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SALVIA GENUS AND TRITERPENOIDS

Shyamal K. Jash [1], Dilip Gorai [2] and Rajiv Roy [*3]

Department of Chemistry [1], Saldiha College, Saldiha, Bankura - 722173, West Bengal, India.
Department of Chemistry [2], Bolpur College, Bolpur, Birbhum - 731204, West Bengal, India.
Independent Researcher [3], Bhatgonna (Dignagar), Burdwan - 713128, West Bengal, India.

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Correspondence to Author:
Rajiv Roy

Independent researcher, Ph.D, Bhatgonna (Dignagar), Burdwan-713128, West Bengal, India.

Email: royrajiv35@gmail.com

ABSTRACT: *Salvia* L., is one of the largest genera from Lamiaceae (Labiatae) family which comprises 900 species and is widely distributed in various regions of the world like in America, Europe, Asia. In this review article, the triterpenoid constituents were investigated from all of the *Salvia* plants to date are reported. About 214 triterpenoids of different classes were isolated and characterized from 113 species of *salvia* genus. So far the *Salvia* plants were investigated for their diterpenoids, phenolics and monoterpenes (volatile oils), especially for diterpenoids rather than for their triterpenoid constituents. However, during the isolation procedures of *Salvia* plant extracts, ursolic and oleanolic acids are common triterpenoid with other constituents isolated. *Salvia,* in Latin named "salvare", which means "to heal" so by name its medicinal importance was understand, since from ancient times different salvia species were used to cure more than sixty different ailments ranging from aches to epilepsy, and mainly to treat colds, bronchitis, tuberculosis, hemorrhage, and menstrual disorders. *Salvia* L., is one of the largest genera from Lamiaceae (Labiatae) family which comprises 900 species and is widely distributed in various regions of the world like in America, Europe, Asia.

INTRODUCTION: *Salvia* L., is one of the largest genera from Lamiaceae (Labiatae) family which comprises 900 species and is widely distributed in various regions of the world like in America, Europe, Asia. The plants are typically 30-150 cm tall, herbaceous or suffruticose, and perennial, rarely biennial, or annual, with attractive flowers in various colors.

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In this review article, the triterpenoid constituents were investigated from all of the *Salvia* plants to date are reported. About 214 triterpenoids of different classes were isolated and characterized from 113 species of *salvia* genus. So far the *Salvia* plants were investigated for their diterpenoids, phenolics and monoterpenes (volatile oils), especially for diterpenoids rather than for their triterpenoid constituents. However, during the isolation procedures of *Salvia* plant extracts, ursolic and oleanolic acids are common triterpenoid with other constituents isolated. This review is an effort to attract natural product chemist to give their contribution on isolation of triterpenoid's from *Salvia* genus [1-158].

MATERIALS AND METHODS:

The triterpenoids isolated and identified from *Salvia* genus, were searched across the Medline (National Library of Medicine) and Science Direct databases, Pubmed, ACS, Pols-one, Wiley chem. abstract, Springer link, RSC, Google and Google Scholar. The data were updated in June 2016, using the search terms Salvia triterpenoid, triterpenoid from *Salvia* genus, triterpenoid, phytochemical, chemical constituents, from *Salvia* as keywords. In addition, the reference lists of all papers identified were thoroughly reviewed.

RESULTS AND DISCUSSION:

List of triterpenoid(s) & their Structure(s) from salvia species: This review article compiled almost 214 triterpenoids from 113 species of *salvia* which are listed in **Table 1** and **Table 2**, with their structure in **Fig.1**.

TABLE 1: LIST OF TRITERPENOIDS

Ursane triterpenoid(s)	Ref. (s)
11-oxo-α-amyrin (1)	1-3
11α-hydroxy-3-oxo-17,22-secours-12,17(28)-diene-22-oic acid (urmiensic acid) (2)	4
11α-hydroxyurs-12-en-3-one (3)	5-7
11α-methoxyurs-12-ene-1β,3β -diol (4)	8
11α-methoxyurs-12-ene-1β,3β,15α-triol (5)	8
11α-methoxyurs-12-ene-1β,3β,28-triol (6)	8
11β-hydroxy-3-oxo-urs-12-en-28-oic acid (7)	5, 7
13β,28-epoxyurs-12-ene-1β,3β-diol (8)	8
1β,2α,3β,11α-tetrahydroxyurs-12-ene (9)	9, 10
1β,2α-dihydroxy-3β-acetoxy-11-oxours-12-ene (10)	9, 10
1β,2α-dihydroxy-3β-acetoxyurs-9(11)-12-diene (11)	9, 10
1β,3α,11α -trihydroxy-urs-12-ene (12)	9, 10
1β,3β,11α-trihydroxyurs-12-ene (13)	4
1β,3β,15α-trihydroxy-11α-methoxyurs-12-en-28-al (14)	8
1β,3β,15α-trihydroxyurs-12-en-28-al (15)	8
23-(trans-p-coumaroyloxy)-3β,6α,30-trihydroxyurs-12-en-28-oic acid (16)	11
2α,20β-dihydroxy-3β-acetoxyurs-9(11)-12-diene (17)	9, 10
2α,3α,19-trihydroxyurs-12-en-28-oic acid (18)	6, 12-14
2α,3α,19-trihydroxyurs-12-en-28-oic acid ester glucoside (19)	6
2α,3α,19α,23-tetrahydoxyurs-12- en-28-oic acid ester glucoside (20)	6
2α,3α,23-trihydroxyurs-12-en-28- oic acid (21)	6, 12, 14
2α,3α,24-trihydroxyurs-12en-28-oic acid (22)	13, 15
2α,3α-dihydroxymethyl ursolate (23)	13
2α,3α-dihydroxyurs-12en-28-oic acid (24)	6, 12-14
2α,3β, 23-trihydroxymethyl ursolate (25)	13
2α,3β,11α-trihydroxy-urs-12-ene (26)	9, 10
2α,3β,19-trihydroxy-24-oxo-urs-12- en-28-oic acid ester glucoside (27)	6
2α,3β,19-trihydroxyurs-12-en-28- oic acid (28)	6, 12-14
2α,3β,20β,23-tetrahydroxyurs-12,19-(29)-dien-28-oic acid (29)	16
2α,3β,24-trihydroxyurs-12-en-28- oic acid (30)	6, 12-14
2α,3β-dihydroxy-12-ene-urs-28 oic acid (31)	17
2α,3β-dihydroxymethyl ursolate (32)	13
2α-acetoxy-urs-5,12-diene-3β,11α-diol (33)	9, 10
2α-hydroxy ursolic acid (34)	18-23
2α-hydroxy-3β-methoxyurs-12-en-28-oic acid (35)	12, 14
3,11-dioxo-urs-12-ene (36)	5, 7
3-*epi*-ursolic acid (37)	24, 25
3-*epi*-uvaol (38)	26, 27
3-keto-13(28)-epoxy-urs-11-ene (39)	5, 7

3-oxo-11α-hydroxy-17,22-seco-urs-12-en-22,17-lactone (urmiensolide B) (40)	4
3-oxo-1β,11α,20-trihydroxyursolic acid (41)	28
3-oxo-urs-12-en-28-oic acid , ursonic acid (42)	12, 14, 24, 29
3-oxo-urs-12-ene (43)	6
3-oxo-urs-12-ene-lβ,11α-diol (44)	30
3-oxo-ursolic acid methyl ester (45)	31
3α-acetoxy-urs-12-ene-1β,11α-diol (46)	9, 10
3α-hydroxy-13(28)-epoxy-urs-11-ene (47)	5, 7
3α-hydroxy-2α-methoxyurs-12-en-28-oic acid (48)	12, 14
3β,11α-dihydroxy-urs-12-ene (49)	4, 23
3β,28-dihydroxyurs-12-ene (50)	6, 32
3β,6α,23-trihydroxyurs-12,19(29)-dien-28-oic acid (51)	11
3β-acetoxy-28-oxo-urs-12-ene (52)	32
3β-acetoxy-2α,11α-dihydroxyurs-12-ene (53)	9, 10, 30
3β-acetoxy-urs-12-ene-1β,2α, 11α-triol (54)	9, 10, 33
3β-acetoxy-urs-12-ene-1β,2α,11α,20β-tetraol (55)	33
3β-acetoxy-urs-12-ene-2α,11α-diol (56)	33
3β-acetoxy-urs-l2-ene-2α,11α,20β-triol (57)	33
3β-acetylursolic acid (58)	32
3β-hydroxy methyl ursolate (59)	13
3β-hydroxy-2α-methoxyurs-12-en- 28-oic acid (60)	12, 14
Dehydrouvaol (61)	17
Micromeric acid (62)	17, 34-36
Salvistamineol (63)	9, 10, 37
Santolinoic acid (64)	38
Tormentic acid (65)	19, 39-41
Urs-12-ene-1β,3β,11α,15α-tetraol (66)	8
Urs-12-ene-1β,3β,15α,28-tetraol (67)	8
Urs-12-ene-3α,11α-diol (68)	23
Urs-12-ene-3β,7β,15α,28-tetraol (69)	8
Urs-9(11),12-dien-3-one (70)	5, 7
Urs-9(11),12-dien-3β-ol (71)	5, 7
Urs-9(11),12-dien-3β-yl acetate , α-amiradienyl acetate (72)	17, 39-41
Ursol-28-oic acid methyl ester (ursolic acid methyl ester) (73)	1- 3, 42, 59
Ursolic acid (74)	1- 2, 5- 7, 17, 12, 14, 15, 21, 22, 25-27, 31-36, 39, 40-101, 102-109, 110
Uvaol (75)	17, 24, 43-49, 63, 71, 81, 82, 94-96, 111, 112, 110
α-amyrin (76)	2, 6, 3, 17, 24, 29, 32, 52, 60, 66, 68, 69, 72- 74, 90, 91, 94-98, 113-116
3α-acetyl-amyrin (77)	1-3, 113, 114, 117
3α-acetylamyrin-28-al (78)	118
Amyrin-3-one (79)	79
A-amyrin 28-al (80)	97, 98
Coleonolic acid (81)	18, 20
Euscaphic acid (82)	18, 20, 119
Pomolic acid (83)	17
3β-hydroxy-11α-methoxy-17,22-seco-17(28),12-ursadien-22-oic (84)	120
1β,3β,11α-trihydroxy-17,22-seco-17(28),12-ursadien-22-oic acid (85)	120
1β,3β-dihydroxy-11α-methoxy-17,22-seco-17(28),12-ursadien-22-oic acid (86)	120
Urmiensolide (87)	121
2α,3β,5α-trihydroxyurs-12-en-28-oic acid (salvin A) (88)	122
Olean triterpenoid(s)	
11-oxo-β-amyrin (89)	1-3
11α-hydroxy-β-amyrin (90)	1-3, 23
1β,11α-dihydroxyolean-18-en-3-one (91)	28
1β,2α,3β,11α-tetrahydroxy-olean-12-ene (92)	9, 10
1β,2α-dihydroxy-3β-acetoxy-olean-9(11),12-diene (93)	9, 10
1β,3β-dihydroxy-olean-9(11),12-dienyl (94)	123
23-hydroxygermanicone (95)	124

24-nor-2α,3β-dihydroxyolean-4(23),12-ene (96)	24
28-acetylerythrodiol (97)	1-3, 125
2α,3α,23-trihydroxymethyl oleanolate (98)	13
2α,3α,23-trihydroxyolean-12-en-28-oic acid (99)	6, 12, 14, 23, 39, 40, 41
2α,3α,24-trihydroxymethyl oleanolate (100)	13
2α,3α-dihydroxy-24-nor-4(23),12-oleanadien- 28-oic acid (101)	22
2α,3α-dihydroxyolean-12-en-28 oic acid (102)	12, 14, 23, 43-49, 63, 71, 81, 82, 99, 111, 126
2α,3β,24-trihydroxyolean-12-en-28- oic acid (103)	6, 12, 14
2α,3β-dihydroxymethyl oleanolate (104)	13
2α,3β-dihydroxyolean-12-en-28-oic acid (maslinic acid, crataegolic acid) (105)	6, 11,12, 14, 17,19, 21-23, 28, 35, 39, 63, 71, 40, 41, 43-49, 53, 79, 81, 82, 85, 86, 89, 94-99, 111
2α-hydroxy-3-oxo-olean-12-en-28- oic acid (106)	12, 14, 17, 23, 43-49, 63, 71, 81, 82, 111
2β,3β,18-trihydroxyolean-12-en 28-oic acid (107)	94-96
2β,3β-dihydroxyolean-5,12-dien 28-oic acid (108)	94-96
3-acetylerythrodiol (109)	125
3-acetyloleanolic acid (110)	68, 72, 97, 98, 110, 127
3-acetylvergatic acid (111)	60
3-*epi*-maslinic acid (112)	35, 39-41
3-*O*-acetyl oleanolic aldehyde (113)	13, 32, 53, 85, 86, 125
3-oxo-oleanolic acid (114)	60, 90, 128
3α,24-dihydroxyolean-12-en-28,30-dioic acid (115)	25
3α,24-dihydroxyolean-12-en-28-oic acid (116)	25
3α,6α,24-trihydroxyolean-12-en-28-oic acid (salvin B) (117)	122
3α-acetyl-erythrodiol (118)	113
3β,22β,28-trihydroxyolean-11,15-diene (salvitriol) (119)	26, 27
3β,22β,28-trihydroxyolean-11-ene (leucanthol) (120)	26, 27
3β,28-dihydroxyolean-12,20(30)-diene (121)	112
3β,28-dihydroxy-olean-12-ene (122)	32, 124
3β-acetoxy-2α,11α-dihydroxy- olean-12-ene (123)	30, 33
3β-acetoxy-olean-12-en-28-ol (124)	53, 79, 85, 86, 129, 130
3β-acetoxy-olean-12-ene-1β,2α,11α-triol (125)	9, 33, 10
3β-acetoxyolean-9,12-diene (126)	1-3
3β-acetyloleanolic acid (127)	5, 7, 32, 37, 130, 131
3β-hydroxy-11α,12α-epoxy-olean- 28,13β-olide (128)	127
3β-hydroxy-1-oxo-olean-12-en-28- methylcarboxylate (129)	111
3β-hydroxyolean-12-ene-28-al (130)	5, 7
3β-hydroxy-oleana-11,13(18)-dien-28-oic acid (131)	69, 74
3β-hydroxyoleanan-13β,28 lactone (132)	58
Anagadiol (133)	39-41, 132, 133
Epi-alnusenol (134)	1-3, 17
Epi-oleanolic acid (135)	17
Erythrodiol diacetate (136)	125
Germanicol (137)	39-41, 54
Moradiol (138)	124
Moronic acid (139)	124
Nivadiol (140)	39, 40, 41
Olean-(l3)18-en-2β,3β-diol (141)	34, 36
Olean-12-en-3-one (142)	84, 134
Olean-12-ene-3β,7β,15α,28-tetraol (143)	8
Olean-13(18)-en-2α,3β,11α-triol (144)	135
Olean-18-ene-1β, 2α, 3β-triol (145)	136
Oleanolic acid (146)	1, 3, 5-7, 12, 14, 17, 19, 21, 22, , 25-28, 31-33, 35, 36, 40, 41, 43-49, 55, 58, 60-75, 79-82, 84-90, 92, 94-98, 100-103, 108, 109, 111, 115, 119, 124, 126-129, 132-134, 137-140, 141-145
Oleanolic acid methyl ester (147)	1, 2, 3
Oleanonic acid squalene (148)	84, 134
Przewanoic acid A (149)	119

Przewanoic acid B(150)	117
Reglin [deacetyloxysessein-7α-(3β-hydroxy-olean-12-en-28-oate] (151)	87, 108
Salviolide (152)	42, 59
Salvinemorol (153)	9, 10, 66, 73
Trijugaoside A (154)	18, 21
Vergatic acid (155)	17, 53, 79, 85, 86, 94-99, 135
β -amyrin (156)	1, 2, 3, 5, 7, 17, 32, 43-49, 50, 51, 54, 55, 62, 63, 68, 69, 71, 72, 74, 79, 81, 82, 84, 93- 98, 111, 127, 134, 146
β -amyrin acetate (157)	79
1β,3β,11α-trihydroxyolean-12-ene (158)	4
Lupane triterpenoid(s)	
1β,11α,20-trihydroxy-lupan-3-one (159)	28
1β,11α-dihydroxylup-20(29)-en-3-one (160)	28
1β,3β-lup-20(29)-ene-1,3,30-triol (161)	147
2-acetoxylupeol (162)	148
2α,3β-dihydroxylup-20(29)-ene , 2α,3β-dihydroxylupane 20(29)-ene (163)	132, 133, 144
2α-acetoxy-lup-20(29)-en-3β-ol (164)	101
2α-methoxylup-20(29)-en-3β-ol (165)	53, 85, 86
3-keto-lupane-11α,20-diol (166)	149
3-oxo-11α,19β,20,22β-tetrahydroxylupane (167)	56
3α-hydroxy-20-oxo-30-norlupane (168)	150
3α-O-acetyl-20(29)-lupen-2α-ol (169)	151
3β,11α,19β,20,22β-pentahydroxylupane (170)	56
3β,11α-dihydroxy-30-norlupan-20-one (171)	12, 14
3β-acetoxy-lup-20(29)-en-2α-ol (172)	101
3β-acetoxy-lupane-11α,20-diol (173)	149
3β-*O*-*cis*-*p*-coumaroyl monogynol A (174)	52
3β-*O*-*trans*-*p*-coumaroyl monogynol A (175)	52
3β, 20-dihydroxylupane-28-oic acid (176)	152
7β-hydroxylup-20(29)-en-3-one (177)	54
Betulin, betulinol (178)	43-49, 59, 111, 63, 71, 17, 153, 82, 140
Betulinic acid (179)	12, 14, 25, 42, 51, 50, 55, 59, 62, 79, 93, 97, 98, 115, 140
Loranthol, lup-20(30)-en-3β,7β-diol (180)	54
Lup-(20)29-ene-2α,3β-diol (nepeticin) (181)	17, 34, 36, 53, 85, 86, 135
Lup-20(29)en-1β,3β-diol (182)	12, 14
Lup-20(29)-ene-3-one , lupeone (183)	28, 113, 118
Lup-20(29)-ene-3β,23-diol (184)	53, 85, 86
Lupan-3β,11α,20 triol (185)	53, 79,85, 86, 149
Lupeol, lupenol (186)	1-3, 5, 7, 12,14, 17, 34, 36, 43 -49, 52-54, 60, 63, 69, 71, 74, 79, 82, 84-86, 111, 113, 124, 129, 135, 132-134, 144, 153
Lupeol acetate, lupeol-3-acetate (187)	79, 140, 131, 146
Lupine-2,3-diol (188)	148
Monogynol A (189)	52
Palestinol (190)	50, 51, 55, 62, 79, 93
Dammaranes	
20*S*,24*R*-epoxydammar-12,25-diol-3-one (191)	57
Amblyol (192)	151
Amblyone (193)	151
Salvilymitol (194)	21
Salvilymitone (195)	21
Santolin B (196)	154
Santolin A (197)	154
Santolin C (198)	154
Miscellaneous triterpenoid(s)	
1-oxo-7α-hydroxysitosterol (199)	2
24-methylenecycloartanol (200)	66, 73, 130
Brassicasterone (201)	113

Friedelin (202)	1-3, 17
Hopanone (203)	113
Stigmast-4-en-3-one (204)	153-156
Hydrangenone (205)	157
Isoperadione (206)	153-156
Peradione (207)	153-156
Perovskone (208)	153-156
Salvadiol (209)	153-156
Salvadione-A (210)	153-156
Salvadione-B (211)	153-156
Salvadione C (212)	158
Perovskone B (213)	158
Salvatrione (214)	153-156

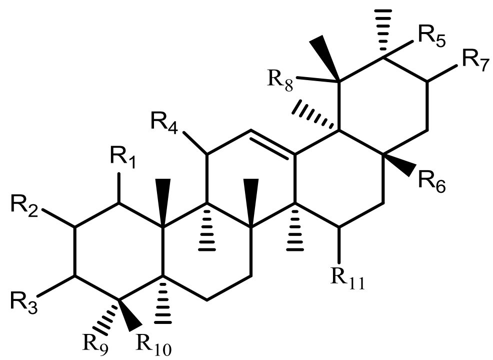
TABLE 2: LIST OF *SALVIA* SPECIES FROM WHICH TRITERPENOID(S) WERE ISOLATED

***Salvia* species**	**Structure no.(s) of Triterpenoid(s)**	**Ref. (s)**
S. aegyptiaca L.	74, 76, 86, 131, 146, 156	69, 74
S. amplexicaulis Lam.	74, 76, 110, 146 , 156, 204	68, 72
S. anastomosans Ramamoorthy	74, 146	75
S. apiana Jeps.	50, 52, 58, 74, 76, 113, 122, 127, 146, 156	32
S. argentea L.	4, 5, 6, 8, 14, 15, 54, 55, 56, 57, 66, 67, 69, 74, 125 , 131, 143, 146	8, 33
S. aspera M. et G.	146, 193, 192	151
S. atropatana	145	136
S. aucheri var. *canescens* Benth.	74	76
S. aurea L.	74	77
S. ballotaeflora	146	143
S. bicolor	74, 191	57
S. blepharochlaena Hedge	76, 109, 110, 200	130
S. blepharophylla Brandegee	74, 76	110, 78
S. breviflora Moc. et Sesse	74, 146	103, 132
S. broussonetii Benth.*(S. bolleana)*	65, 72, 74, 99, 105, 112, 133, 137, 140, 146	39, 40, 41
S. bucharica M. Pop.	206, 207, 208, 209, 210, 211, 214	153-156
Salvia buchananii Hedge	74, 146	100
S. cabulica Benth.	86, 146, 163	144
S. caespitosa Mont. et Auch. ex Benth.	74, 76, 86, 111, 114, 146	60
S. candelabrum Boiss.	74, 146, 181	104
S. candicans Mart. & Gal.	74, 146	105
S. candidissima Vahl.	77	117
S. cardiophylla Benth.	74, 146, 156	109
S. carduacea Benth.	34, 74, 101, 105, 146	22
S. ceratophylla L.	74, 146	106
S. chinensis	29	----
S. chinopeplica Epl.	74	107
S. cilicica Boiss. et Kotschy	74, 146	65
S. cryptantha Mont. et Auch. ex Benth.	46, 79, 105, 109, 155, 156, 157	79
S. coccinea Juss. ex Murr.	75, 121, 129	112
S. cyanescens Boiss. et Bal.	76, 77, 187,	114
S. deserta Schang	41, 91, 105, 146, 159, 160, 183	28
S. divaricata Mont. et Auch. ex Benth.	74, 146	61
Salvia eremophila	176	152
S. euphratica Mont. et Auch. ex Benth.	74, 76, 146	102
S. farinacea Benth.	74, 76, 179	115
S. forskahlei L.	76	116
S. glutinosa L.	1, 73, 74, 76, 77, 86, 89, 90, 97, 126, 134, 146, 147, 156, 199, 202	1-3
S. gilliessi Benth.	146	137
S. glabrescens Makino	34, 65, 74, 105, 146	19
S. japonica Thunb.		
S. grandiflora Etling	105, 112	35
S. haenkei L.	44, 53, 123	30
S. hierosolymitana Boiss.	16, 34, 51, 74, 96, 105, 105, 146, 194, 195	11, 21

S. hydrangea DC. ex Benth.	74, 146, 205, 212, 213	64, 157, 158
S. hypargeia Fisch. et Mey.	110, 187	131
S. horminum L. (*S. viridis* L.)	62, 74, 86, 141, 146, 181	34, 36
S. karwinskii Benth.	74	32, 92
S. kronenburgii Rech. f.	9, 10, 11, 12, 17, 19, 26, 33, 46, 53, 54, 63, 92, 125, 153	9, 10
S. lanata Roxb.	37, 42, 75, 76	24, 29
S. lanigera Poir.	74, 132, 146	58
S. lasiantha	146	138
S. lavandulifolia Vahl.	74, 146	70, 35
S. lavanduloides (Cantueso)	45, 74, 146	31
S. leriifolia	162, 188	148
S. leucantha Cav.	38, 74, 119, 120, 146	26, 27
S. limbata C. A. Meyer	74, 146	80
S. lineata Benth.	146	139
S. longipedicellata Hedge	74, 76, 146	102
S. longystyla Benth.	110, 128, 146, 179	127
S. mellifera Greene	7, 36, 39, 47, 70, 71, 74, 86,110, 130, 146, 156	5, 7
S. menthaefolia Tenore	62, 74, 146	35
S. mexicana L. var. *minor* Benth.	73, 74, 152, 178, 179	42, 59
S. microphylla Kunth	86, 109, 146	129
S. montbretii Benth.	74, 76, 86, 146, 174, 175, 189	52
S. moorcraftiana Wall.	86, 133, 146, 163	132, 133
S. multicaulis Vahl.	76, 77, 86, 118, 183, 201, 203	113
S. nemorosa L.	74, 76, 146, 153, 200	66, 73
S. nicolsoniana Ramamoorthy	37, 74, 115, 116, 146, 179	25
S. nilotica Juss. ex Jacq.	31, 61, 62, 72, 74, 75, 76, 83, 86, 105, 106, 134, 135, 146, 155, 156,	17, 101
S. plebeia R. Br., *S. viridis* L.	164, 172, 178, 181, 202	
S. nubicola Wall. ex Sweet	168	150
S. officinalis L.	74, 75, 86, 102, 105, 106, 146, 146, 156, 178	43-49, 63, 71, 81, 82, 111, 142
S. oxyodon L.	74, 105	82
S. palaefolia H. B. K.	74, 86, 142, 146, 148, 156	84, 134
S. palaestina Benth.	74, 86, 105, 124, 130, 146, 155, 165, 181, 184, 185	53, 85, 86
S. paramiltiorrhiza H. W. Li et X. L. Huang	18, 22, 23, 24, 25, 31, 32, 59, 98, 100, 104, 113	6, 12-14
S. phlomoides Asso	166, 173, 185	149
S. pinnata L.	86, 144, 146, 155, 181	135
S. pisidica Boiss. & Heldr.	79, 86, 109, 146, 156, 157, 185, 187	79
S. pomifera L.	76, 86, 95, 138, 139, 146, 146	124
S. potentillifolia Boiss.et Heldr.	86, 105, 146, 155, 156, 185	79
S. pratensis L.	74, 137, 146, 156, 177, 180, 186	54
S. przewalskii Maxim.	82, 146, 149, 150	119, 145
S. recognita Fisch. et Meyer	78, 110, 183	108
S. regla Cav.	74, 146, 151	108, 87
S. reptans Jacq.	74, 146	88
S. ringens Sm.	74, 105, 146	89
S. roborowskii Max.	18, 21, 28, 30, 31, 35, 42, 48, 60, 74, 86, 102, 102, 102, 103, 105, 146, 171, 179, 182	12, 14
S. sapinae Epl.	74, 102, 146	126
S. santolinifolia	64, 88, 117, 196, 197, 198	38, 122
S. scabiosifolia Lam.	74, 105, 146	89
S. sclarea L.	74, 76, 114, 146	90, 128
S. sclareoides	161	147
S. sochifolia C. Y. Wu	22, 24, 74	15
S. sousae	146	92
S. splendens L.	74, 146	35
S. syriaca L.	74, 84, 85, 86, 146	67, 120
S. staminea Benth.	63, 127	37
S. tchihatcheffii (Fisch.et Mey.) Boiss.	97, 109, 130, 136	125
S. thymoides Benth.	146, 178, 179	140
S. transsylvanica (Schur ex Griseb.)	156, 187	146

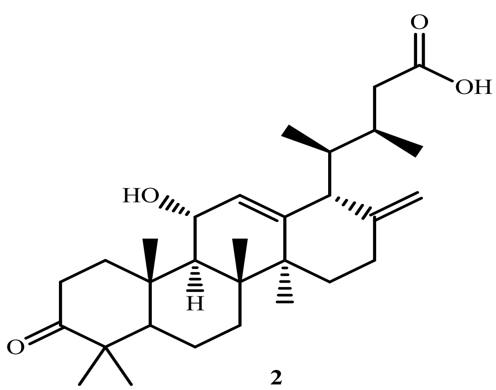
S. tricupis	3, 18, 19, 20, 21, 27, 28, 30, 31, 43, 50, 74, 99, 102, 103, 105, 146	6
S. trijuga Diels.	34, 81, 82, 154, 169	18, 21, 151
S. triloba L. (*S. fruticosa* L.)	74, 146, 156, 179, 190	50, 51, 55, 62, 79, 93
S. tomentosa Miller	74, 75, 76, 105, 107, 108, 146, 155, 156	94, 95, 96
S. urmiensis	2, 40, 49, 87, 158	4, 121
S. verticillata L.	74, 76,80, 105, 110, 146, 155, 156, 179	97, 98
S. virgata Jacq.	105, 155	79, 23, 99
& *S. virgata* Aioton	74, 102, 146	99
S. wagneriana Polak.	74, 167, 170	56
S. willeana Holmboe	34, 68, 99, 102, 105	23
S. xanthocheila	94	123

Structure(s):



1 $R_1=R_2=R_5=R_6=R_7=R_8=R_{11}=H$; $R_3=\alpha OH$; $R_4=O=$; $R_9=R_{10}=CH_3$
3 $R_1=R_2=R_5=R_6=R_7=R_8=R_{11}=H$; $R_3=O=$; $R_4=\alpha OCH_3$; $R_9=R_{10}=CH_3$
4 $R_1=R_3=\beta OH$; $R_2=R_5=R_6=R_7=R_8=R_{11}=H$; $R_4=\alpha OCH_3$; $R_9=R_{10}=CH_3$
5 $R_1=R_3=\beta OH$; $R_2=R_5=R_6=R_7=R_8=H$; $R_4=\alpha OCH_3$; $R_{11}=\alpha OH$; $R_9=R_{10}=CH_3$
6 $R_1=R_3=\beta OH$; $R_2=R_5=R_7=R_8=R_{11}=H$; $R_4=\alpha OCH_3$; $R_6=OH$; $R_9=R_{10}=CH_3$
7 $R_1=R_2=R_5=R_7=R_8=R_{11}=H$; $R_3=O=$; $R_4=\beta OH$; $R_6=COOH$; $R_9=R_{10}=CH_3$
9 $R_1=R_3=\beta OH$; $R_2=R_4=\alpha OH$; $R_5=R_6=R_7=R_8=R_{11}=H$; $R_9=R_{10}=CH_3$
10 $R_1=\beta OH$; $R_2=\alpha OH$; $R_5=R_6=R_7=R_8=R_{11}=H$; $R_3=\beta OAc$; $R_4=O=$; $R_9=R_{10}=CH_3$
12 $R_1=\beta OH$; $R_2=R_5=R_6=R_7=R_8=R_{11}=H$; $R_3=R_4=\alpha OH$; $R_9=R_{10}=CH_3$
13 $R_1=R_3=\beta OH$; $R_2=R_5=R_6=R_7=R_8=R_{11}=H$; $R_4=\alpha OH$; $R_9=R_{10}=CH_3$
14 $R_1=R_3=\beta OH$; $R_2=R_5=R_7=H$; $R_4=\alpha OCH_3$; $R_6=CHO$; $R_9=R_{10}=CH_3$; $R_{11}=\alpha OH$
15 $R_1=R_3=\beta OH$; $R_2=R_4=R_5=R_7=R_8=H$; $R_6=CHO$; $R_9=R_{10}=CH_3$; $R_{11}=\alpha OH$
18 $R_1=R_4=R_5=R_7=R_{11}=H$; $R_2=R_3=\alpha OH$; $R_6=COOH$; $R_8=OH$; $R_9=R_{10}=CH_3$
19 $R_1=R_4=R_5=R_7=R_{11}=H$; $R_2=R_3=\alpha OH$; $R_6=COOglc$; $R_8=OH$; $R_9=R_{10}=CH_3$
20 $R_1=R_4=R_5=R_7=R_{10}=R_{11}=H$; $R_2=R_3=R_8=\alpha OH$; $R_6=COOglc$; $R_9=R_{10}=CH_3$
21 $R_1=R_4=R_5=R_7=R_8=R_{11}=H$; $R_2=R_3=\alpha OH$; $R_6=COOH$; $R_9=CH_2OH$; $R_{10}=CH_3$
22 $R_1=R_4=R_5=R_7=R_8=R_9=R_{11}=H$; $R_2=R_3=\alpha OH$; $R_6=COOH$; $R_{10}=CH_2OH$; $R_9=CH_3$
23 $R_1=R_4=R_5=R_7=R_8=R_{11}=H$; $R_2=R_3=\alpha OH$; $R_6=COOCH_3$; $R_9=R_{10}=CH_3$
24 $R_1=R_4=R_5=R_7=R_8=R_{11}=H$; $R_2=R_3=\alpha OH$; $R_6=COOH$; $R_9=R_{10}=CH_3$
25 $R_1=R_4=R_5=R_6=R_7=R_8=R_{11}=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_6=COOCH_3$; $R_9=CH_2OH$; $R_{10}=CH_3$
26 $R_1=R_5=R_6=R_7=R_8=R_{11}=H$; $R_2=R_4=\alpha OH$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$
27 $R_1=R_4=R_5=R_6=R_7=R_{11}=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_6=COOglc$; $R_8=$ OH; $R_{10}=CHO$; $R_9=CH_3$
28 $R_1=R_4=R_5=R_6=R_7=R_{10}=R_{11}=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_6=COOH$; $R_8=$ OH; $R_9=R_{10}=CH_3$
30 $R_1=R_4=R_5=R_6=R_7=R_8=R_{11}=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_6=COOH$; $R_{10}=$ CH_2OH; $R_9=CH_3$
31 $R_1=R_4=R_5=R_6=R_7=R_8=R_{11}=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_6=COOH$; $R_9=R_{10}=CH_3$
32 $R_1=R_4=R_5=R_6=R_7=$ $R_8=R_{11}=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_6=COOCH_3$; $R_9=R_{10}=CH_3$
33 $R_1=R_3=R_4=R_5=R_6=R_7=R_8=R_{11}=H$; $R_2=\alpha OH$; $R_6=COOCH_3$; $R_9=R_{10}=CH_3$
34 $R_1=R_3=R_4=R_5=R_6=R_7=R_8=R_{11}=H$; $R_2=\alpha OH$; $R_6=COOH$; $R_9=R_{10}=CH_3$
35 $R_1=R_4=R_5=R_6=R_7=R_8=R_{11}=H$; $R_2=\alpha OH$; $R_3=\beta OCH_3$; $R_6=COOH$; $R_9=R_{10}=CH_3$
36 $R_1=R_2=R_5=R_6=R_7=R_8=R_{11}=H$; $R_3=R_4=O=$; $R_9=R_{10}=CH_3$
37 $R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H$; $R_3=\alpha OH$; $R_6=COOH$; $R_9=R_{10}=CH_3$
38 $R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H$; $R_3=\alpha OH$; $R_6=CH_2OH$; $R_9=R_{10}=CH_3$
41 $R_1=\beta OH$; $R_2=R_5=R_7=R_8=R_{11}=H$; $R_3=O=$; $R_4=\alpha OH$; $R_6=COOH$; $R_9=R_{10}=CH_3$
42 $R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H$; $R_3=O=$; $R_6=COOH$; $R_9=R_{10}=CH_3$
43 $R_1=R_2=R_4=R_5=R_6=R_7=R_8=R_{11}=H$; $R_3=O=$; $R_9=R_{10}=CH_3$
44 $R_1=\beta OH$; $R_2=R_5=R_6=R_7=R_8=R_{11}=H$; $R_3=O=$; $R_4=\alpha OH$; $R_9=R_{10}=CH_3$
45 $R_1=\beta OH$; $R_2=R_4=R_5=R_7=R_8=R_{11}=H$; $R_3=O=$; $R_6=COOCH_3$; $R_9=R_{10}=CH_3$

46 R_1=βOH; R_2=R_5=R_6=R_7=R_8=R_{11}=H; R_3=OAc; R_4=αOH; R_9=R_{10}=CH_3
48 R_1=R_4=R_5=R_6=R_7=R_8=R_{11}=H; R_2=αOCH_3; R_3=αOH; R_6=COOH; R_9=R_{10}=CH_3
49 R_1=R_2=R_5=R_6=R_7=R_8=R_{11}=H; R_3=βOH; R_4=αOH; R_9=R_{10}=CH_3
50 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=βOH; R_6=OH; R_9=R_{10}=CH_3
52 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=βOAc; R_6=CHO; R_9=R_{10}=CH_3
53 R_1=R_2=R_5=R_6=R_7=R_8=R_{11}=H; R_3=βOAc; R_4=αOH; R_9=R_{10}=CH_3
54 R_1=βOH; R_2=R_4=αOH; R_3=OAc; R_5=R_6=R_7=R_8=R_{11}=H; R_9=R_{10}=CH_3
55 R_1=R_5=βOH; R_2=R_4=αOH; R_3=OAc; R_6=R_7=R_8=R_{11}=H; R_9=R_{10}=CH_3
56 R_1=R_5=R_6=R_7=R_8=R_{11}=H; R_2=R_4=αOH; R_3=OAc; R_9=R_{10}=CH_3
57 R_1=R_6=R_7=R_8=R_{11}=H; R_2=R_4=αOH; R_3=OAc; R_5=βOH; R_9=R_{10}=CH_3
58 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=βOAc; R_6=COOH; R_9=R_{10}=CH_3
59 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=βOH; R_6=$COOCH_3$; R_9=R_{10}=CH_3
60 R_1=R_4=R_5=R_6=R_7=R_8=R_{11}=H; R_2=βOCH_3; R_3=αOH; R_6=COOH; R_9=R_{10}=CH_3
63 R_1=R_2=R_5=R_6=R_7=R_8=R_{11}=H; R_3=βOH; R_4=R_7=αOH; R_9=R_{10}=CH_3
65 R_1=R_4=R_5=R_6=R_7=R_{11}=H; R_2=R_8=αOH; R_3=βOH; R_9=R_{10}=CH_3
66 R_1=R_3=βOH; R_2=R_5=R_6=R_7=R_8=H; R_4=R_{11}=αOH; R_9=R_{10}=CH_3
67 R_1=R_3=βOH; R_2=R_4=R_5=R_7=R_8=H; R_6=OH; R_9=R_{10}=CH_3; R_{11}=αOH
68 R_1=R_2=R_5=R_6=R_7=R_8=R_{11}=H; R_3=R_4=αOH; R_9=R_{10}=CH_3
73 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=βOHc; R_6=$COOCH_3$; R_9=R_{10}=CH_3
74 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=βOH; R_6=COOH; R_9=R_{10}=CH_3
75 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=βOH; R_6=CH_2OH; R_9=R_{10}=CH_3
76 R_1=R_2=R_4=R_5=R_6=R_7=R_8=R_{11}=H; R_3=αOH; R_9=R_{10}=CH_3
77 R_1=R_2=R_4=R_5=R_6=R_7=R_8=R_{11}=H; R_3=αOAc; R_9=R_{10}=CH_3
78 R_1=R_2=R_4=R_5=R_7=R_8=R_{11}=H; R_3=αOAc; R_6=CHO; R_9=R_{10}=CH_3
79 R_1=R_2=R_4=R_5=R_6=R_7=R_8=R_{11}=H; R_3=O=; R_9=R_{10}=CH_3
80 R_1=R_2=R_4=R_5=R_6=R_7=R_8=R_{11}=H; R_3=αOH; R_6=CHO; R_9=R_{10}=CH_3
82 R_1=R_4=R_5=R_6=R_7=R_{11}=H; R_3=R_2=R_8=αOH; R_9=R_{10}=CH_3
83 R_1=R_4=R_5=R_6=R_7=R_{11}=H; R_3=βOH; R_8=αOH; R_9=R_{10}=CH_3



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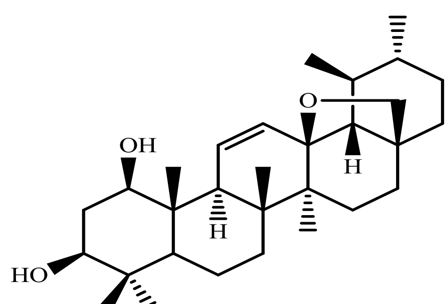

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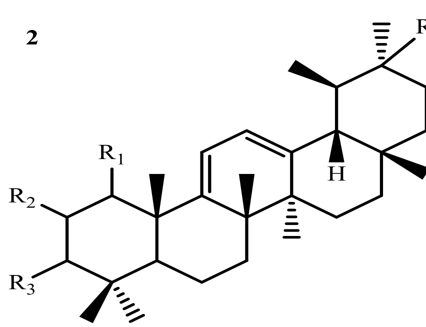
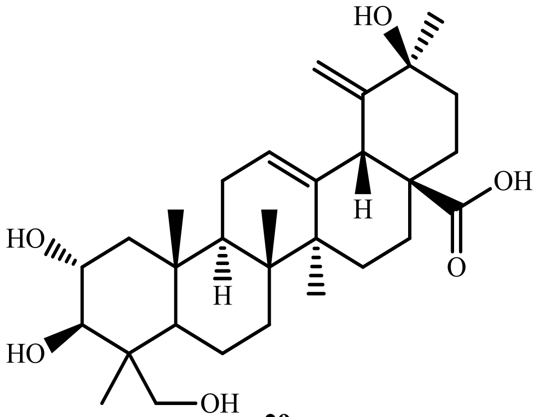


11 R_1=R_2=βOH; R_3=βOAc; R_4=H
17 R_1=H; R_2=αOH; R_3=βOAc; R_4=βOH
70 R_1=R_2=R_4=H; R_3=O=
71 R_1=R_2=R_4=H; R_3=βOH
72 R_1=R_2=R_4=H; R_3=βOAc



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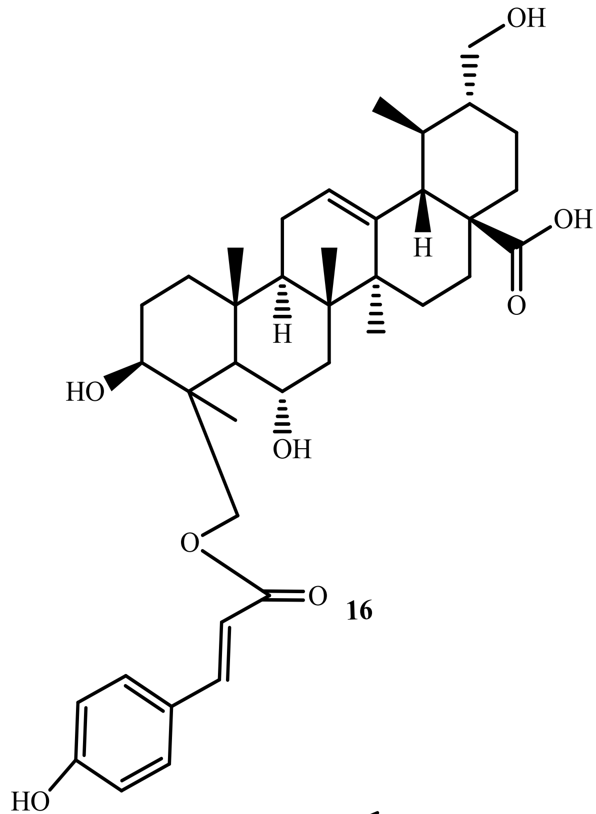

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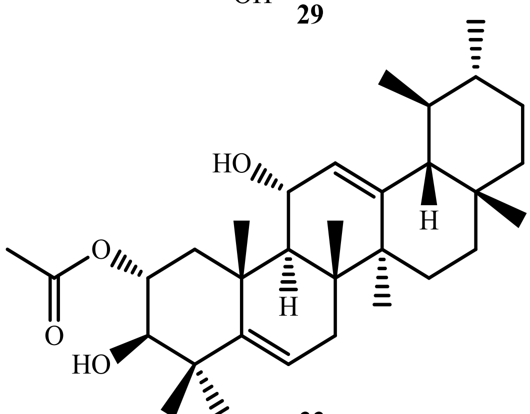

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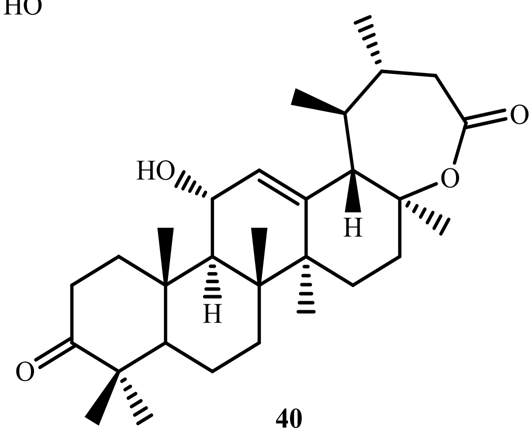

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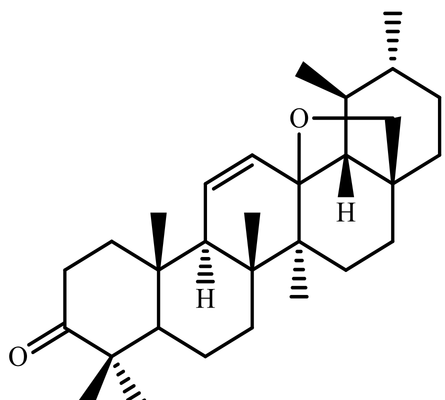

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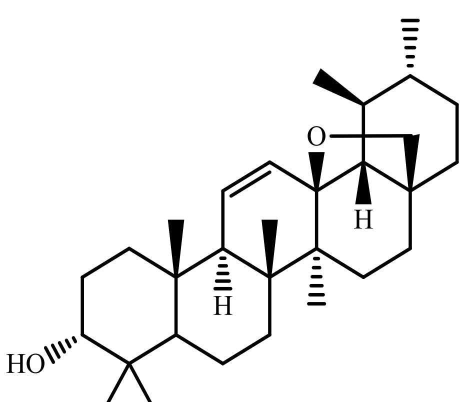

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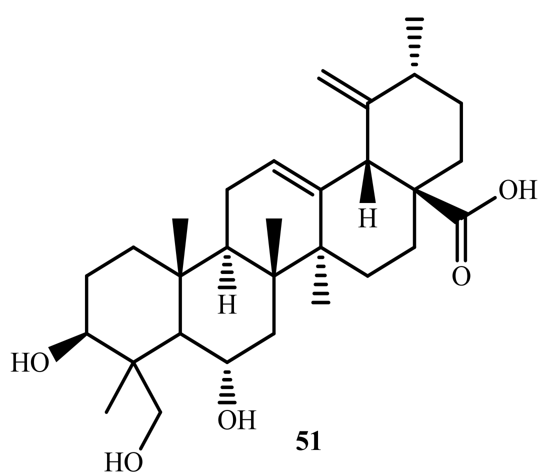

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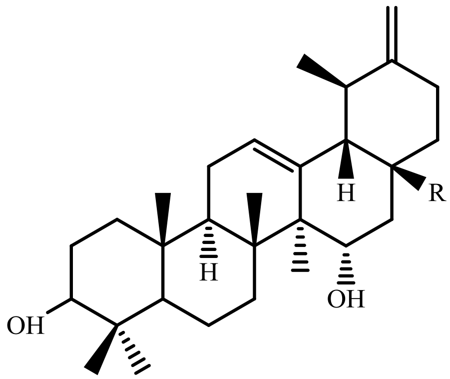
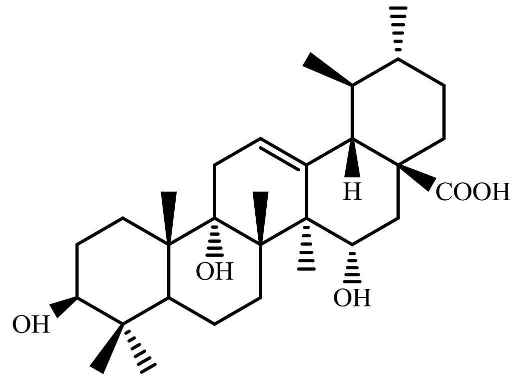


61 R=CH_2OH
62 R=COOH



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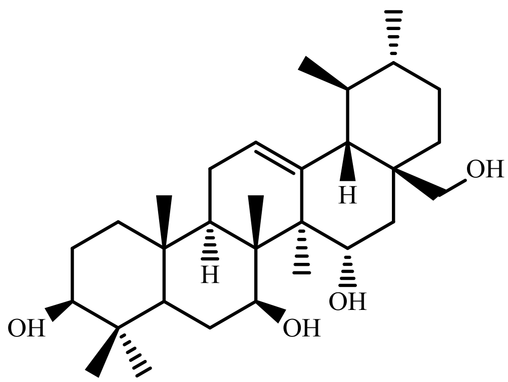

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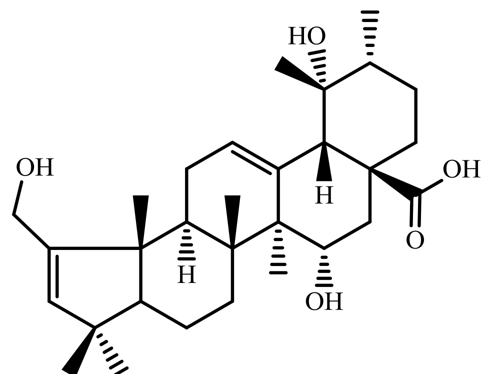

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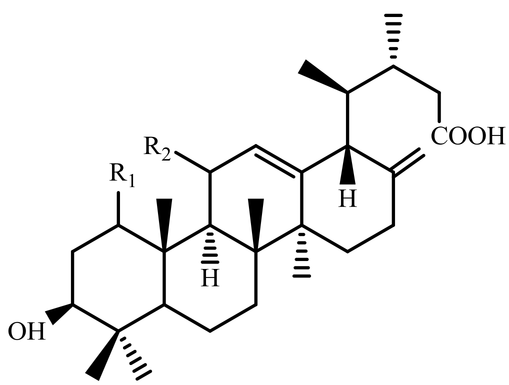
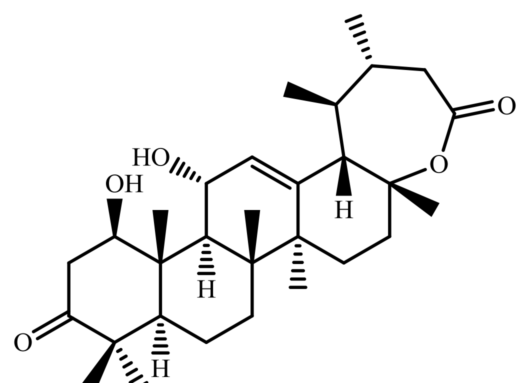


84 R_1=H; R_2=αOCH$_3$
85 R_1=βOH; R_2=αOH
86 R_1=βOH; R_2=αOCH$_3$



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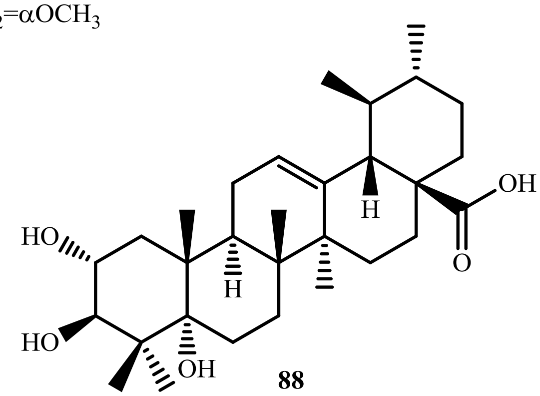

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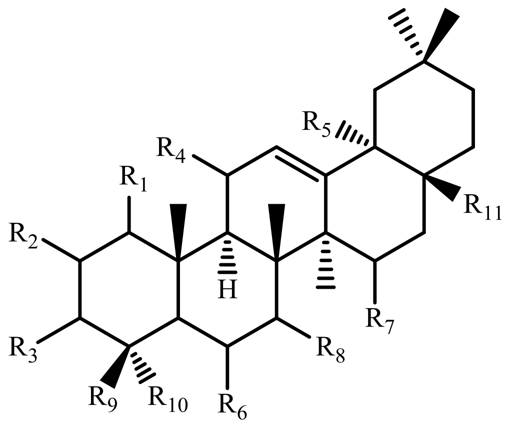
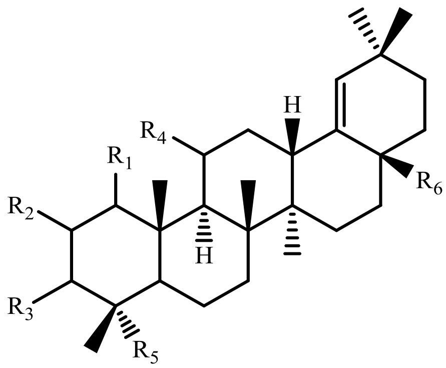
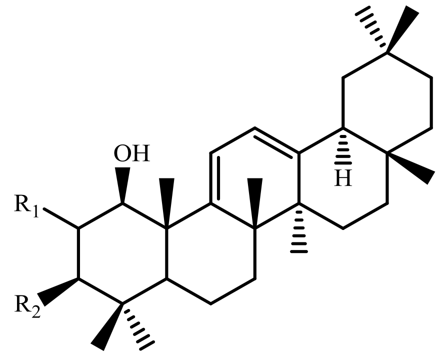
FIG.1: URSANE TRITERPENOIDS



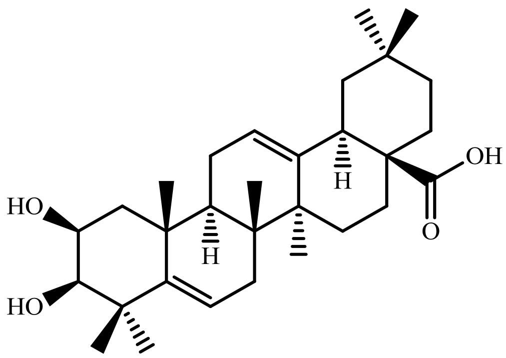
89 $R_1=R_2=R_5=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_4=O=$; $R_9=R_{10}=R_{11}=CH_3$
90 $R_1=R_2=R_5=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_4=\alpha OH$; $R_9=R_{10}=R_{11}=CH_3$
92 $R_1=R_3=\beta OH$; $R_2=R_4=\alpha OH$; $R_5=R_6=R_7=R_8=H$; $R_9=R_{10}=R_{11}=CH_3$
97 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=CH_2OAc$
98 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=R_3=\alpha OH$; $R_9=CH_3$; $R_{10}=CH_2OH$; $R_{11}=COOMe$
99 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=R_3=\alpha OH$; $R_9=CH_3$; $R_{10}=CH_2OH$; $R_{11}=COOH$
100 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=R_3=\alpha OH$; $R_9=CH_2OH$; $R_{10}=CH_3$; $R_{11}=COOMe$
102 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=R_3=\alpha OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
103 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_9=CH_2OH$; $R_{10}=CH_3$; $R_{11}=COOH$
104 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOMe$
105 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=\alpha OH$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
106 $R_1=R_4=R_5=R_6=R_7=R_8=H$; $R_2=\alpha OH$; $R_3=O=$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
107 $R_1=R_4=R_6=R_7=R_8=H$; $R_2=R_3=\beta OH$; $R_5=OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
109 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OAc$; $R_9=R_{10}=CH_3$; $R_{11}=CH_2OH$
110 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=OAc$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
111 $R_1=O=$; $R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OAc$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
113 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OAc$; $R_9=R_{10}=CH_3$; $R_{11}=CHO$
114 $R_1=R_2=R_4=R_5=R_6=R_7=R_8=H$; $R_3=O=$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
116 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\alpha OH$; $R_9=CH_2OH$; $R_{10}=CH_3$; $R_{11}=COOH$
117 $R_1=R_2=R_5=R_4=R_7=R_8=H$; $R_3=R_6=\alpha OH$; $R_9=CH_2OH$; $R_{10}=CH_3$; $R_{11}=COOH$
118 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\alpha OAc$; $R_9=R_{10}=CH_3$; $R_{11}=CH_2OH$
122 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=CH_2OH$
123 $R_1=R_5=R_6=R_7=R_8=H$; $R_2=R_4=\alpha OH$; $R_3=\beta OAc$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
124 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OAc$; $R_9=R_{10}=CH_3$; $R_{11}=CH_2OH$
125 $R_1=\beta OH$; $R_2=R_4=\alpha OH$; $R_3=\beta OAc$; $R_5=R_6=R_7=R_8=H$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
127 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OAc$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
129 $R_1=O=$; $R_2=R_4=R_5=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOMe$
130 $R_1=R_2=R_4=R_5=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=CHO$
135 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\alpha OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
136 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OAc$; $R_9=R_{10}=CH_3$; $R_{11}=CH_2OAc$
142 $R_1=R_2=R_4=R_5=R_6=R_7=R_8=H$; $R_3=O=$; $R_9=R_{10}=R_{11}=CH_3$
143 $R_1=R_2=R_4=R_5=R_6=H$; $R_3=R_8=\beta OH$; $R_7=\alpha OH$; $R_9=R_{10}=CH_3$; $R_{11}=CH_2OH$
146 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
147 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOMe$
148 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOA$
155 $R_1=O=$; $R_2=R_4=R_5=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=CH_3$; $R_{11}=COOH$
156 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OH$; $R_9=R_{10}=R_{11}=CH_3$
157 $R_1=R_2=R_5=R_4=R_6=R_7=R_8=H$; $R_3=\beta OAc$; $R_9=R_{10}=R_{11}=CH_3$
158 $R_1=R_3=\beta OH$; $R_2=R_5=R_6=R_7=R_8=H$; $R_4=\alpha OH$; $R_9=R_{10}=R_{11}=CH_3$



91 R_1=βOH; R_2=R_3=O=; R_4=αOH; R_5=R_6=CH_3
95 R_1=R_2=R_4=H; R_3=βOH; R_5=CH_2OH; R_6=CH_3
133 R_1=R_3=βOH; R_2=R_4=H; R_5=R_6=CH_3
137 R_1=R_2=R_4=H; R_3=βOH; R_5=R_6=CH_3
138 R_1=R_2=R_4=H; R_3=βOH; R_5=CH_3; R_6=CH_2OH
139 R_1=R_2=R_4=H; R_3=O=; R_5=CH_3; R_6=COOH
140 R_1=R_2=H; R_3=βOH; R_4=αOH; R_5=R_6=CH_3
141 R_1=R_4=H; R_2=R_3=βOH; R_5=R_6=CH_3
144 R_1=H; R_2=R_3=βOH; R_4=αOH; R_5=R_6=CH_3
145 R_1=R_3=βOH; R_2=αOH; R_4=H; R_5=R_6=CH_3



93 R_1=αOH; R_2=βOAc
94 R_1=H; R_2=βOH



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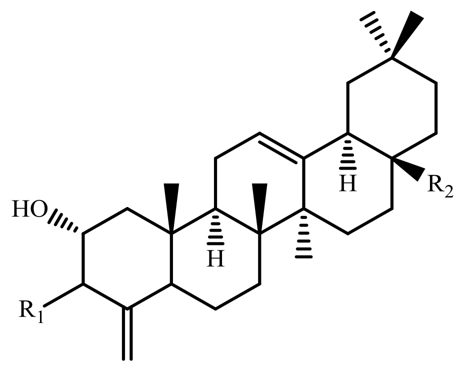
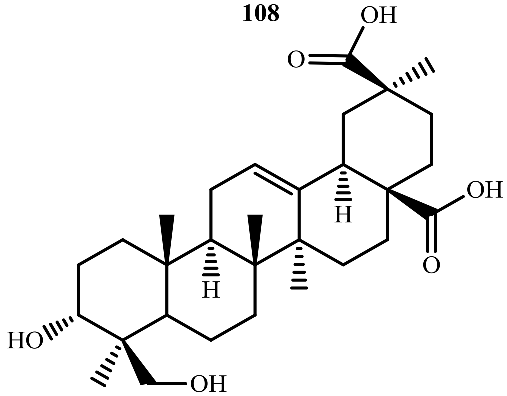


96 R_1=βOH; R_2=CH_3
101 R_1=αOH; R_2=COOH



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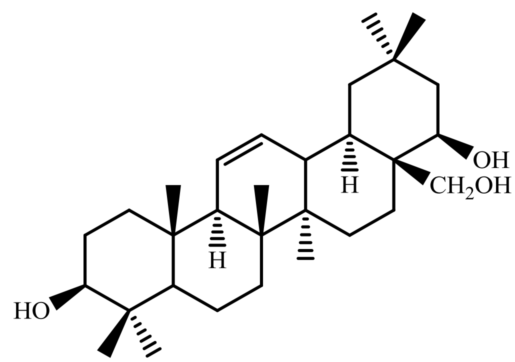

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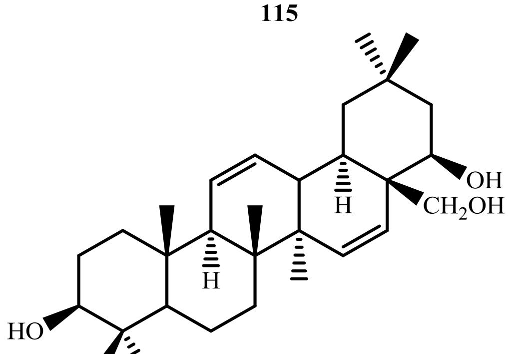

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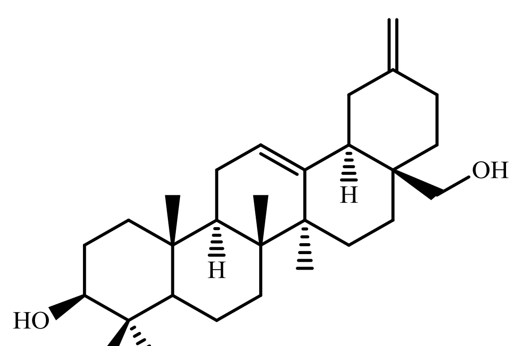

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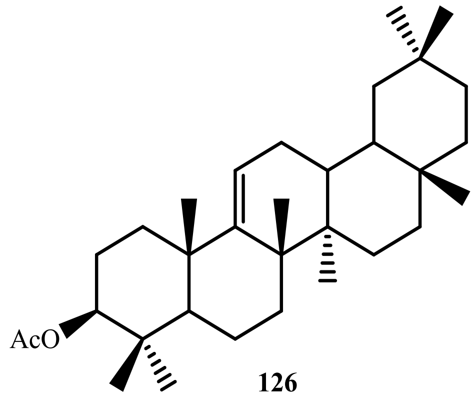

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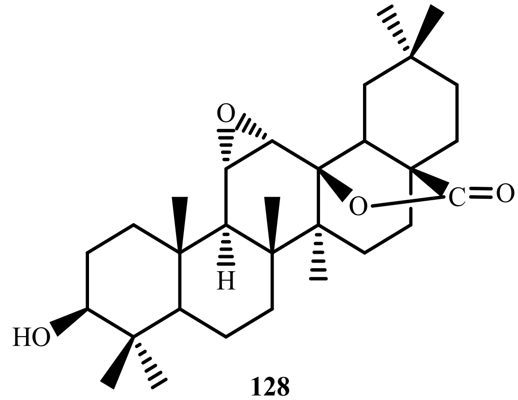

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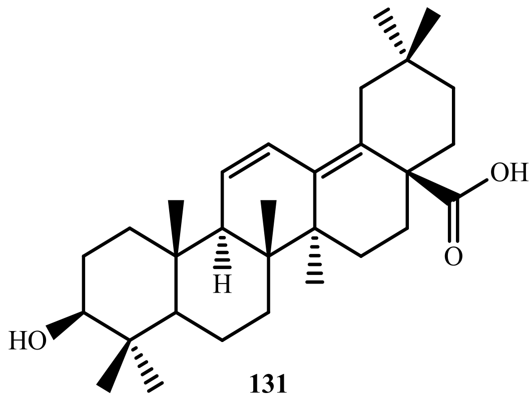

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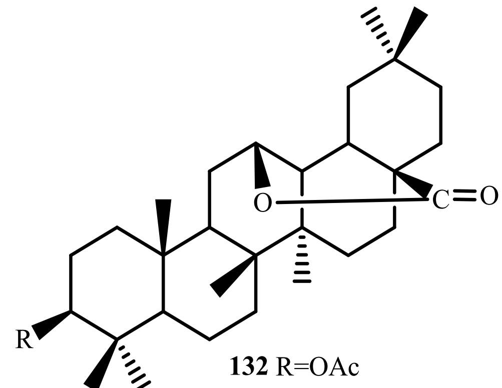
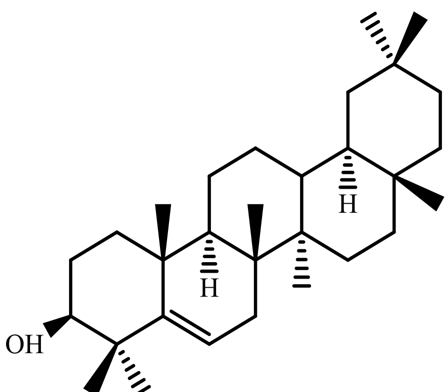


132 R=OAc
152 R=OH



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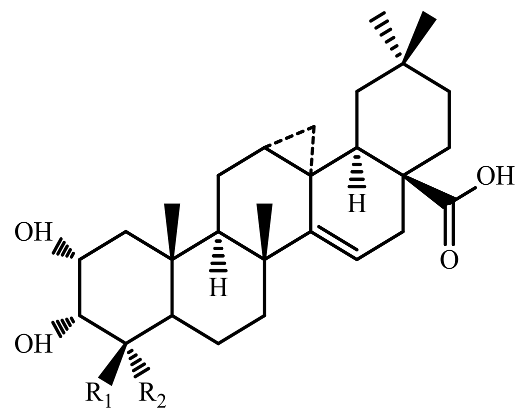
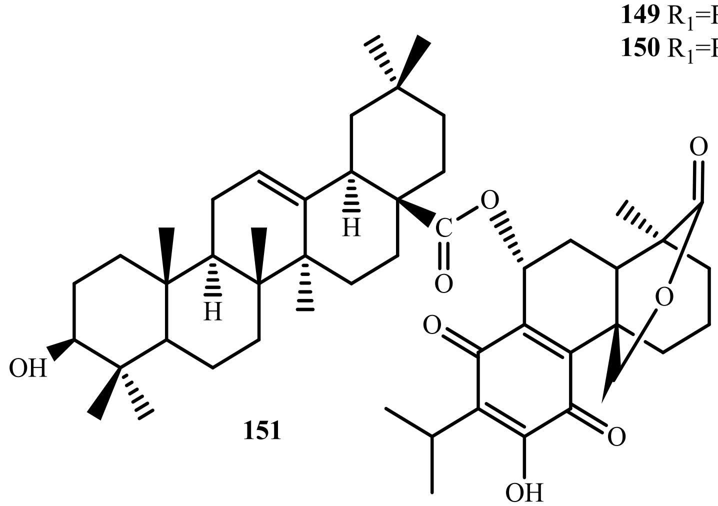


149 $R_1=R_2=CH_3$
150 $R_1=R_2=CH_2$



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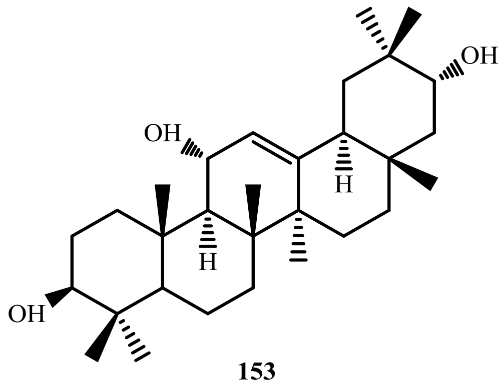

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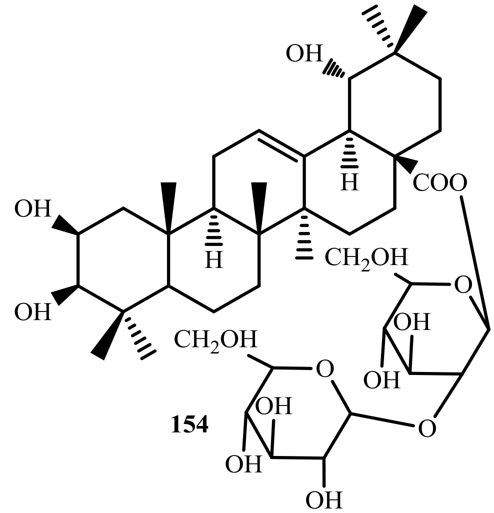
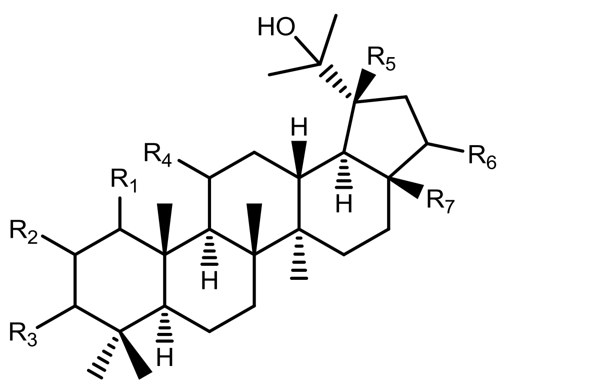
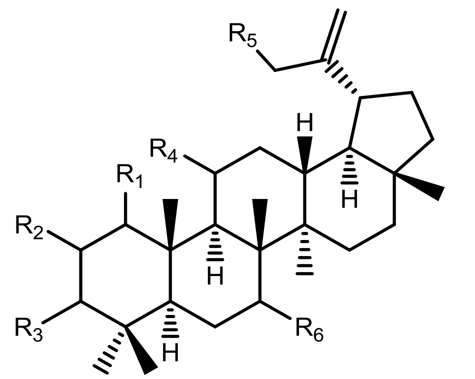


154

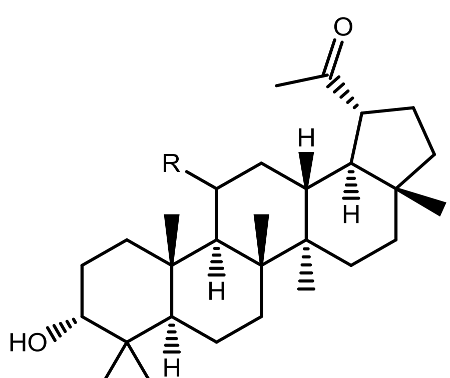
FIG. 2: OLEAN TRITERPENOIDS



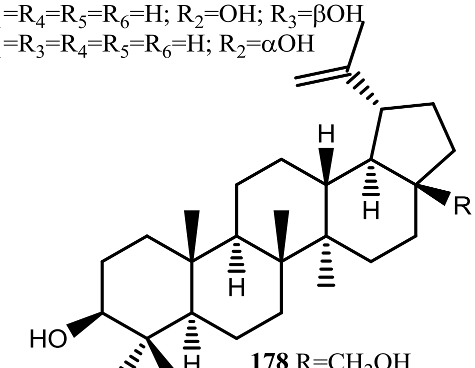
159 R_1=βOH; R_2=R_3=R_5=R_6=H; R_4=αOH; R_7=CH_3
166 R_1=R_2=R_5=R_6=H; R_3=O=; R_4=αOH; R_7=CH_3
167 R_1=R_2=H; R_3=O=; R_4=αOH; R_5=R_6=βOH; R_7=CH_3
170 R_1=R_2=H; R_3=R_5=R_6=βOH; R_4=αOH; R_7=CH_3
173 R_1=R_2=R_5=R_6=H; R_3=βOAc; R_4=αOH; R_7=CH_3
174 R_1=R_2=R_4=R_5=R_6=H; R_3=β-O-***cis*-p-coumaroyl**; R_7=CH_3
175 R_1=R_2=R_4=R_5=R_6=H; R_3=β-O-***trans*-p-coumaroyl**; R_7=CH_3
176 R_1=R_2=R_4=R_5=R_6=H; R_3=βOH; R_7=COOH
186 R_1=R_2=R_5=R_6=H; R_3=βOH; R_4=αOH; R_7=CH_3
189 R_1=R_2=R_4=R_5=R_6=H; R_3=βOH; R_7=CH_3



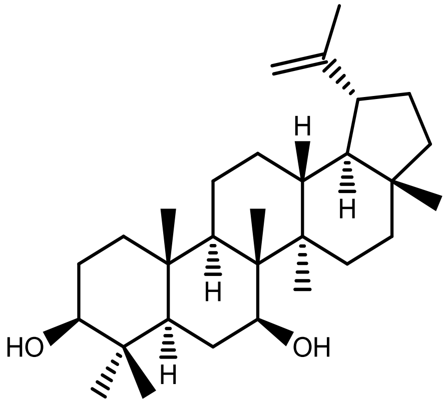
160 R_1=βOH; R_2=R_5=R_6=H; R_3=O=; R_4=αOH
161 R_1=βOH; R_2=R_6=H; R_3=O=; R_4=αOH; R_5=OH
162 R_1=R_4=R_5=H; R_2=OH; R_3=OH
163 R_1=R_4=R_5=R_6=H; R_2=αOH; R_3=βOH
164 R_1=R_4=R_5=R_6=H; R_2=αOAc; R_3=βOH
165 R_1=R_4=R_5=R_6=H; R_2=αOMe; R_3=βOH
169 R_1=R_4=R_5=R_6=H; R_2=αOH; R_3=αOAc
172 R_1=R_4=R_5=R_6=H; R_2=αOH; R_3=βOAc
177 R_1=R_2=R_4=R_5=H; R_3=O=; R_6=βOH
181 R_1=R_4=R_5=R_6=H; R_2=αOH; R_3=βOH
182 R_1=R_3=βOH; R_2=R_4=R_5=R_6=H
183 R_1=R_2=R_4=R_5=R_6=H; R_3=O=
186 R_1=R_2=R_4=R_5=R_6=H; R_3=βOH
187 R_1=R_2=R_4=R_5=R_6=H; R_3=αOH
188 R_1=R_4=R_5=R_6=H; R_2=OH; R_3=βOH
190 R_1=R_3=R_4=R_5=R_6=H; R_2=αOH



168 R=H
171 R=βOH



178 R=CH_2OH
179 R=COOH



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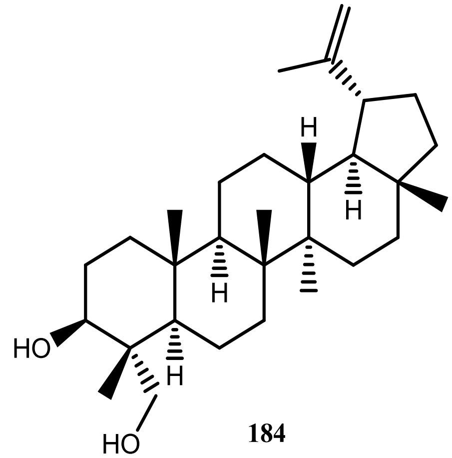
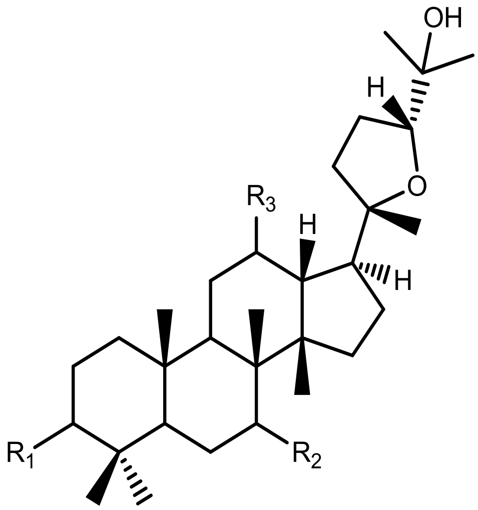
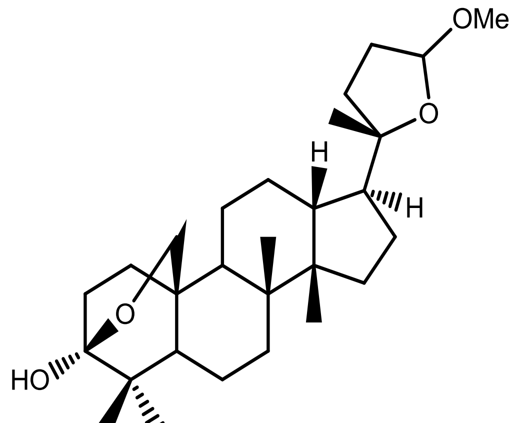


184

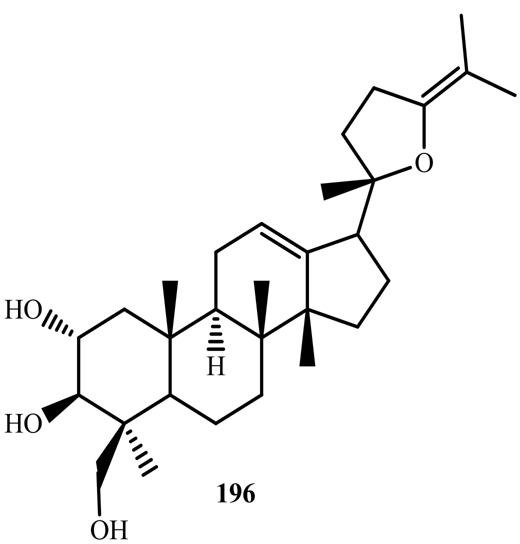
FIG. 3: LUPANE TRITERPENOIDS



191 R_1=O=; R_2=H; R_3=βOH
194 R_1=βOH; R_2=αOH; R_3=H
195 R_1=O=; R_2=βOH; R_3=H



192 R=OMe
193 R=O=



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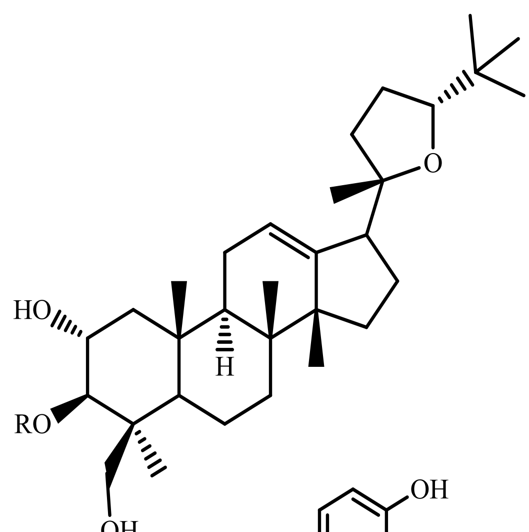


197 R=H **198** R=

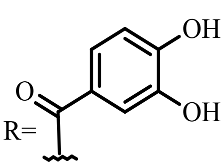
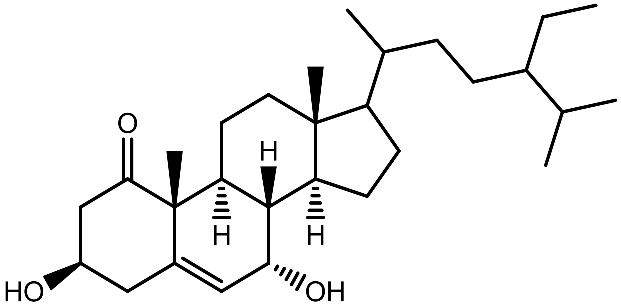


FIG.4: DAMMARANE TRITERPENOIDS



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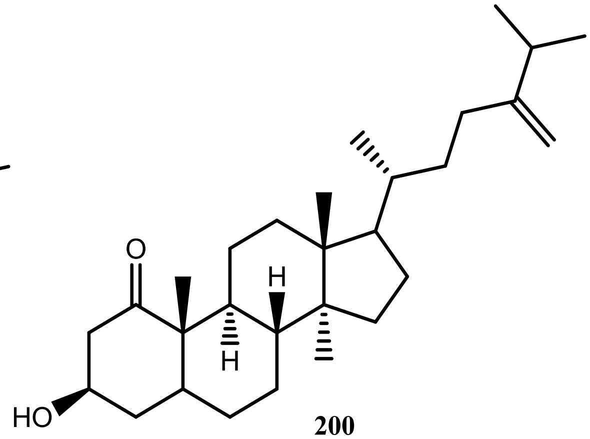

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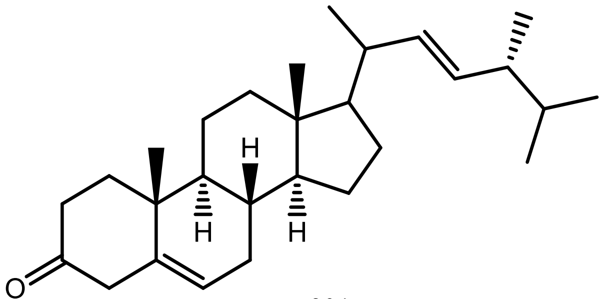

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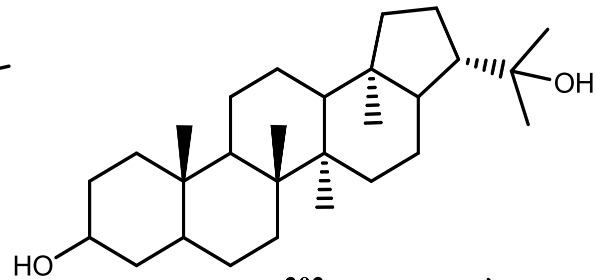

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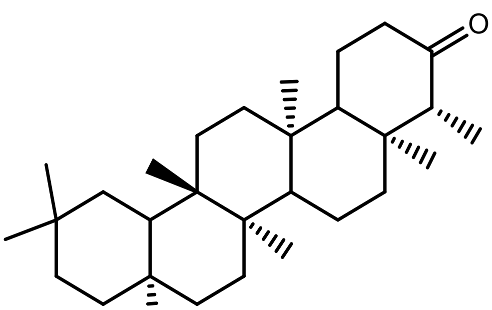

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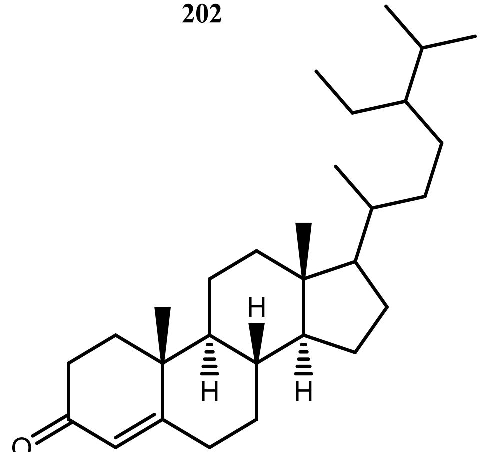

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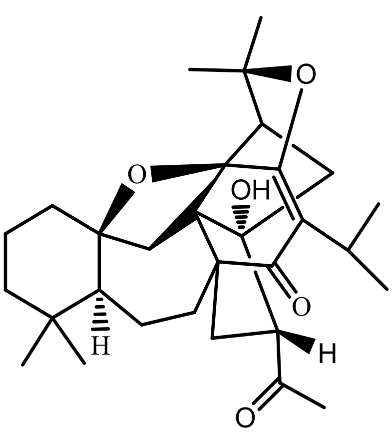

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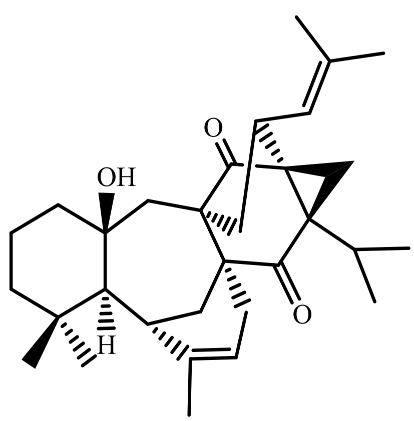

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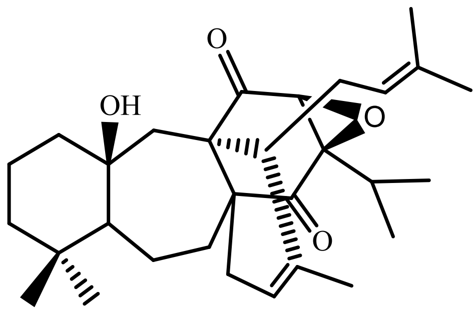

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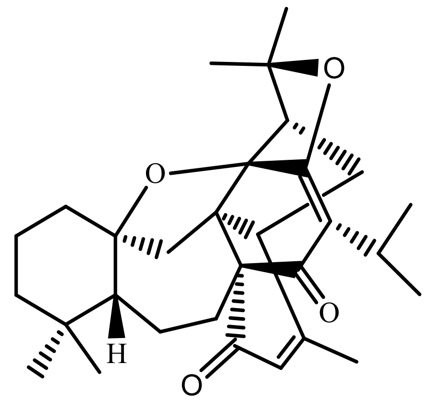

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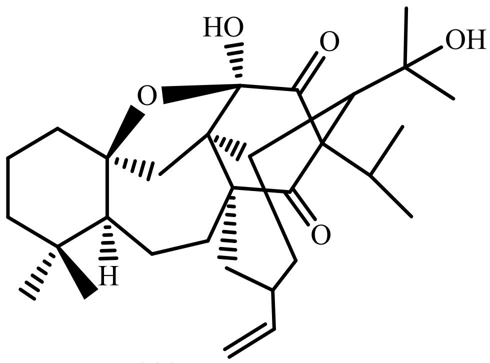

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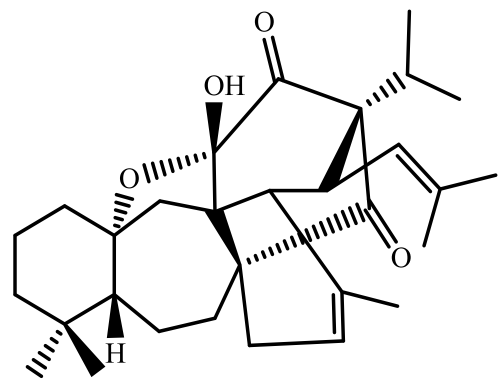
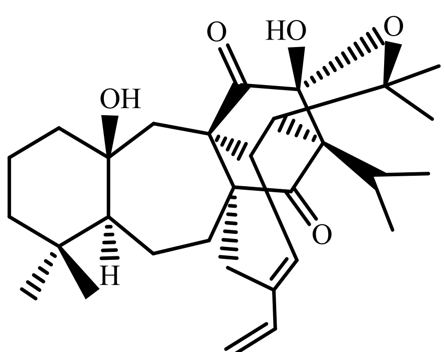
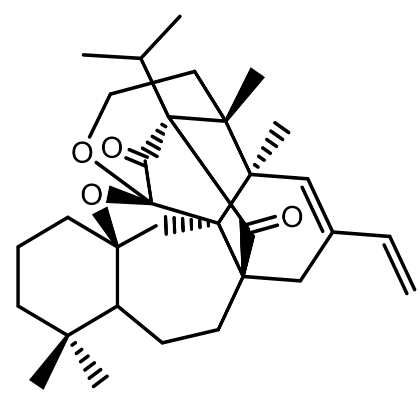


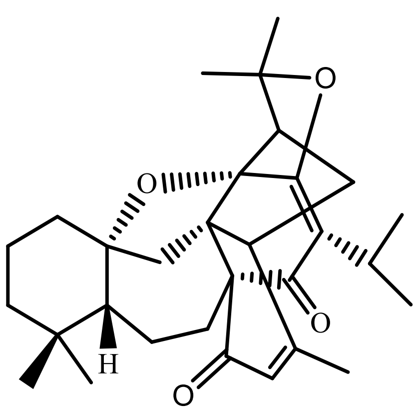
210



211



212



213

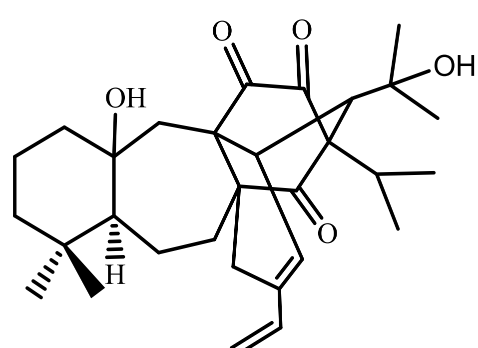


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FIG.5: MISCELLANEOUS TRITERPENOIDS

CONCLUSIONS: The present review deals with up to date literature on triterpenoid isolated from *Salvia* genus regarding exhibited by the plant extracts. We are quite optimistic that this review article will surely stimulate present day researcher to undertake more systematic research work on this important genus for isolation of triterpenoids.

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