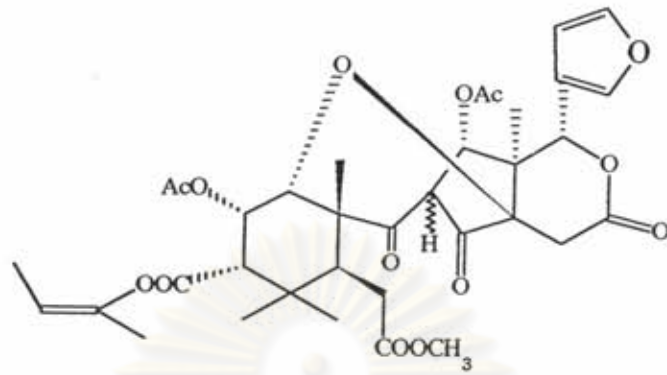
(127) $R_1 = \text{CH}_2\text{OH}$, $R_2, R_3 = \text{O}$, \triangle



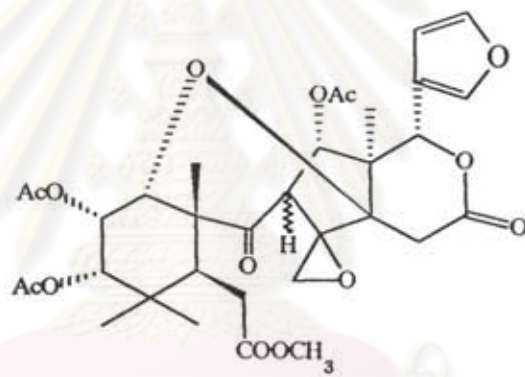
(130) $R_1 = \text{H}$, $R_2 = \text{H, OAc}$, $R_3 = \text{OH}$

(131) $R_1 = \text{OAc}$, $R_2 = \text{H, H}$, $R_3 = \text{OAc}$

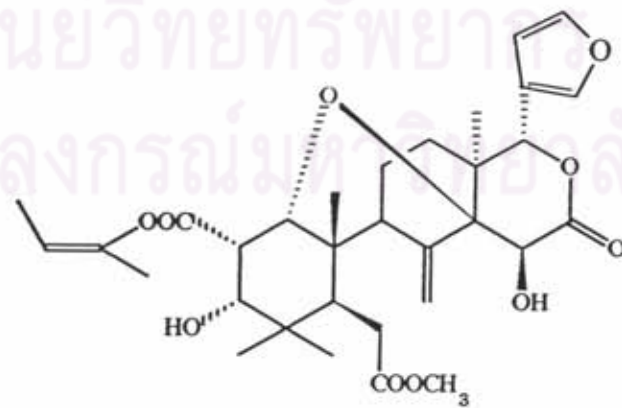
(132) $R_1 = \text{OAc}$, $R_2 = \text{H, OAc}$, $R_3 = \text{O}$



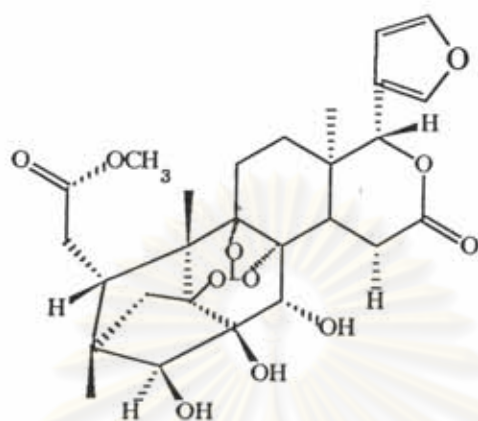
(133)



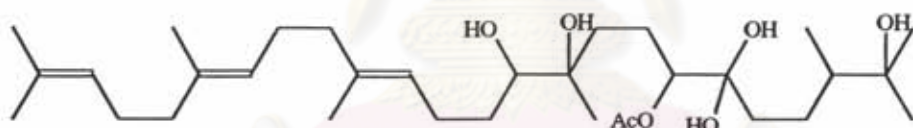
(134)



(135)



(136)



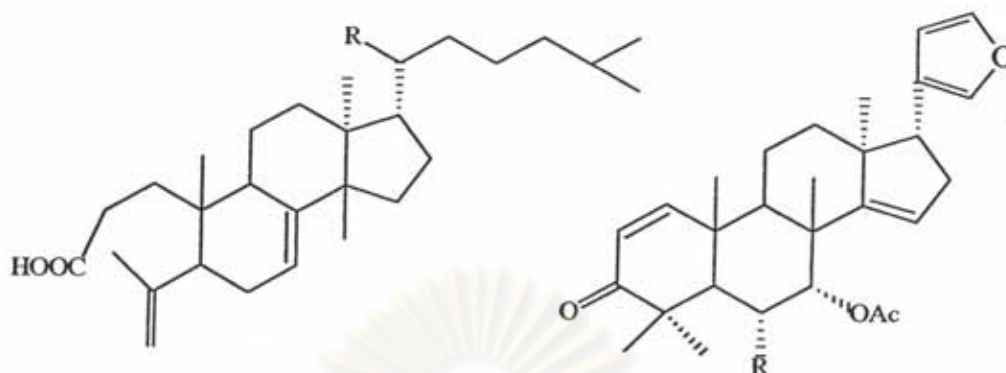
(137)



(138)



(139)

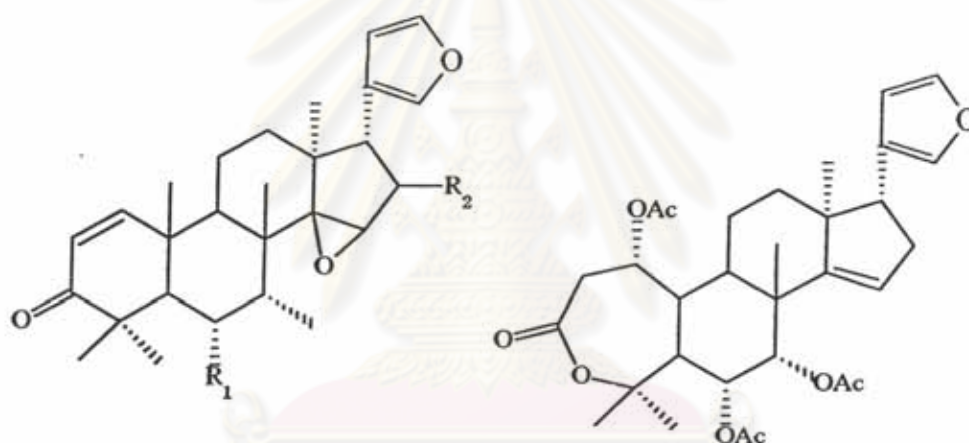


(140) R=COOH

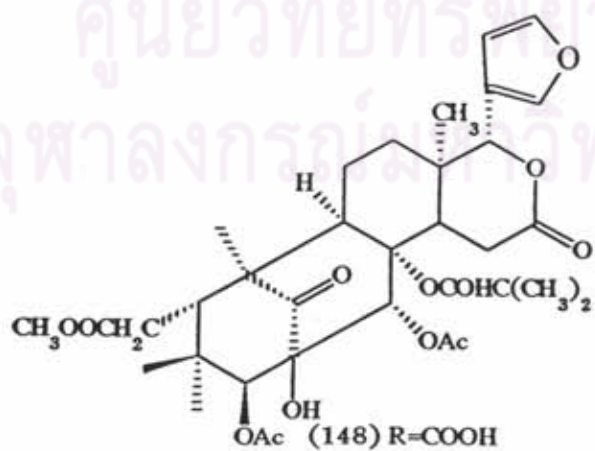
(146) R=CH₃

(141) R=H

(142) R=OAc

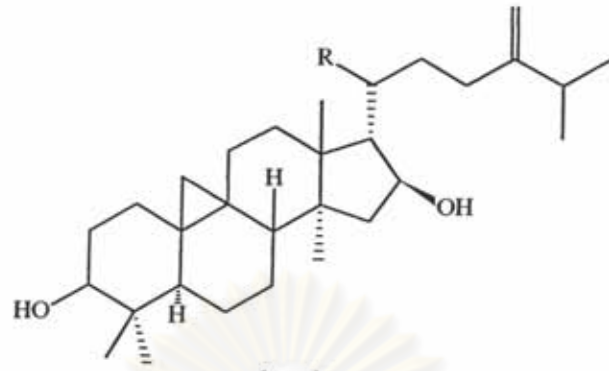
(143) R₁,R₂=H,H(144) R₁=OAc, R₂=O(145) R₁=OAc, R₂=H,H

(147)

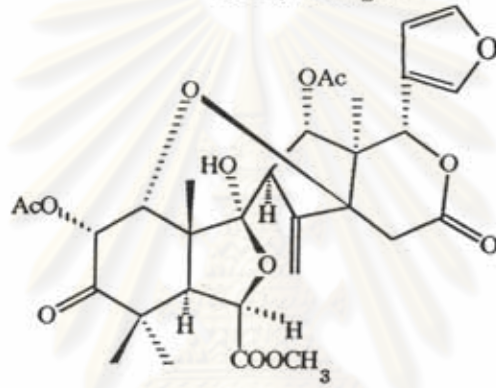


(148) R=COOH

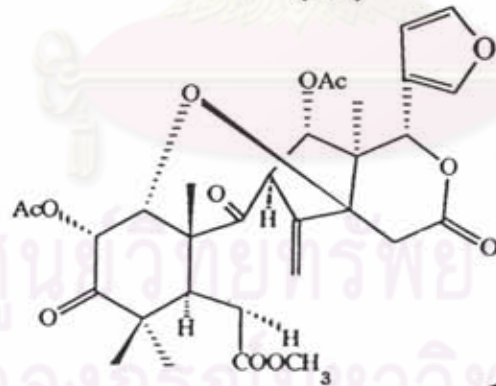
(149) R=CH₂OH



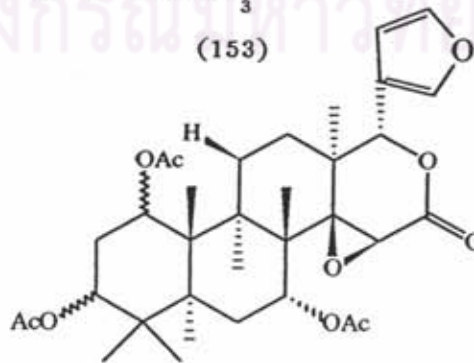
(150)R=COOH

(151)R=CH₂OH

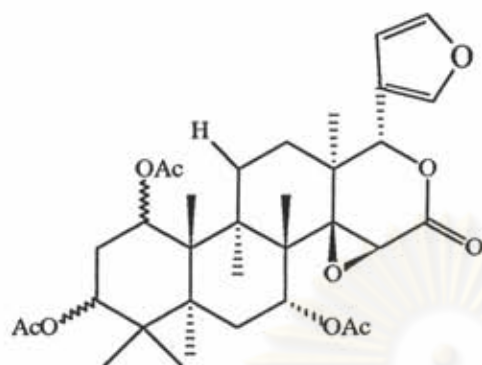
(152)



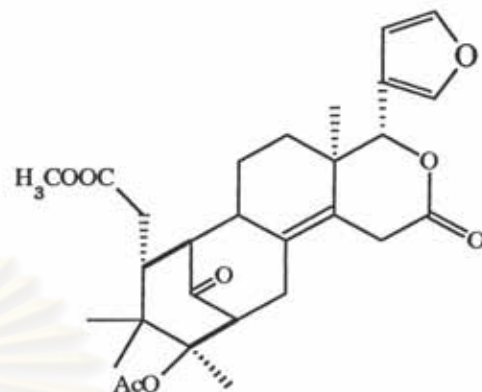
(153)



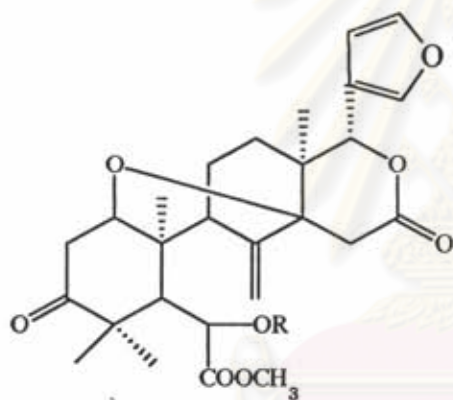
(154)



(155)

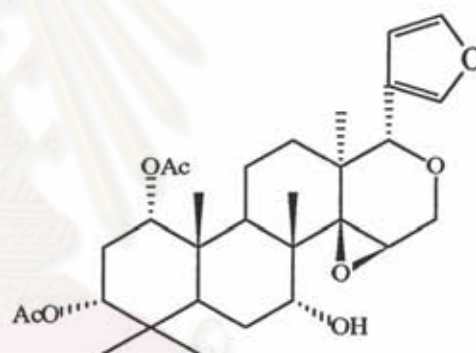


(156)

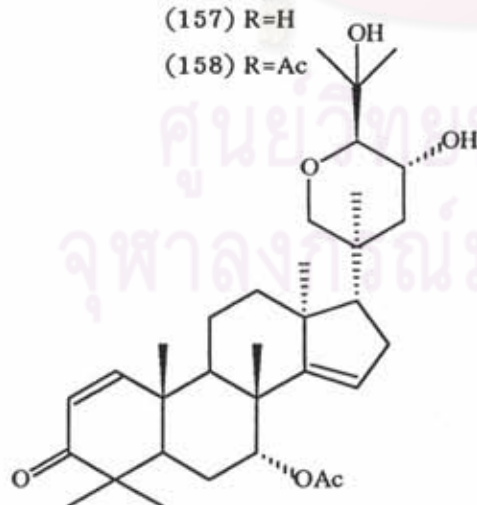


(157) R=H

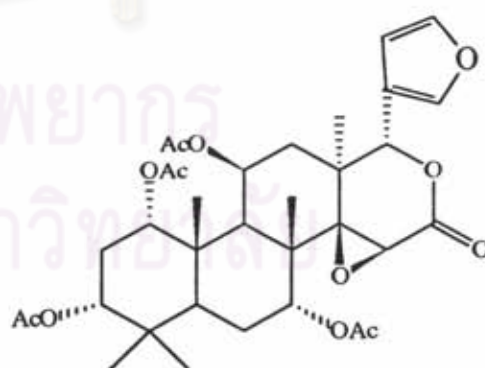
(158) R=Ac



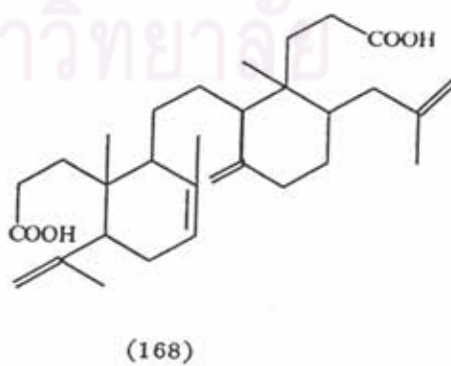
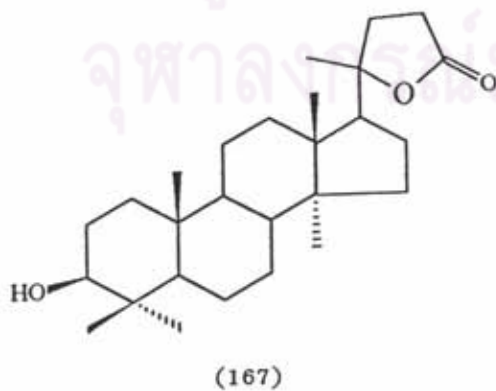
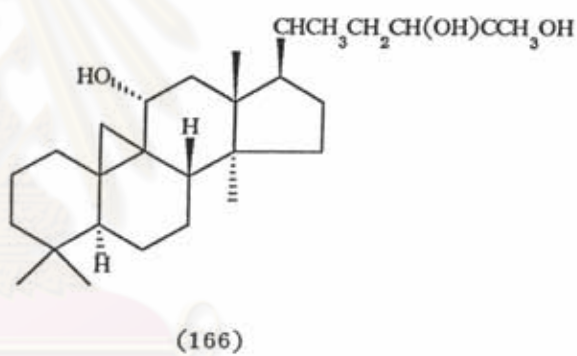
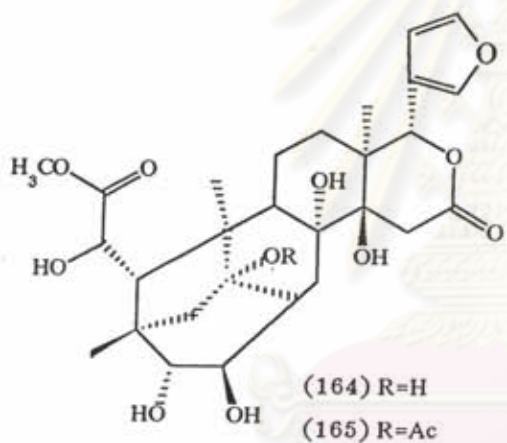
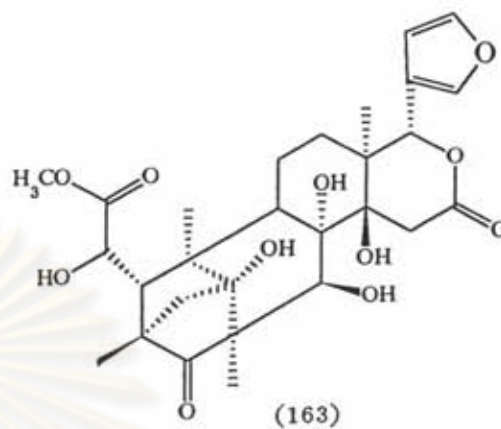
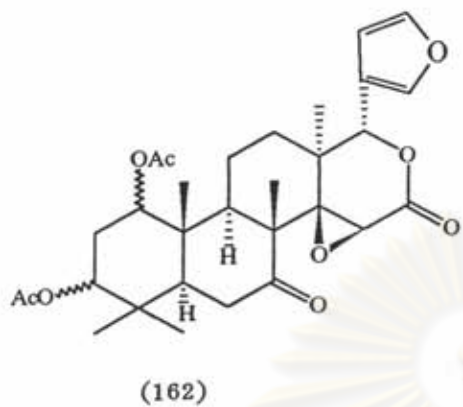
(159)

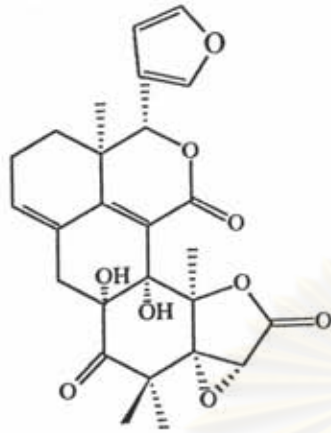


(160)

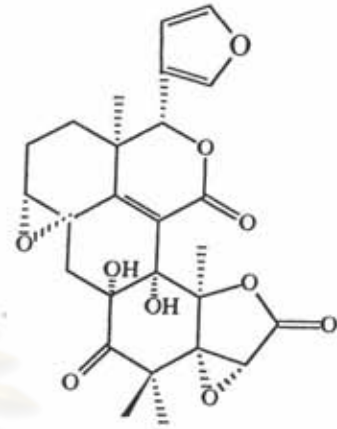


(161)

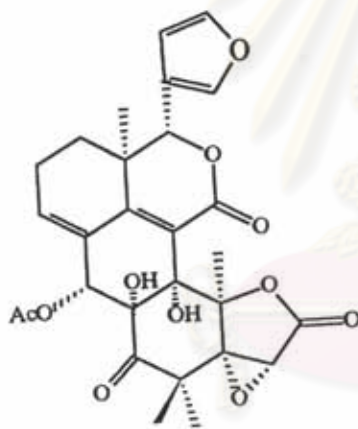




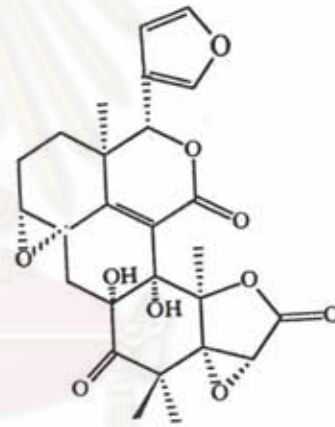
(169)



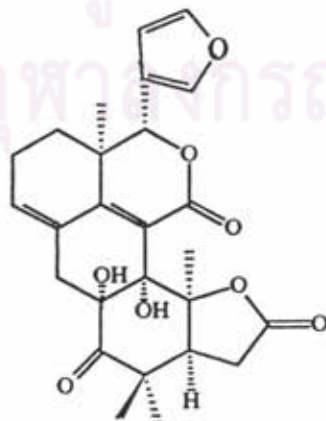
(170)



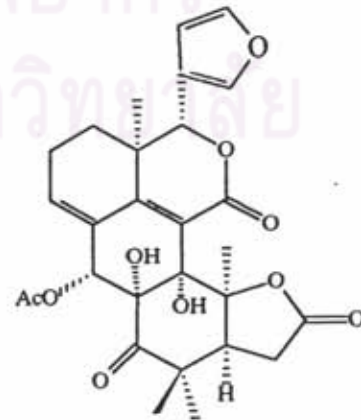
(171)



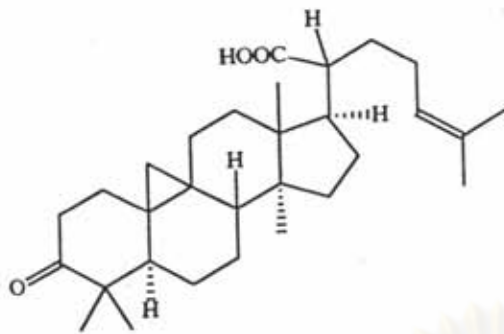
(172)



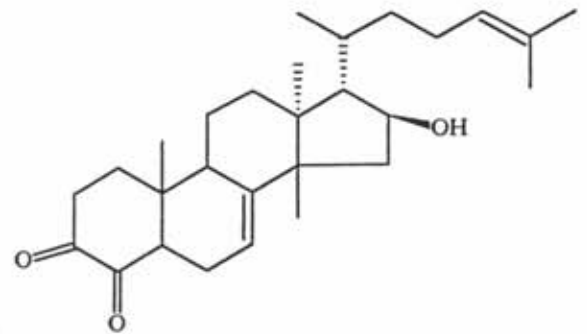
(173)



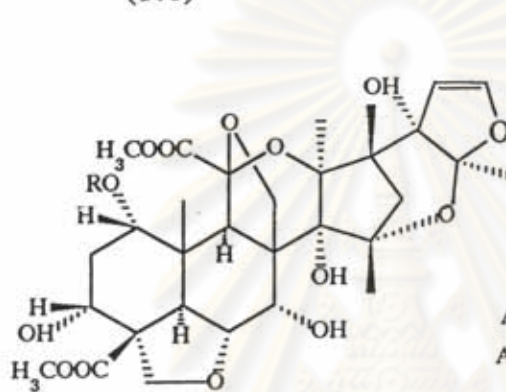
(174)



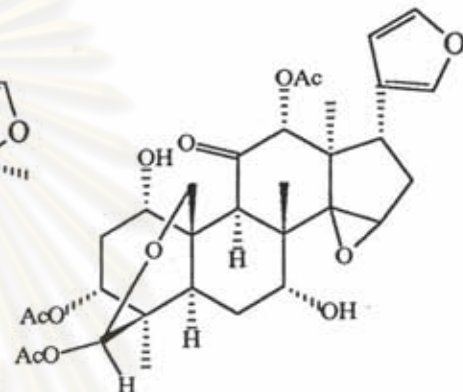
(175)



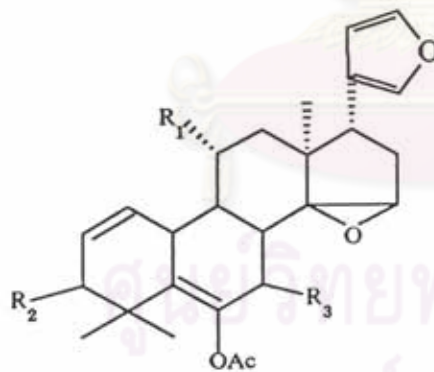
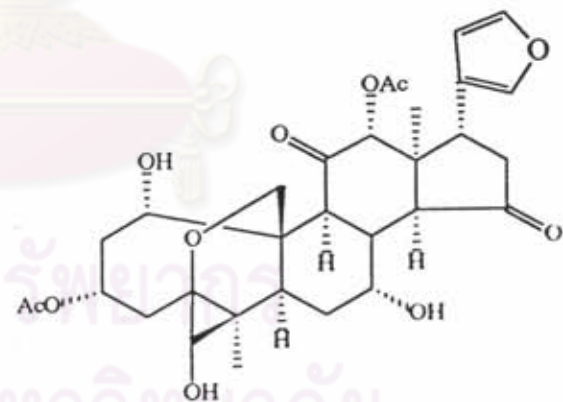
(176)



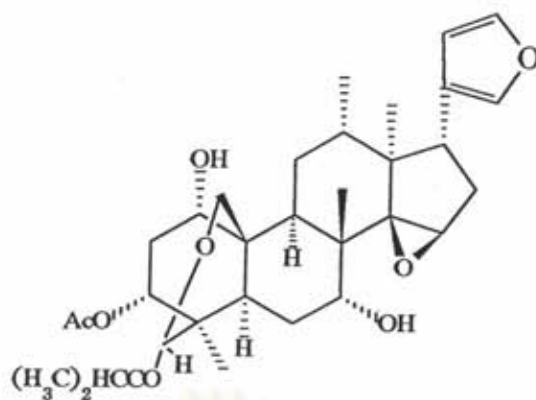
(177) R=cinnamate



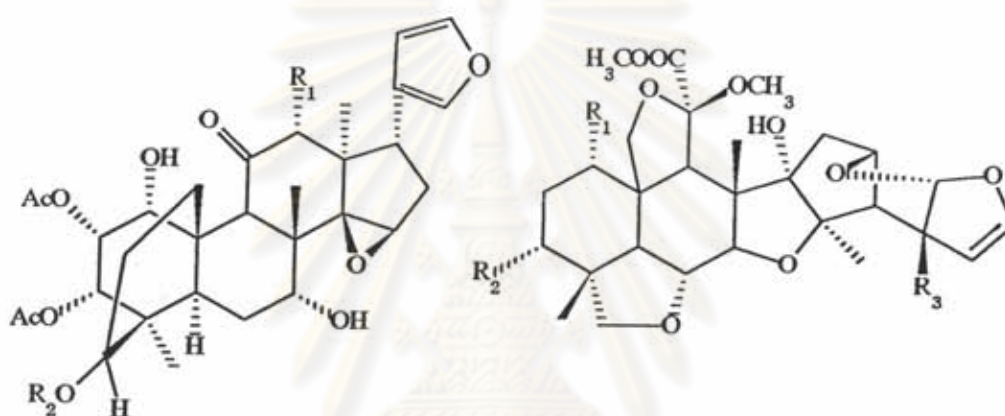
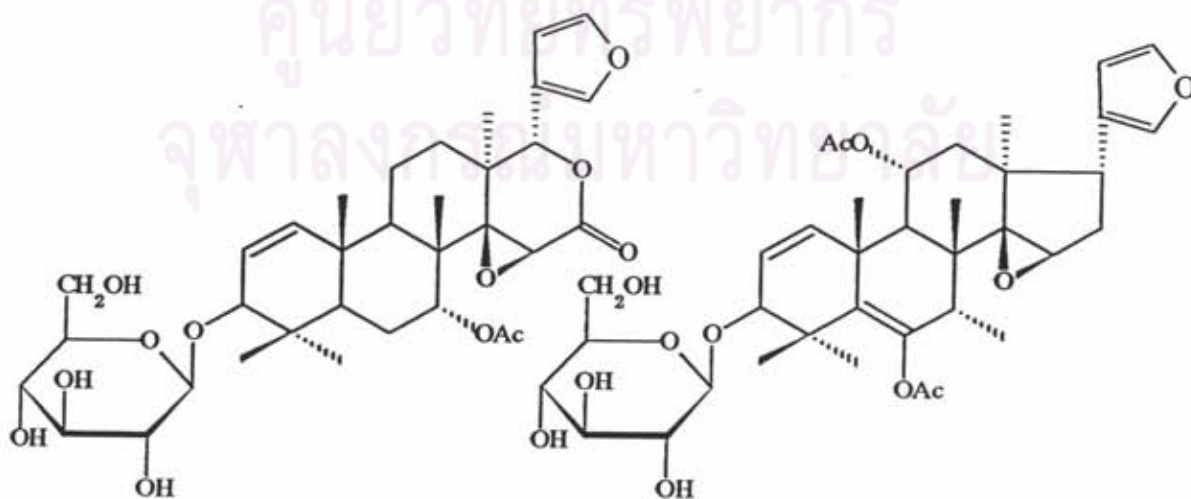
(178)

(179) R₁=H; R₂=O; R₃=H,OH(180) R₁=H; R₂=H, O-glucuronic acid; R₃=O(193) R₁=OH; R₂=H; O-rhamnose; R₃=O(196) R₁=H; R₂=H, O-xylose; R₃=O

(181)

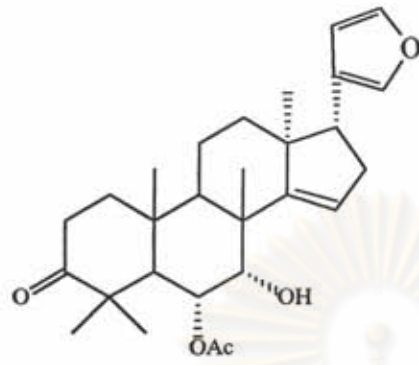


(182)

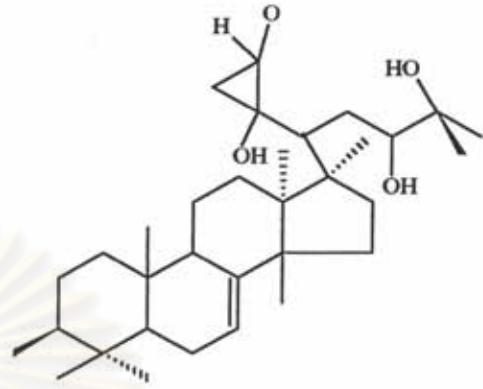
(186) $R_1=OTig$, $R_2=R_3=OCOCH_3$ (183) $R_1=OAc$, $R_2=COCH(CH_3)CH_2CH_3$ (187) $R_1=R_3=OCOC(CH_3)$, $R_2=OTig$ (184) $R_1=OAc$, $R_2=COCH(CH_3)CH_2CH_3$ (188) $R_1=OCin$, $R_2, R_3=OH$ $1\alpha=OAc$ (189) $R_1=H$, $R_2=OCOC(CH_3)=CH_2$, $R_3=OH$ (185) $R_1=OAc$, $R_2=COCH(CH_3)_2$ (190) $R_1=OCin$, $R_2=OCOCH_3$, $R_3=OH$ 

(191)

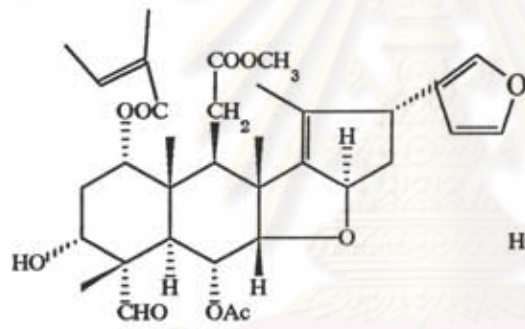
(192)



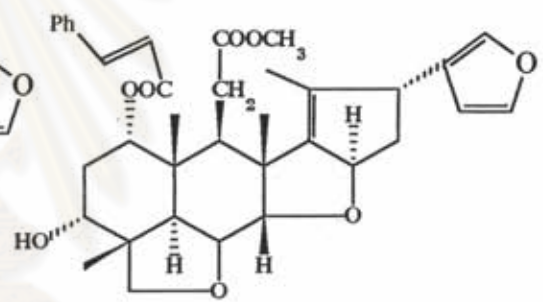
(194)



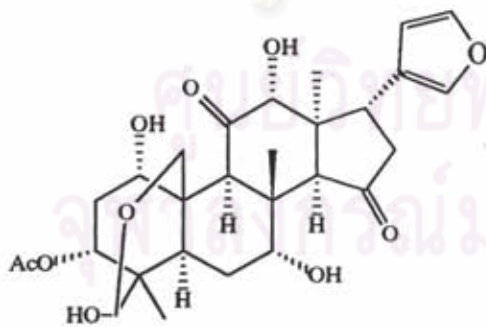
(195)



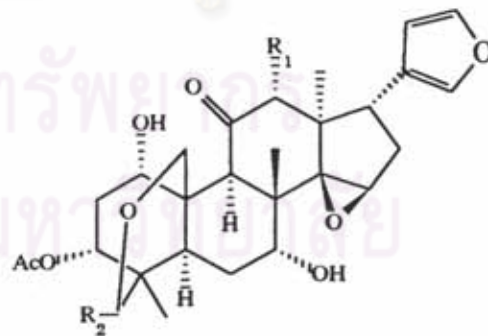
(197)

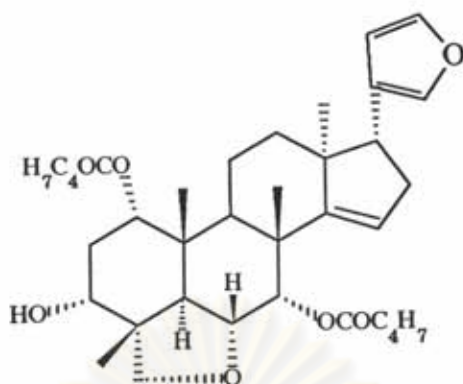


(198)

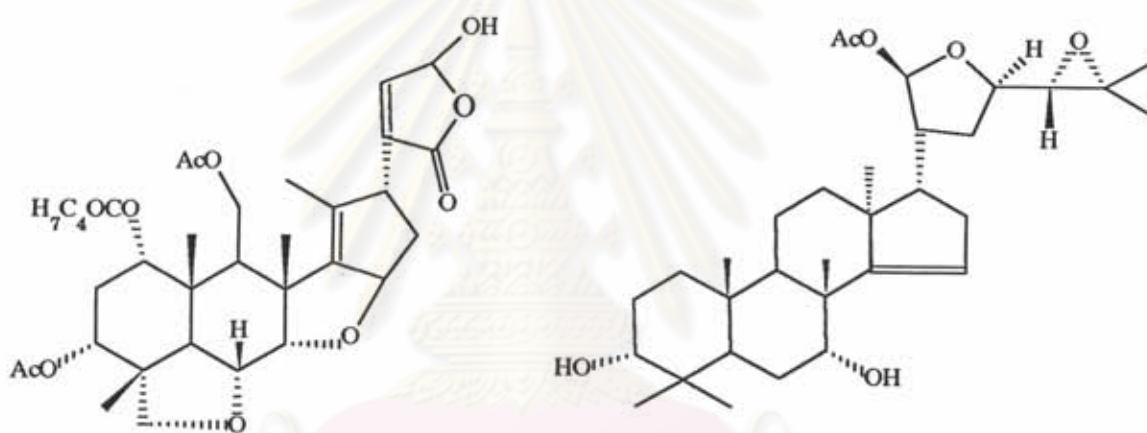


(199)

(200) $R_1=R_2=OH$ (201) $R_1=OAc, R_2=OH$

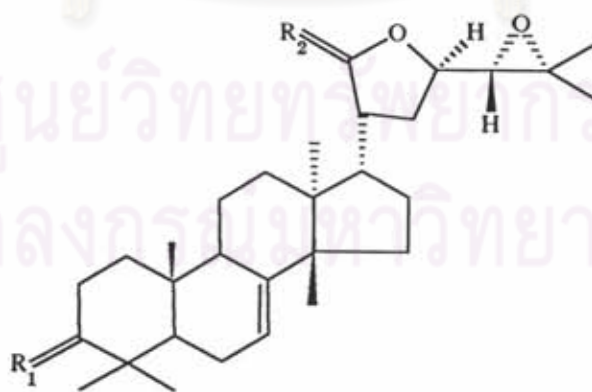


(202)



(203)

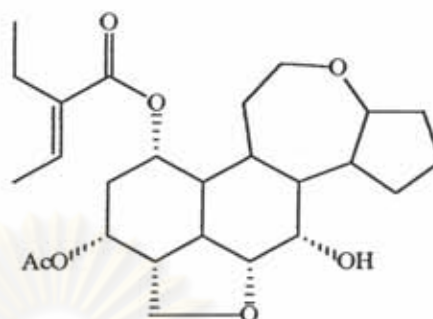
(204)



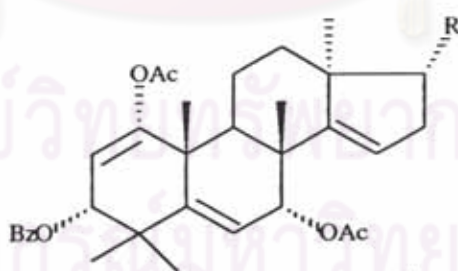
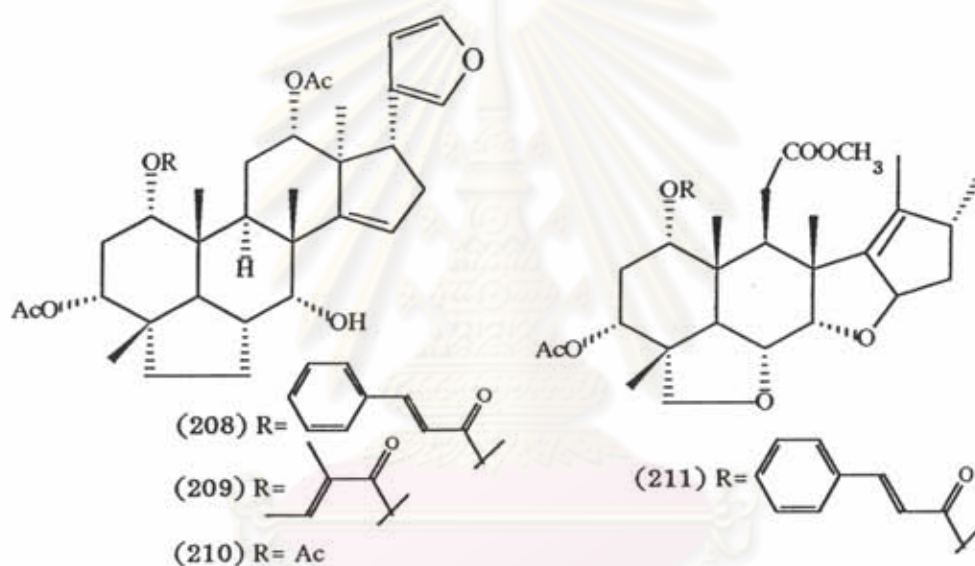
(205) $R_1 = \alpha\text{-H}, \beta\text{-OCO}(\text{CH}_2)_n\text{CH}_3, n=10,12,14,16$

$R_2 = \text{H}, \text{OH}; \text{C21 epimeric mixture}$

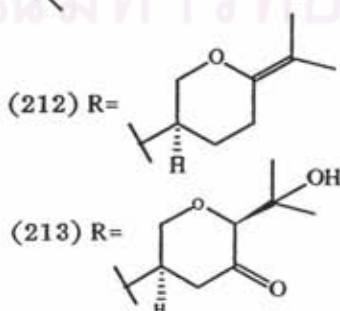
(206) $R_1 = \text{O}; R_2 = \text{H}, \text{OH}; \text{C21 epimeric mixture}$



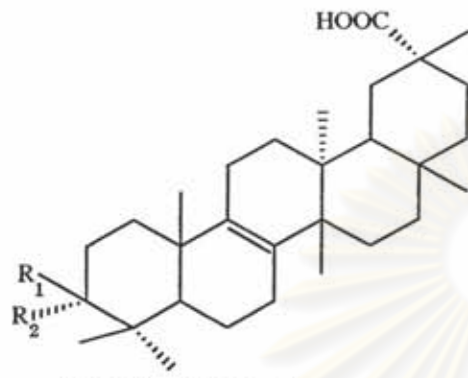
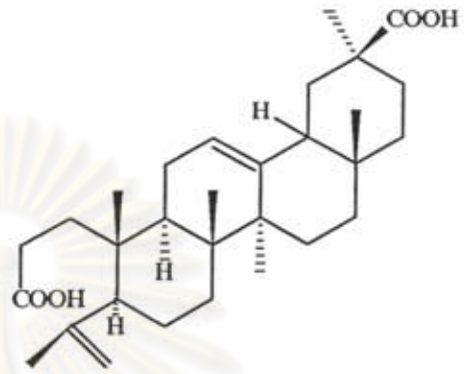
(207)



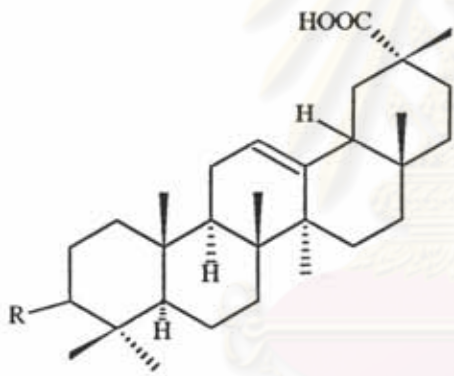
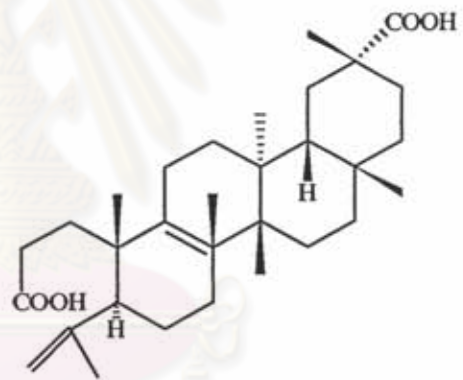
(212) R =



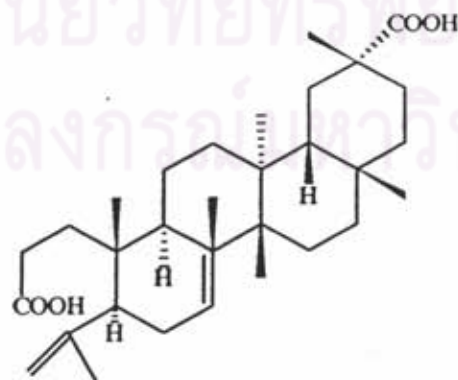
(213) R =

(214) $R_1=OH$; $R_2=H$ (215) $R_1, R_2=O$ 

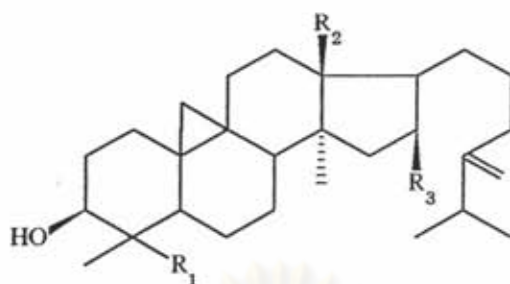
(216)

(217) $R=O$ (218) $R=OH$ 

(219)

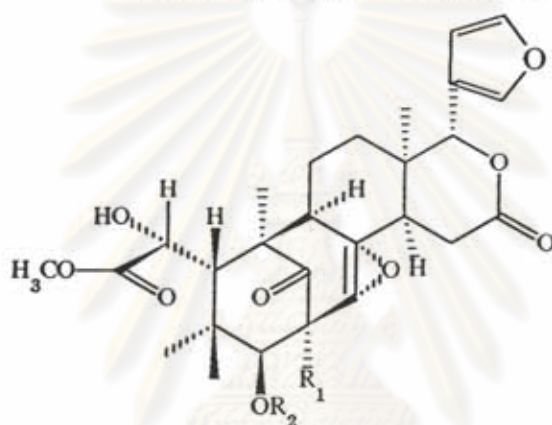


(220)



(221) $R_1=H, R_2=H, R_3=H$

(229) $R_1=CH_3, R_2=CH_3, R_3=OH$



(222) $R_1=H; R_2=COC_2H_5$

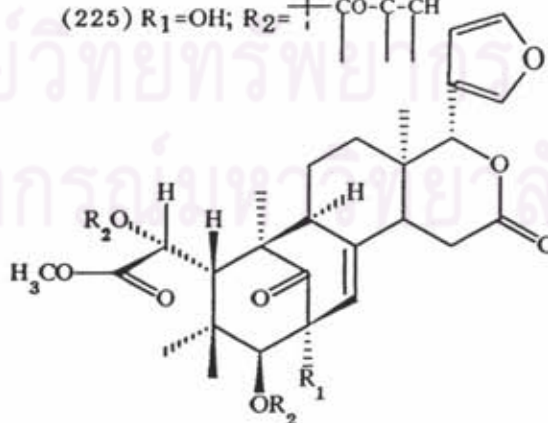
(223) $R_1=H; R_2=Ac$

(224) $R_1=H; R_2=$

$$\begin{array}{c} | \\ -C- \\ | \end{array} CO-C-CH$$

(225) $R_1=OH; R_2=$

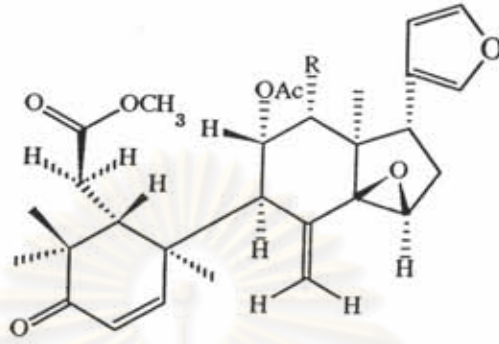
$$\begin{array}{c} | \\ -C- \\ | \end{array} CO-C-CH$$



(226) $R_1=Ac; R_2=H$

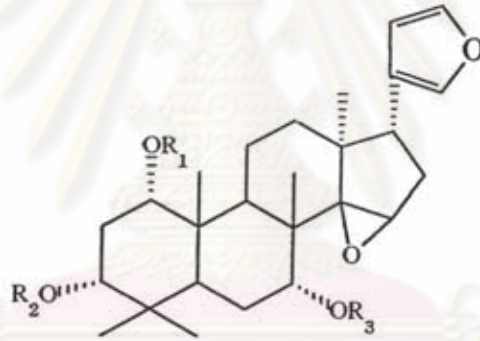
(227) $R_1=H; R_2=Ac$

(228) $R_1, R_2=Ac$



(230) R=OAc

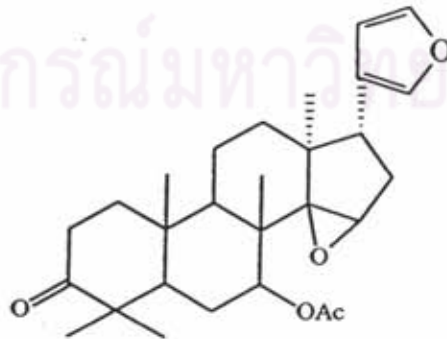
(231) R=H



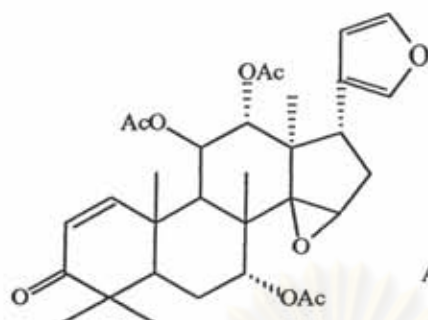
(232) R₁,R₂,R₃=Ac

(233) R₁=H; R₂,R₃=Ac

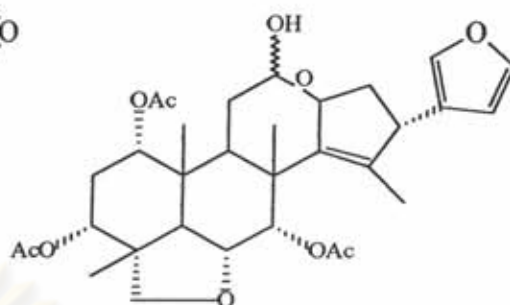
(234) R₂=H; R₁,R₃=Ac



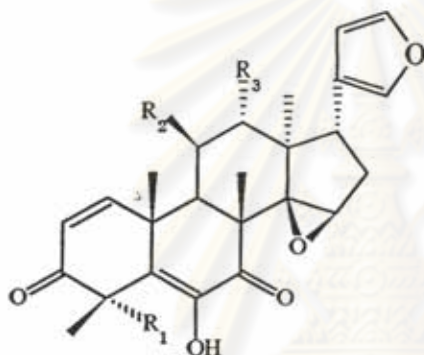
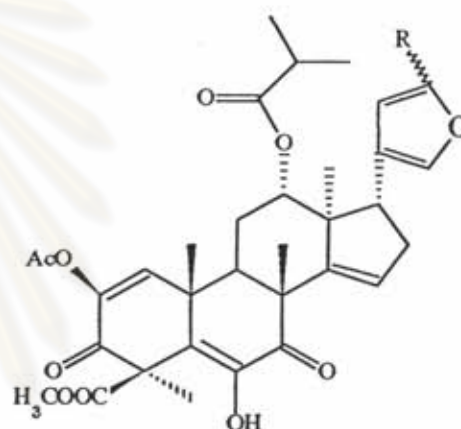
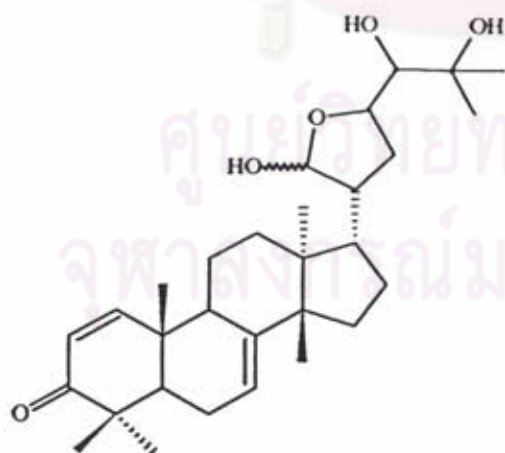
(235)



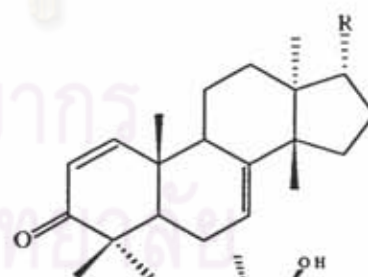
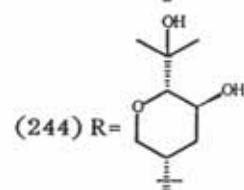
(236)

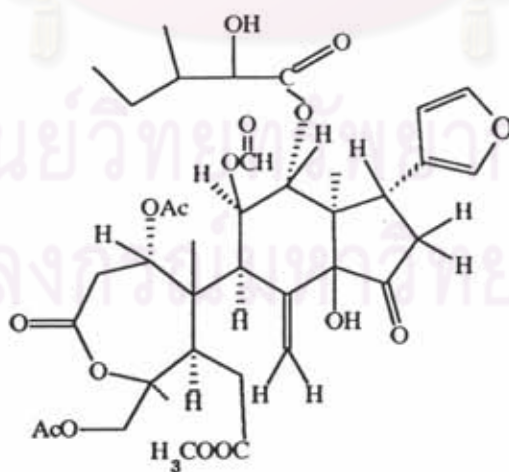
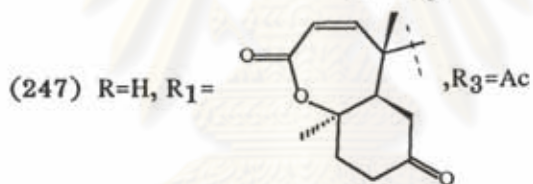
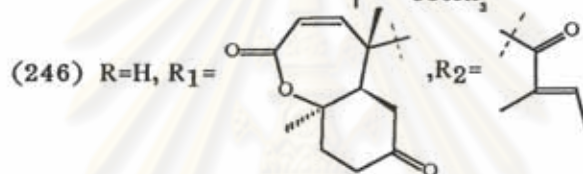
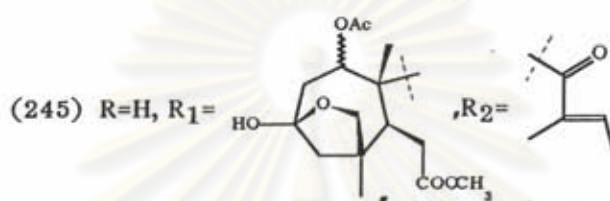
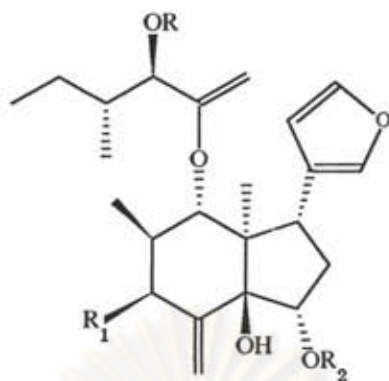


(237)

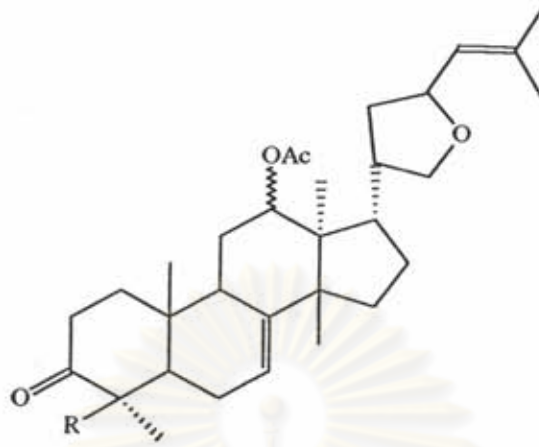
(238) $R_1 = \text{COOCH}_3$; $R_2 = \text{OAc}$; $R_3 = \text{OCOEt}$ (239) $R_1 = \text{COOCH}_3$; $R_2 = \text{OH}$; $R_3 = \text{OCOEt}$ (240) $R = \text{H}$ (241) $R = \text{OH}$ 

(242)

(243) $R =$ (244) $R =$

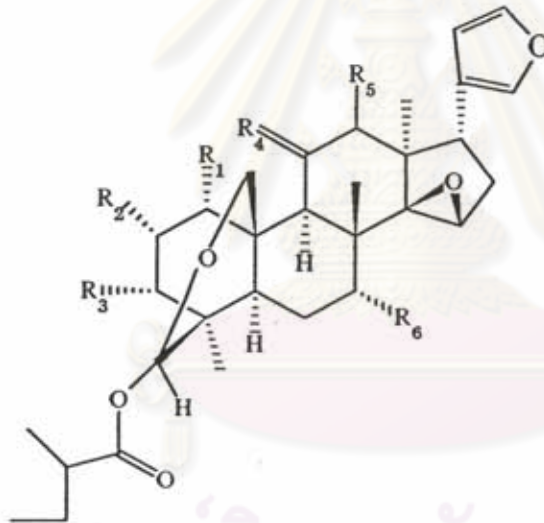


(248)



(249) $R = \text{CH}_3$

(250) $R = \text{CH}_2\text{OH}$



(251) $R_1, R_5, R_6 = \text{OH}; R_2, R_3 = \text{OAc}; R_4 = \text{O}$

(252) $R_1, R_6 = \text{OH}; R_2, R_3 = \text{OAc}; R_4 = \text{O}; R_5 = \text{H}, \alpha-$

(253) $R_1, R_6 = \text{OH}; R_2, R_3 = \text{OAc}; R_4 = \text{O}; R_5 = \text{O}$

(254) $R_1, R_6 = \text{OH}; R_2, R_3 = \text{OAc}; R_4 = \text{O}; R_5 = \text{H}, \text{H}$

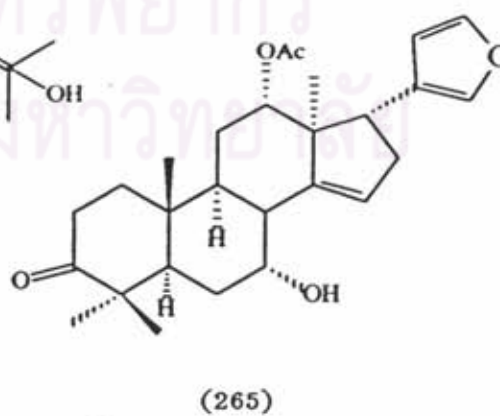
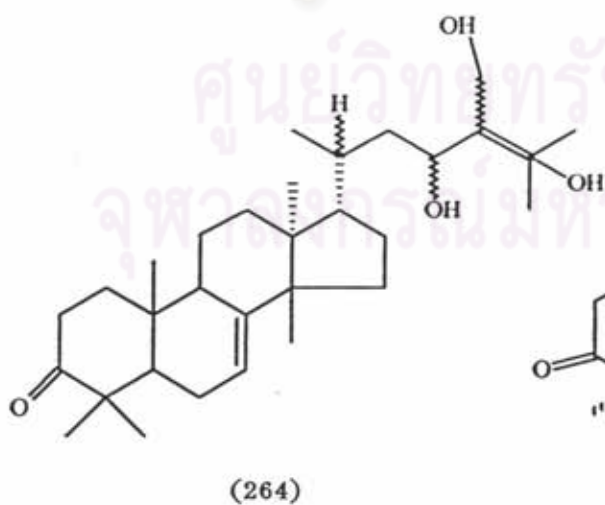
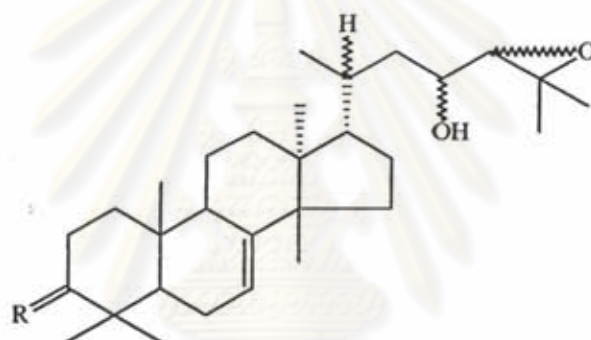
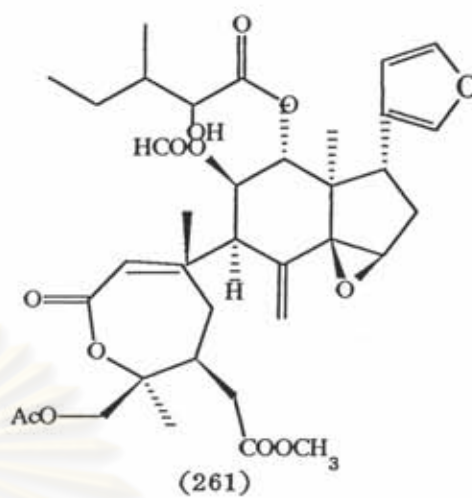
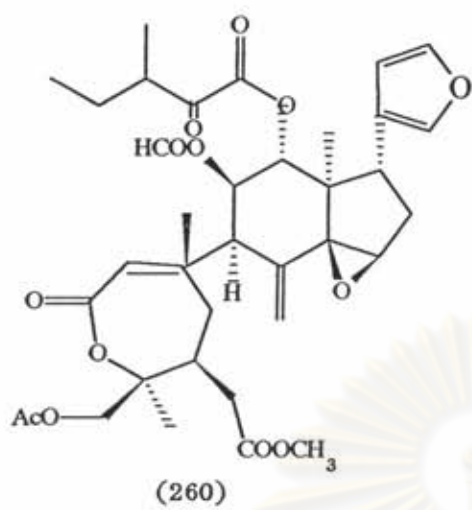
(255) $R_1, R_6 = \text{OH}; R_2 = \text{OAc}; R_3, R_4 = \text{O}; R_5 = \text{H}, \text{OH}$

(256) $R_1, R_2 = \text{OAc}; R_3, R_6 = \text{OH}; R_4 = \text{O}; R_5 = \text{H}, \text{OH}$

(257) $R_1, R_3 = \text{OAc}; R_2, R_6 = \text{OH}; R_4 = \text{O}; R_5 = \text{H}, \text{OH}$

(258) $R_1 = \text{OH}; R_2, R_3, R_6 = \text{OAc}; R_4 = \text{O}; R_5 = \text{H}, \text{OH}$

(259) $R_1, R_2, R_6 = \text{OH}; R_3 = \text{OAc}; R_4 = \text{O}; R_5 = \text{H}, \text{OH}$



2.3 Miscellaneous Chemical Constituents of the Meliaceous Plants

Several Meliaceous plants have been studied for their chemical constituents other than alkaloids and terpenoids. The results were summarized in Table 3



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Table3 Miscellaneous Constituents of the Meliaceae Plants

Plant Name	Part	Chemical Constituents	Category	References
<i>Aglaia edulis</i> A. Gray	leaf	Quercetin-3-O-rhamnoside (266)	Flavonoid-glycoside	Shumsub ,1996
<i>A. elliptifolia</i> Merr.	root & stem	Rocaglamide (267) Dehydrorocaglamide(268)	Benzofuran	King <i>et al.</i> ,1982
	stem bark	Rocaglamide (267) Aglafoline (269)	Benzofuran Benzofuran	King <i>et al.</i> ,1985 Ko <i>et al.</i> , 1992
<i>A. ferruginea</i> C.T. White & Francis	bark	Ferrugin (270)	Isoflavan	Dean <i>et al.</i> ,1993
<i>A. odorata</i> Lour.	twig	Rocaglamide (267)	Benzofuran	Janprasert <i>et al.</i> , 1993
	leaf	Rocaglamide (267) Desmethylocaglamide (271) Methylocaglate (269) Rocaglaol (272)	Benzofuran	Ishibashi <i>et al.</i> , 1993
<i>A. oligophylla</i> Miq.	twig	Rocaglamide (267) Desmethylocaglamide (271)	Benzofuran	Hwunseng,Wiriyachitra and Sukumalnand ,1995
<i>A. pirifera</i> Hance	stem bark	Grandisin (273)	Lignan	Ngowgarmratana and Saifah ,1987

Table 3 (continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>A. pyramidata</i> Hance	leaf	<i>N</i> -methyl- <i>trans</i> -4-hydroxy-L-proline (274)	Amino acid	Saifah and Puripattanavong, 1992
<i>A. roxburghiana</i> Hance	leaf & fruit	Roxburghadiol A (35) Roxburghadiol B (36)	Steroid	Balakrishna and Kundu, 1990
<i>Amoora rohituka</i> Wall.	stem bark	Poriferasterol 3- <i>o</i> - α -L-rhamno-pyranoside(275)	Saponinglycoside	Agnihotri, 1987
<i>Azadirachta indica</i> A. Juss.	leaf	8-Prenyl-5,7-dihydroxy-3'(3-hydroxy-3,3-dimethyl-butyl)-4'methoxy flavanone(276)	Flavanone	Balasubramanian and Mohan, 1993
		8,3'-Diisoprenyl-5,7-dihydroxy-4-methoxy-flavanone (277)	Flavanone	
		<i>p</i> -Hydroxyacetophenone (278)	Phenol	
<i>Dysoxylum lenticellare</i> Gilles	stem			Aladesanmi, 1988
<i>D. richii</i> (Gray) C.DC.	leaf	Dysoxysulfone (279)	Sulfur	Jogia <i>et al.</i> , 1989
<i>Ekeberghia senegalensis</i> A. Juss.		8-Methoxy-4-methyl-coumarin (280)	Coumarin	Bevan and Ekong, 1965
<i>Entandrophragma cylindricum</i> Spargue	wood	Ergosta-5,24(28)-diene-7 α -methoxy-3 β -ol-3 β -ol (281)	Steroid	Ngnoam <i>et al.</i> , 1994
<i>E. utile</i> Spargue	stem bark	3 β ,7 α ,20 β -Trihydroxyergosta-5,24	Steroid	Tchouankeu <i>et al.</i> , 1992

Table 3 (continued)

Plant Name	Part	Chemical Constituents	Category	References
<i>Khaya anthotheca</i> (Welw.) C. DC.	heart wood	(24')diene (282) Anthothecal (155)	Diosphenol	Bevan, Powell and Taylor ,1963
<i>K. grandifoliola</i> C. DC.	seed	Grandifoliolin (156)	Chromone	Adesogan and Taylor ,1967
<i>Lansium mallayanum</i> Bedd.	bark	Lansisterone E (283) Lansisterone Z (284) Lansisterol A (285)	Steroid Steroid Steroid	Purushothaman, Sarada and Saraswathy, 1987a
<i>Melia azedarach</i> Linn.	stem bark	4,5-Dihydroxyflavone-7-o- α -L-rhamnopyranosyl-(1-4)- β -D-glucopyranoside(286)	Flavoneglycoside	Mishra and Srivastava ,1984
	stem bark	1,8-Dihydroxy-2-methyl-anthraquinone-3-o- α -L-rhamnopyranoside (287)	Anthraquinone glycoside	Srivastava and Mishra ,1985
	root	1,5-Dihydroxy-8-methoxy-2-methyl-anthraquinone-3-o- α -L-rhamnopyranoside(288) Apigenin-5-o- β -D-galactopyranoside(289)	Anthraquinone glycoside Flavonol-glycoside	Gupta and Srivastava ,1985

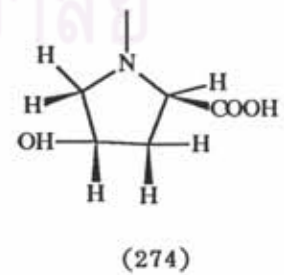
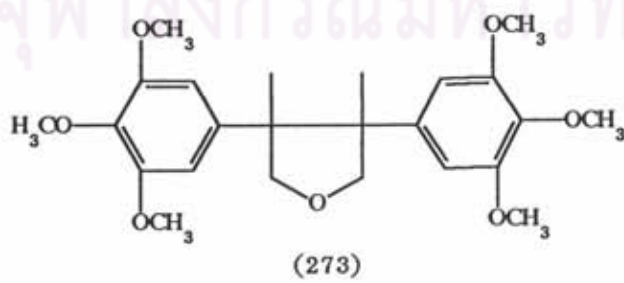
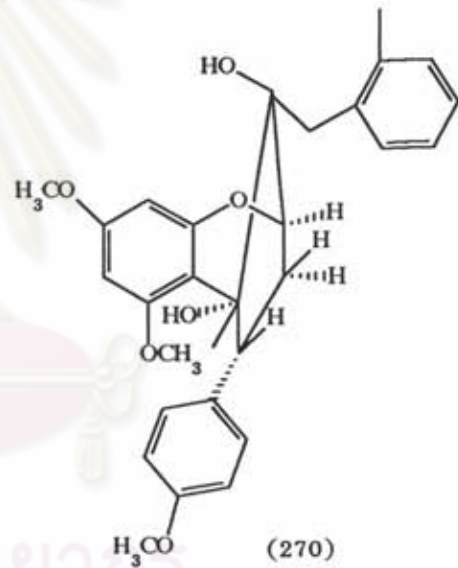
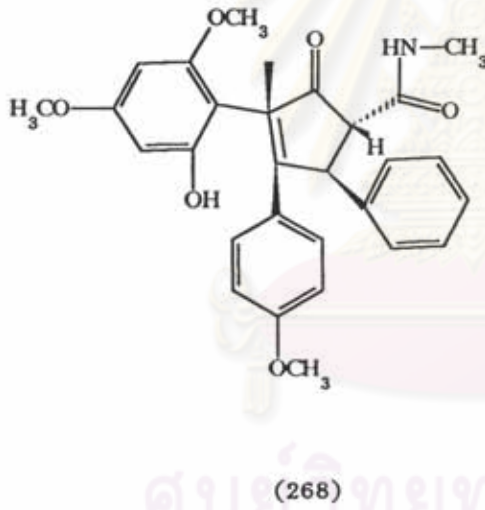
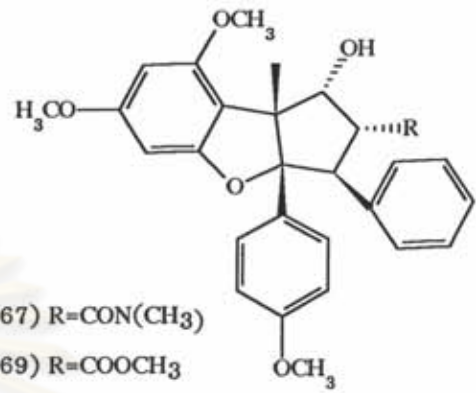
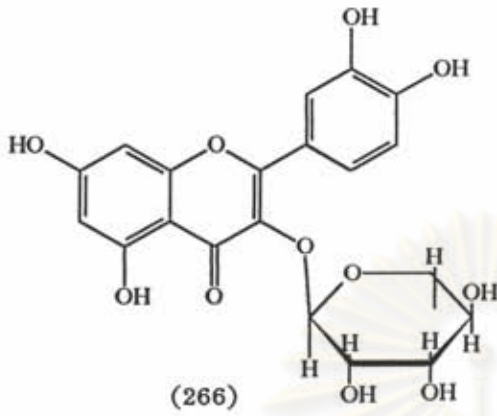
Table 3 (continued)

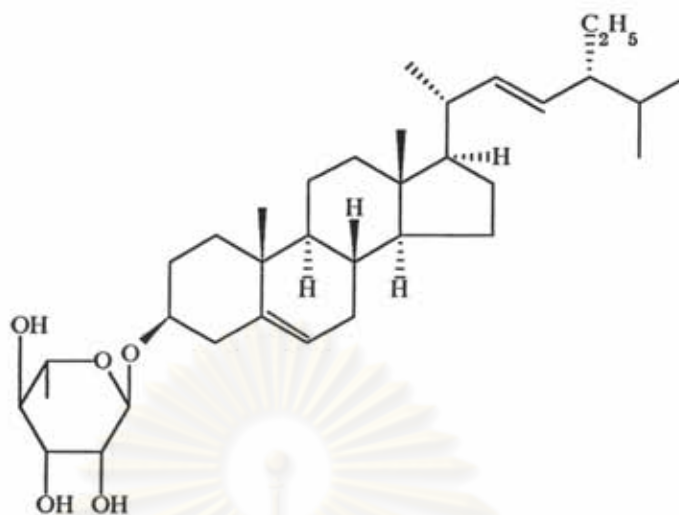
Plant Name	Part	Chemical Constituents	Category	References	
<i>M. azedarach</i> Linn. var. <i>japonica</i> Makino <i>M. toosendan</i> Sieb. & Zucc. <i>Ptaeroxylon obliquum</i> Radlk. <i>P. obliquum</i> (Thunb.)Radlk.	leaf	Rutin (290)	Flavonol-glycoside	Marco, Sanz and Sanchez Paraseda, 1986 Nakatani, Takoa and Miura 1985	
	root bark	Kaempferol-3-o- β -rutinoside(291) Azedarachtol (292)	Steroid		
	leaf	Toosendanoside (293)	Steroid glycoside		
	<i>Ptaeroxylon obliquum</i> Radlk.	heart wood	Nieshoutol (294)	Coumarin	Murray and Ballantyne,1969
	<i>P. obliquum</i> (Thunb.)Radlk.	leaf & twig	Methylalloptaeroxylin(295)	Chromone	McCabe, McCrindle and Murry ,1967
		timber	Karenin (296)	Chromone	
			Desoxykarenin (297)	Chromone	
		timber	Heteropeucenin-7-methyl ether (298)	Chromone	
			Ptaeroxylin (299)	Chromone	
	<i>Sandoricum indicum</i> Cav.	fruihull	Alloptaeroxylin (300)	Chromone	Dean and Taylor ,1966
Obliquin (301)			Chromone		
Mesoinositol (302)			Sugar derivative		
Mucic acid (303)			Acid		

Table 3 (continued)

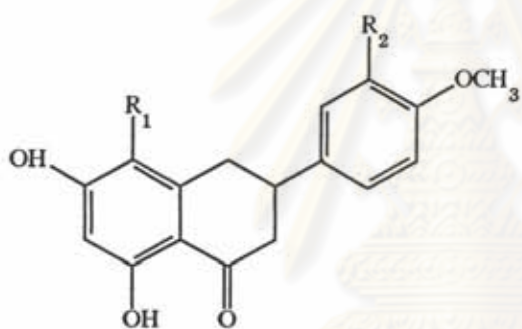
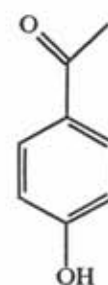
Plant Name	Part	Chemical Constituents	Category	References
<i>Swietenia mahogani</i> Jacq.	wood	α -Hexyl-3-(6-hydroxy-2,4-octadienyl)oxiranemerthanol (304)	Polyacetylene	Wakabayashi, Spencer and Water ,1991
<i>Trichilia schomburgkii</i> C. DC.	root & leaf	2 β ,3 β ,4 β -Trihydroxypregnan-16-one (305)	Steroid	Ketwaru <i>et al.</i> ,1993
<i>Turrea nilotica</i> Kotschy&Peyr.	leaf	Lariciresinol-4'-mono-methyl ether (306)	Lignan	Ayoub and Kingston ,1984a
		Lariciresinol diacetate ether (307)	Lignan	
		Lariciresinol dimethyl ether (308)	Lignan	
<i>T. vilosa</i> (Benn.)	aerial parts	Villosterol (309)	Steroid	Chiplunkar <i>et al.</i> , 1993

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

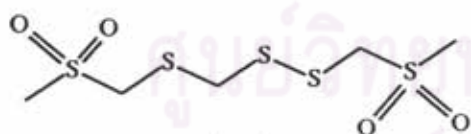




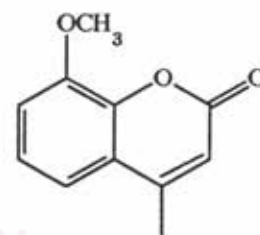
(275)

(276) R_1 =prenyl; R_2 = $\text{CH}_2\text{CH}_2\text{C}(\text{OH})(\text{CH}_3)_2$ (277) R_1, R_2 =prenyl

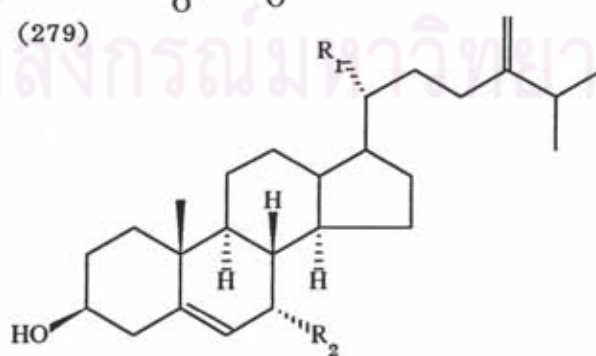
(278)

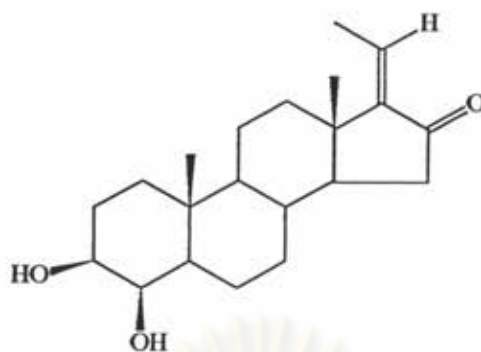


(279)

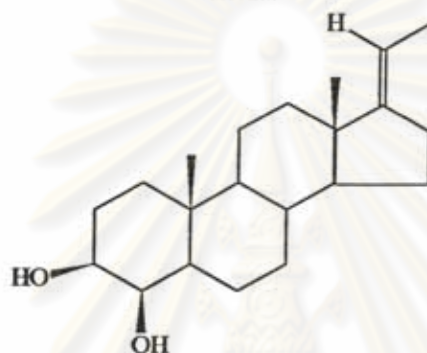


(280)

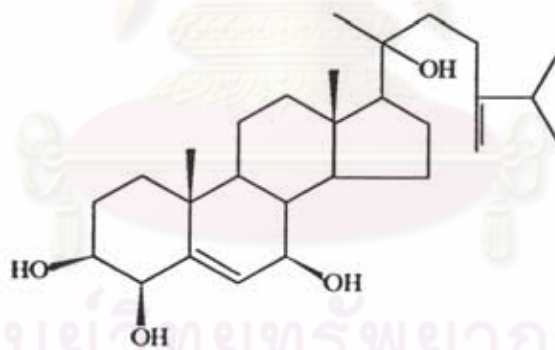
(281) R_1 =H, CH_3 ; R_2 = OCH_3 (282) R_1 =H, OH; R_2 =OH



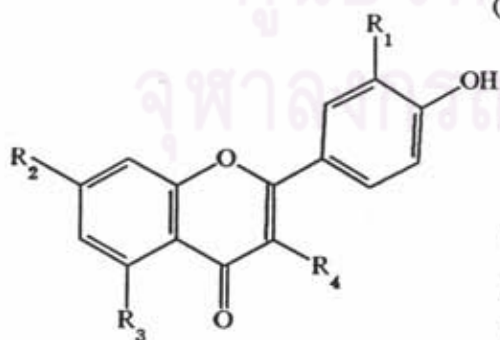
(283)

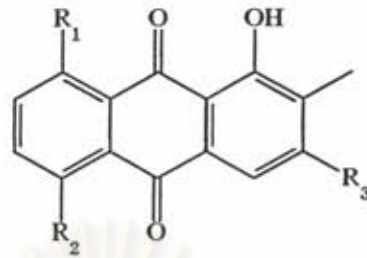


(284)



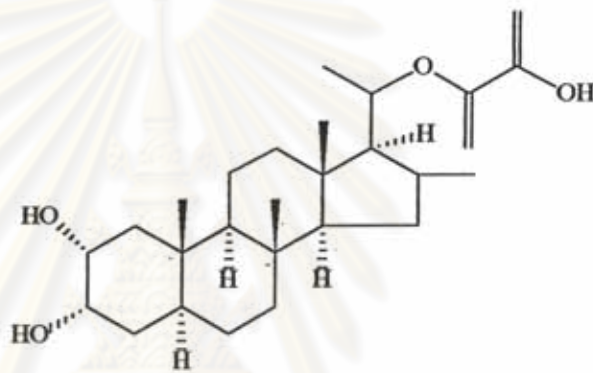
(285)

(286) $R_1, R_4 = H$; $R = O-\alpha-L\text{-rhamnopyranosyl-}$ (1-4)- β -D-glucopyranoside; $R_3 = OH$ (289) $R_1, R_4 = H$; $R_2 = OH$; $R_3 = O-D\text{-galactose}$ (290) $R_1, R_2, R_3 = OH$; $R_4 = O\text{-rutinose}$ (291) $R_1 = H$; $R_2, R_3 = OH$; $R_4 = O\text{-rutinose}$

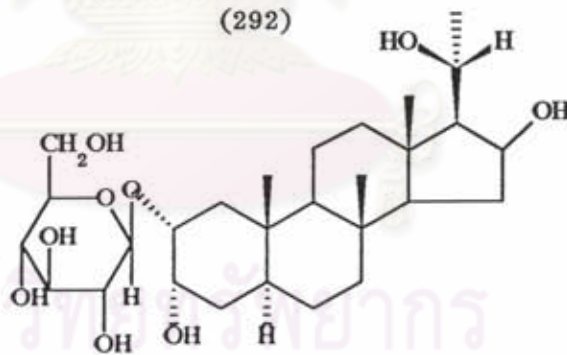


(287) R₁=OH; R₂=H; R₃=O-D-galactose

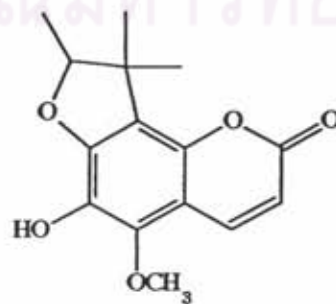
(288) R₁=OCH₃; R₂=OH; R₃=O-L-rhamnose



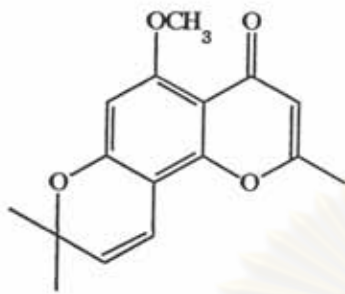
(292)



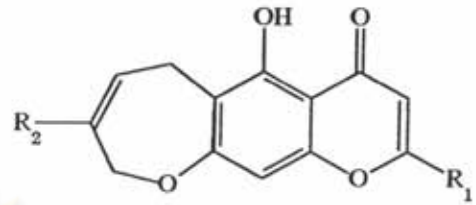
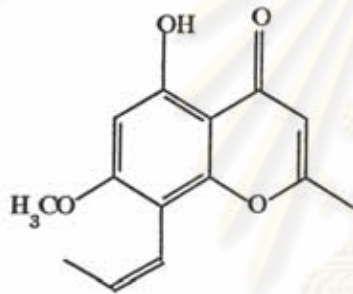
(293)



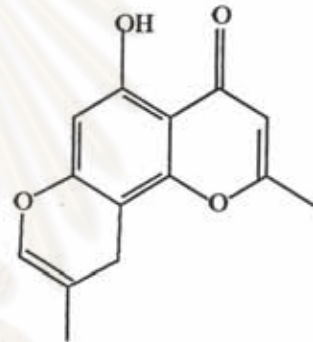
(294)



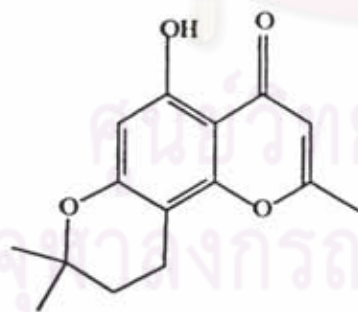
(295)

(296) $R_1=R_2=CH_3$ (297) $R_1=CH_2OH, R_2=CH_3$ 

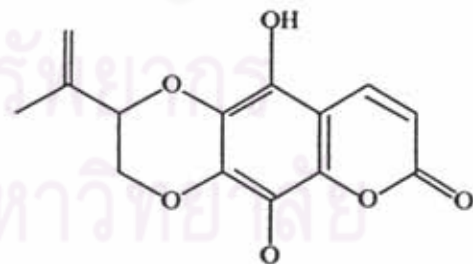
(298)



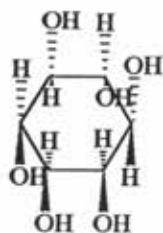
(299)



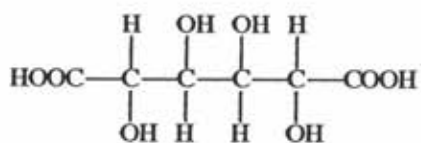
(300)



(301)



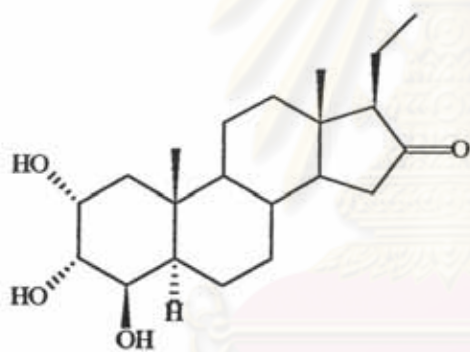
(302)



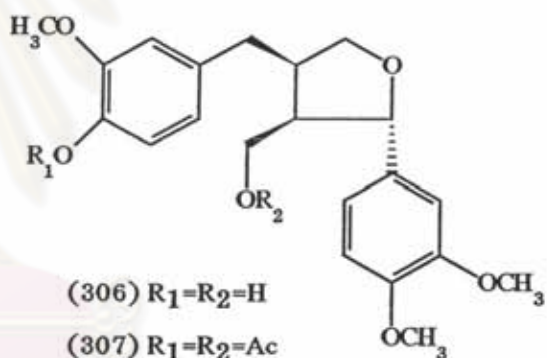
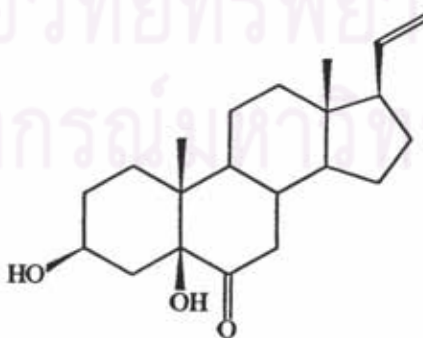
(303)



(304)



(305)

(306) $R_1=R_2=H$ (307) $R_1=R_2=Ac$ (308) $R_1=CH_3, R_2=H$ 

(309)

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Medicinal Uses and Toxicity of the Meliaceous Plants

Volkonsky (1937) studied the leaves of *Melia azedarach* Linn. for insecticidal effect based on the observation that some types of insects never touched the leaves of this plant. Other plants sprinkled with extract of *Melia* leaves were equally protected against locust.

Carratala (1939) reported the death of 3 year-old child some days after eating the fruits of *Melia azedarach* Linn. An aqueous extract of the fruits when injected into the rabbit (1ml sc.) produced dyspnea, tremor, convulsion and death on following day. When given by mouth, the extract also produced gastrointestinal symptoms.

Guaevara (1940) studied the fruits of *Lansium domesticum* Corr. and found that the peel of the fruit contained a resin which checked diarrhoea and relieved intestinal spasm.

Sinha and Gulati (1963) studied the seed cake of *Azadirachta indica* A. Juss. and found that the alcoholic extract of seed cake left after the oil expression shown repellent action against migratory locust where as the marc was inactive.

Two years later, Bernt (1965) reported the use of margosa oil from *Azadirachta indica* A Juss. in dermatological preparations in Indian pharmacy.

Several species of *Dysoxylum* were reported to be used as medicinal plants in many Asian countries. In the Malay Peninsula, a poultice of fruits of *D. cauliflorum* Hiem was used to treat rheumatism, and a plaster of the boiled roots was applied to treat abdominal pain. In Indo-China, the essential oil of *D. loureiroi* Pierre (*Epicharis loureiri* Pierre) was used in native medicine. In Indonesia, the nauseous juice of the bark of *D. gaudichaudianum* (A. Juss.) Miq. was used internally as emetic and externally as astringent (Perry, 1980).

Pharmacological Activities of Extracts and Active Constituents of Meliaceous Plants

Several reports on pharmacological activities of the extracts and active constituents of the Meliaceous plants were summerized in Table 4



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Table 4 Pharmacological Activities of Extracts and/or Active Constituents of Meliaceouse Plants

Plant Name	Part	Extracts/Chemical Constituents	Pharmacological activity	Refferences
<i>Aglaia argentea</i> Blume	leaf	Argenteanone A (25) Argenteanone B (26)	Cytotoxic	Omobuwajo <i>et al.</i> ,1995
<i>A. elliptifolia</i> Merrill	root & stem	Rocaglamide (267)	Antileukemic	King <i>et al.</i> , 1982
	stembark	Dehydrorocaglamide (268)		
	stembark	Aglafoline (269)	Platelet activating factor antagonist	Ko <i>et al.</i> ,1992
<i>A. formosana</i> (Hayata)Hayata	leaf	Dehydroodorin (6)	Anticancer	Duh <i>et al.</i> , 1993
<i>A. odorata</i> Lour.	leaf & twig	(-)-Odorinol (2)	Antileukemic	Hayashi <i>et al.</i> ,1982
	twig	Rocaglamide (267)	Insecticidal	
<i>A. odoratissima</i> Blume	plant exudate	-	Anticancer	Dhar <i>et al.</i> , 1973
	leaf	Rocaglamide (267) Methylrocaglate (269)	Insecticidal	Ishibashi <i>et al.</i> ,1993
<i>A. oligophylla</i> Miq.	twig	Rocaglamide (267)	Insecticidal	Hwunseng, Wiriyaচিত্রা and Sukumalnand, 1995
		Desmethylocaglamide(271)		
<i>A. pirifera</i> Hance	leaf	Piriferine (8)	Enhancing the anticancer activity of vinblastine	Saifah <i>et al.</i> ,1993

Table4 (continued)

Plant Name	Part	Extracts/Chemical Constituents	Pharmacological activity	References
<i>A. roxburghiana</i> Miq. var. Beddomei	ethanolic extract leaf	- (+)-Odorine (1) (+)-Odorinol (2)	Anticancer Anticancer	Vishinoi <i>et al.</i> ,1988 Joshi <i>et al.</i> , 1986
<i>Amoora wallichii</i> King	stem	-	Anthelmintic Anticancer Anticancer	Dhar <i>et al.</i> ,1968
<i>Aphanamixis grandifolia</i> Blume	fruit peel	Aphanamol I (42) Aphanamol II (43)	Toxic principle	Nishizawa <i>et al.</i> ,1984
<i>Azadirachta indica</i> A. Juss.	fruit oil	Azadirachtin (48) Salannin (49) 6-O-Acetylnimbandiol (51)	Insecticidal	Kubo, Matsumoto and Matsumoto, 1986
	bark	Nimbionone (54) Nimbionol (55)	Antibacterial	Siddiqui <i>et al.</i> , 1988
<i>Chisocheton paniculatus</i> Hiern	fruit	1,2-Dihydro-6 α -acetoxyazadirone (91)	Antifungal	Bordoloi <i>et al.</i> ,1993

Table4 (continued)

Plant Name	Part	Extracts/Chemical Constituents	Pharmacological activity	References
<i>Dysoxylum acutangulum</i> Miq.	seed	(+)-8-Hydroxycalamenene(97)	Antibacterial	Nishizawa <i>et al.</i> ,1983
<i>D. alliaceum</i> Blume	-	(+)-8-Hydroxycalamenene (97)	Antibacterial	
<i>D. binectiferum</i> Hook. f.	plant exudate fruit	- Dysobinin (99)	CNS effect CNS-depressant mild anti-inflammatory	Dhar <i>et al.</i> , 1973 Singh, Garg and Khanna, 1976
	leaf , trunk& rootbark	Rohitukine (10)	Analgesic Anti-inflammatory Immuno-modulatory Anticancer	Vasudev <i>et al.</i> ,1985 de Souza ,1993
<i>D. cyrtobotryum</i> Miq.	leaf	Rohitukine (10)	Anti-inflammatory Muscle relaxant Cardiovascular	Jermviwakul ,1993 Sangamnadech,1991 Lermanon ,1991

Table 4 (continued)

Plant Name	Part	Extracts/Chemical Constituents	Pharmacological activity	References
<i>D. lenticellare</i> Gillespie	leaf	Dysoxylin (11) S-(+)-homoaudanosine (12) 3-Epi-12-hydroxy schelhammericine (17)	Bronchodilator Inhibit contraction of renal and coronary artery effect Cardiac effect	Chanleur, 1993 Dulchuprapha ,1994 Aladesanmi and Ilesanmi, 1987
<i>D. richii</i> (Gray) C. DC.	leaf	Dysoxysulfone (279)	Antibacterial	Jogia <i>et al.</i> , 1989
<i>D. roseum</i> C. DC.	leaf	Dysorone E (127)	Anticancer	Adesanya,Pais,Sevanet, 1991
<i>Entandrophragma angolense</i> (Welw.) C. DC.	stembark	Methyl angolensate (80)	Antiulcer	Njar, Adesanwo and Raji , 1995
<i>Lansium domesticum</i> Corr.	seed	Dukunolide A (167) Dukunolide B (168) Dukunolide C (169) Dukunolide D (172)	Bitter principle	Nishizawa <i>et al.</i> ,1985a, 1985b,1988

Table 4 (continued)

Plant Name	Part	Extracts/Chemical Constituents	Pharmacological activity	References
<i>Melia azedarach</i> Linn.	stem bark	Dukunolide E (170) Dukunolide F (171) -	Anticancer Spasmogenic	Bhakuni <i>et al.</i> , 1969
	fruit	Azadirachtin (48)	Insecticidal	Morgan and Thornton, 1973
	-	Sendanin (178)	Anticancer	Pettit <i>et al.</i> , 1983
	seed oil	-	Antifeedant	Hu, Yang and Chen, 1983
	root bark	Azedarachtin C (182)	Antifeedant	Huang <i>et al.</i> , 1995
	root bark	1-Cinnamoyl-3-hydroxy-11-methoxy-meliacarpinin (188)	Cytotoxic	Takeya <i>et al.</i> , 1996
	root	6-Acetoxy-7 α -hydroxy-3-oxo-14 β ,15 β -epoxy-meliac-1,5-diene (179)	Antibacterial	Srivastava and Gupta, 1985
	fruit	6-Acetoxy-3 β -hydroxy-7-oxo-14 β ,15 β -epoxymeliac-1,5-diene-3-O- β -D-glucuronopyranoside (180) 1-Cinnamoylmelianolone (177)	Insecticidal	Lee, Klock and Balandrin,

Table 4 (continued)

Plant Name	Part	Extracts/Chemical Constituents	Pharmacological activity	References
<i>M. azedarach</i> Linn. var. <i>japonica</i> Makino	root bark	Azedarachol (292)	Antifeedant	1987 Nakatani, Takoa and Miura, 1985
	stem bark	12-Hydroxyamoorastatone (199) 12-Hydroxyamoorastatin(200) 12-Acetoxyamoorastatin(201)		Ahn, Choi and Lee 1994
<i>M. volkeinsii</i> Giirke	fruit	Salannin (49) Volkensin (207)	Antifeedant Antifeedant	Rajab and Bentley, 1988
	root bark	Meliavolen (212) Melianinone (213)	Anticancer Anticancer	
<i>Ptaeroxylon obliquum</i> (Thumb.) Radlk.	leaf&twig	Methylalloptaeroxylin(295)	Antihypertensive	Langenhoven <i>et al.</i> , 1989
<i>Swietenia mahogani</i> Jacq.	seed	Swietemahonin A (222) Swietemahonin D (223) Swietemahonin E (224) Swietemahonin G (225)	Pletelet-aggregation inhibitor	Ekimoto <i>et al.</i> , 1991
<i>Sandoricum koetjape</i> Merr.	stem	3-Oxo-olean-12-en-29-oic acid	Cytotoxic	Kaneda <i>et al.</i> , 1992

Table 4 (continued)

Plant Name	Part	Extracts/Chemical Constituents	Pharmacological activity	References
<i>Turrea nilotica</i> Kotschy & Peyr. <i>Trichilia roka</i> P. Br.	leaf	(217) Lariciresinol-4-mono-methyl ether (306)	Anticancer	Ayoub and Kingston., 1984b
	root bark	Trichilin A (251)	Antifeedant	Nakatani, Jame and Nakanishi ,1981
	fresh fruit	Sendanin (170)	Antifeedant	Kubo and Klocke, 1982
	root bark	7-Acetyltrichilin A (258)	Antifeedant	Nakatani <i>et al.</i> ,1985
	root bark	Trichilin F (256)	Antifeedant	Nakatani and Nakanishi,1993

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย