Hailin Qin, Dequan Yu

^{1}H NMR Handbook of Natural Products

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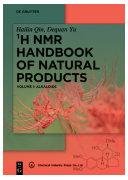

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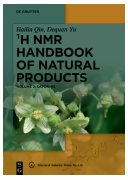

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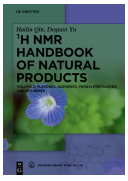

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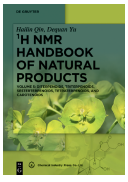

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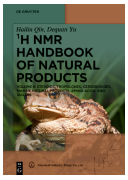

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Hailin Qin, Dequan Yu

^{1}H NMR Handbook of Natural Products

Volume 4: Monoterpenoids and Sesquiterpenoids

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8 Monoterpenoids

8.1 Acyclic monoterpenoids

Table 8-1-1: Compounds, MFs, and test solvents of acyclic monoterpenoids **8-1-1**~**8-1-48**.

No.	Compounds	MFs	Test solvents	References
8-1-1	7-hydroperoxy-5,6-*E*-dehydro-6,7-dihydronerol	$C_{10}H_{18}O_3$	$CDCl_3$	[1]
8-1-2	3,7-dimethyloct-1-en-6-one	$C_{10}H_{18}O$	$CDCl_3$	[2]
8-1-3	3,7-dimethyl-5-hydroxyoct-1-en-6-one	$C_{10}H_{18}O_2$	$CDCl_3$	[2]
8-1-4①	6(*S*)-hydroxy-2,6-dimethyl-2(*E*)-7-octadienoic acid	$C_{10}H_{16}O_3$	$CDCl_3$	[3]
8-1-5②	(+)-1-hydroxylinalool	$C_{10}H_{18}O_2$	$CDCl_3$	[3]
8-1-6	6-oxo-8-hydroxy-santolina-1,4-diene	$C_{10}H_{16}O_2$	$CDCl_3$	[4]
8-1-7	5,8-epoxy-4,6-dihydroxy-santolin-1-ene	$C_{10}H_{18}O_3$	$CDCl_3$	[4]
8-1-8	sachalinol A	$C_{10}H_{20}O_3$	CD_3OD	[5]
8-1-9	(3*S*,6*S*)-6,7-dihydroxy-6,7-dihydrolinalool	$C_{10}H_{20}O_3$	C_5D_5N	[6]
8-1-10	(3*S*,6*R*)-6,7-dihydroxy-6,7-dihydrolinalool	$C_{10}H_{20}O_3$	C_5D_5N	[6]
8-1-11	(2*E*,4*E*)-3,7-dimethyl-2,4-octadiene	$C_{10}H_{18}$	$CDCl_3$	[7]
8-1-12	deoxygeraniol	$C_{10}H_{18}$	$CDCl_3$	[8]
8-1-13	*trans*-5-hydroxy-2-isopropenyl-5-methylhex-3-en-1-ol	$C_{10}H_{18}O_2$	–	[9]
8-1-14	4-hydroxy-2-isopropenyl-5-methylene-hexan-1-ol	$C_{10}H_{18}O_2$	$CDCl_3$	[10]
8-1-15	rhodioloside E	$C_{21}H_{38}O_{11}$	CD_3OD	[11]
8-1-16	rhodioloside D	$C_{16}H_{30}O_8$	CD_3OD	[11]
8-1-17	rhodioloside C	$C_{22}H_{38}O_{12}$	CD_3OD	[11]
8-1-18	rhodioloside B	$C_{22}H_{38}O_{12}$	CD_3OD	[11]
8-1-19	rhodioloside F	$C_{21}H_{36}O_{11}$	CD_3OD	[12]
8-1-20	rhodioloside A	$C_{16}H_{28}O_8$	CD_3OD	[11]
8-1-21	(3*S*)-*O*-*α*-L-rhamnopyranosyl-(1→3)-[4-*O*-(*E*)-coumaroyl]-*α*-L-rhamnopyranosyl-(1→6)-*β*-D-glucopyranosyl-linalool	$C_{37}H_{54}O_{16}$	CD_3OD	[13]
8-1-22	(3*S*)-*O*-*α*-L-rhamnopyranosyl-(1→3)-[4-*O*-(*Z*)-coumaroyl]-*α*-L-rhamnopyranosyl-(1→6)-*β*-D-glucopyranosyl-linalool	$C_{37}H_{54}O_{16}$	CD_3OD	[13]
8-1-23	(3*S*)-3-*O*-(3′,4′-diangeloyl-*β*-D-glucopyranosyloxy)-7-hydroperoxy-3,7-dimethylocta-1,5-diene	$C_{26}H_{40}O_{10}$	$CDCl_3$	[14]
8-1-24	(3*S*)-3-*O*-(3′,4′-diangeloyl-*β*-D-glucopyranosyloxy)-6-hydroperoxy-3,7-dimethylocta-1,7-diene	$C_{26}H_{40}O_{10}$	$CDCl_3$	[14]
8-1-25	(3*S*)-8-hydroxy-6,7-dihydrolinallol 3-*O*-*β*-D-glucopyranoside	$C_{16}H_{30}O_7$	C_5D_5N	[6]
8-1-26	(3*S*,6*E*)-8-hydroxylinalool 3-*O*-*β*-D-(3-*O*-potassium sulfo)glucopyranoside	$C_{16}H_{27}KO_{10}S$	C_5D_5N	[6]

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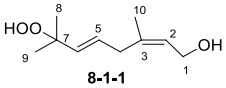
Table 8-1-1 (continued)

No.	Compounds	MFs	Test solvents	References
8-1-27	(3*S*,6*S*)-6,7-dihydroxy-6,7-dihydrolinalool 3-*O*-*β*-D-glucopyranoside	$C_{16}H_{30}O_8$	C_5D_5N	[6]
8-1-28	(3*S*,6*R*)-6,7-dihydroxy-6,7-dihydrolinalool 3-*O*-*β*-D-glucopyranoside	$C_{16}H_{30}O_8$	C_5D_5N	[6]
8-1-29	(3*S*,6*R*)-6,7-dihydroxy-6,7-dihydrolinalool-3-*O*-*β*-D-(3-*O*-potassium sulfo)-glucopyranoside	$C_{16}H_{29}KO_{11}S$	C_5D_5N	[6]
8-1-30	(2*E*,6*Z*)-2,6-dimethyl-8-*β*-D-glucosyloxy-2,6-octadienoic acid	$C_{16}H_{26}O_8$	CD_3COCD_3	[15]
8-1-31	(2*E*,6*R*)-2,6-dimethyl-8-hydroxy-2-octenoic acid 8-*O*-[6′-*O*-(*E*)-*p*-coumaroyl]-*β*-D-glucopyranoside	$C_{25}H_{34}O_{10}$	CD_3OD	[16]
8-1-32	kudingoside A	$C_{31}H_{44}O_{12}$	CD_3OD	[17]
8-1-33	kudingoside B	$C_{31}H_{44}O_{13}$	CD_3OD	[17]
8-1-34	portuloside A	$C_{16}H_{26}O_7$	C_5D_5N	[18]
8-1-35	3,7-dimethyl-2(*E*),6-octadien-5-one-1-*O*-*β*-D-glucoside	$C_{16}H_{26}O_7$	CD_3OD	[19]
8-1-36	3,7-dimethyl-3(*E*),6-octadien-5-one-1-*O*-*β*-D-glucoside	$C_{16}H_{26}O_7$	CD_3OD	[19]
8-1-37	2*α*-(3-methylbut-2-enyl)-3-methyl-2,5-dihydrofuran③	$C_{10}H_{16}O$	$CDCl_3$	[20]
8-1-38	2*β*-(3-methylbut-2-enyl)-3-methyl-2,5-dihydrofuran③	$C_{10}H_{16}O$	$CDCl_3$	[20]
8-1-39	2-hydroxy-2-(3-methylbut-2-enyl)-3-methyl-2,5-dihydrofuran③	$C_{10}H_{16}O_2$	$CDCl_3$	[20]
8-1-40	vitexoid	$C_{10}H_{16}O_3$	$CDCl_3$	[21]
8-1-41	sachalinol B	$C_{10}H_{18}O_3$	CD_3OD	[5]
8-1-42	sachalinol C	$C_{10}H_{18}O_3$	CD_3OD	[5]
8-1-43	1,10-oxy-*β*-myrcene hydroxide	$C_{10}H_{16}O_2$	$CDCl_3$	[10]
8-1-44	1,10-oxy-*α*-myrcene hydroxide	$C_{10}H_{16}O_2$	$CDCl_3$	[10]
8-1-45	sachalinoside B	$C_{16}H_{28}O_7$	CD_3OD	[5]
8-1-46	dissectol A	$C_{16}H_{26}O_7$	C_5D_5N	[22]
8-1-47	lappaceolide A	$C_{10}H_{12}O_6$	$CDCl_3$	[23]
8-1-48	lappaceolide B	$C_{10}H_{12}O_6$	$CDCl_3$	[23]

① Product of hydrolysis.
② Product of reduction.
③ Designation of original literature.



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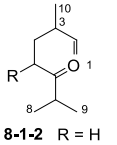
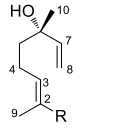
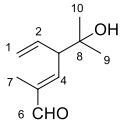


8-1-2 R = H
8-1-3 R = OH



8-1-4 R = COOH
8-1-5 R = CH_2OH



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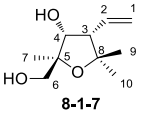

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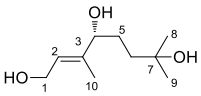

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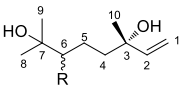
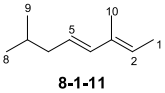


8-1-9 R = α-OH
8-1-10 R = β-OH



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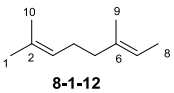

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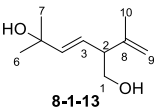

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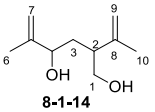

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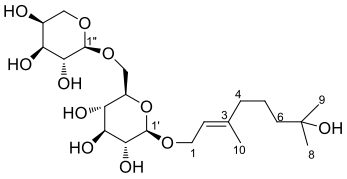

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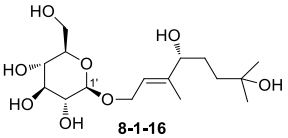

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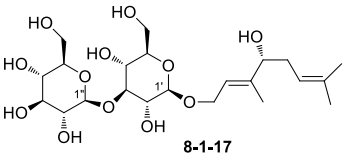

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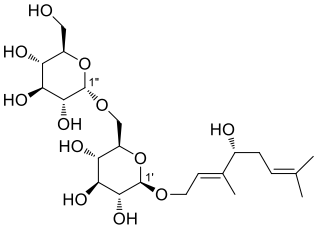

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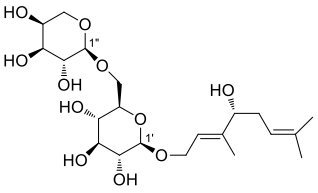

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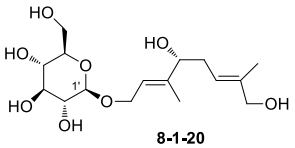

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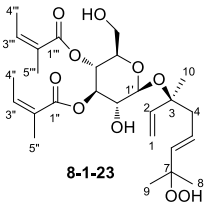

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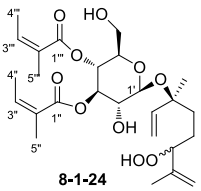
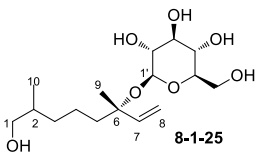


8-1-24



8-1-25

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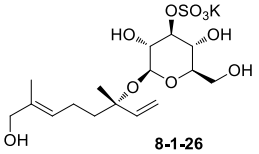
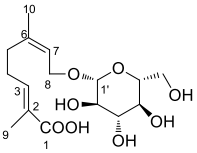
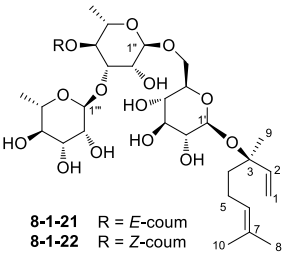


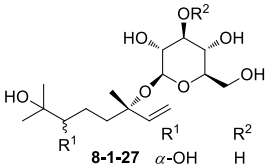
8-1-26



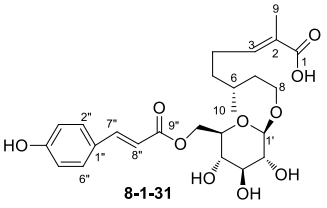
8-1-30



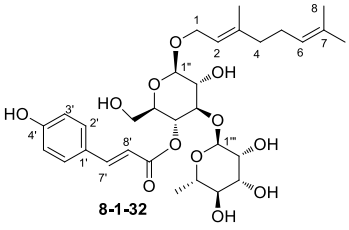
8-1-21 R = *E*-coum
8-1-22 R = *Z*-coum



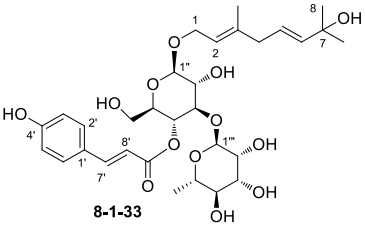
	R¹	R²
8-1-27	α-OH	H
8-1-28	β-OH	H
8-1-29	β-OH	SO_3K



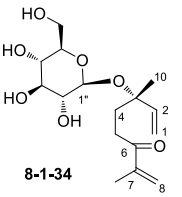
8-1-31



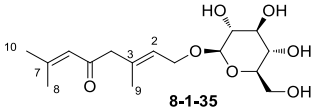
8-1-32



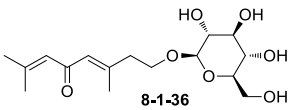
8-1-33



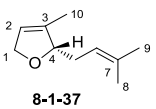
8-1-34



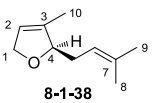
8-1-35



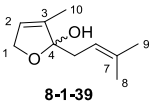
8-1-36



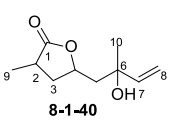
8-1-37



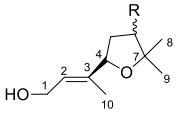
8-1-38



8-1-39



8-1-40



8-1-41 R = α-OH
8-1-42 R = β-OH

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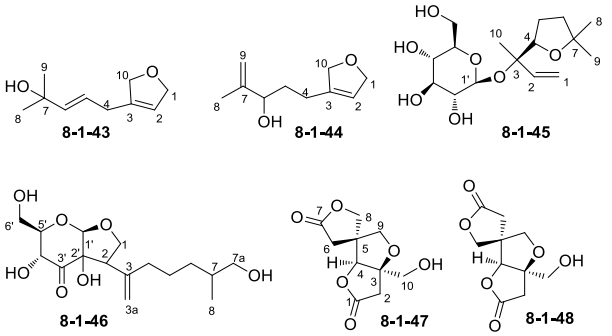

Table 8-1-2: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-1**~**8-1-5**.

H	8-1-1	8-1-2	8-1-3	8-1-4	8-1-5
1	4.59 dq(7.0, 1.0)	4.98 d(18)	5.05 d(18)		3.96 m(2H)
		4.90 d(10)	4.95 d(10)		
2	5.41 tqdd(7.0, 1.5, <1, <1)	5.70 ddd(18, 10, 10)	5.75 ddd(18, 10, 10)		
3		2.10 m	1.85~2.30 m	6.82 br s	5.40 ddq(5.7, 1.3)①
4	2.85 d(5)	2.15~2.35 m	1.85~2.30 m	2.21 m	2.06 m
5	5.65 dd(16, 5)	2.15~2.35 m	4.00 dd(6, 8)	1.62 m	1.56 m
6	5.57 d(16)				
7		2.70 sept(7)	2.65 sept(7)	5.89 dd(10.8, 17.3)	5.90 dd(10.8, 17.3)
8	1.32 s	0.90 d(7)	0.85 d(7)	5.21 dd(17.3, 0.7)	5.19 dd(17.3, 1.3)
				5.07 dd(10.8, 0.7)	5.04 dd(10.8, 1.3)
9	1.32 s	0.90 d(7)	0.85 d(7)	1.79 s	1.64 br s
10	1.75 dd(1.5, 1.0)	0.92 d(7)	0.95 d(7)	1.29 s	1.27 s
OH	1.64 s, 7.8 s				

① Two coupling constants were given in the original literature.

Table 8-1-3: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-6** and **8-1-7**.

H	8-1-6	8-1-7	H	8-1-6	8-1-7
1	5.23 br d(10)	5.24 dd(2, 10)	6	9.47 s	3.40 s
	5.16 ddd(17, 1.5, 1.5)	5.21 ddd(17, 2, 1)			
2	5.87 ddd(17, 10, 8)	5.96 ddd(10, 17, 9)	7	1.78 d(1.5)	1.28 s
3	3.27 br dd(10.5, 8)	2.65 dd(9, 6)	9	1.25 s	1.21 s
4	6.58 dq(10.5, 1.5)	4.11 d(6)	10	1.23 s	1.28 s

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Table 8-1-4: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-8**~**8-1-12**.

H	8-1-8	8-1-9	8-1-10	8-1-11	8-1-12
1	4.13 d(6.3)(2H)	5.13 dd(2.0, 11.0) 5.59 dd(2.0, 17.5)	5.14 dd(2.0, 10.5) 5.59 dd(2.0, 17.0)	1.70 d(7.6)	1.69 s
2	5.54 t(6.3)	6.21 dd(11.0, 17.5)	6.21 dd(10.5, 17.0)	5.44 q(7.6)	
3					5.11~5.16 m
4	3.81 t(6.6)	1.97 ddd(3.5, 13.0, 13.0) 2.43 ddd(3.5, 13.0, 13.0)	1.99 ddd(4.5, 13.0, 13.0) 2.42 ddd(4.5, 13.0, 13.0)	6.04 d(15.5)	1.99~2.08 (ov)
5	1.50 dd(6.8, 6.6)	1.94 dddd(3.5, 9.5, 13.0, 13.0) 2.20 dddd(2.0, 3.5, 13.0, 13.0)	1.94 dddd(4.5, 10.0, 13.0, 13.0) 2.20 dddd(2.0, 4.5, 13.0, 13.0)	5.54 dt(15.5, 7.5)	1.99~2.08 (ov)
6	1.56 dd(6.8, 6.6)	3.79 dd(2.0, 9.5)	3.78 dd(2.0, 10.0)	1.97 br t①	
7				1.63 m	5.11~5.16 m
8	1.17 s	1.48 s	1.50 s	0.89 d(7.6)	2.02 d(6.2)
9	1.16 s	1.51 s	1.51 s	0.89 d(7.6)	1.61 s
10	1.65 s	1.51 s	1.48 s	1.73 br s	1.61 s

① Coupling constant was not given in the literature.

Table 8-1-5: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-13**~**8-1-17**.

H	8-1-13	8-1-14	8-1-15	8-1-16	8-1-17
1	3.67 dd(10.7, 7.5) 3.59 dd(10.7, 7.1)	3.59 dd(10.5, 6.9) 3.58 dd(10.5, 6.8)	4.35 dd(11.7, 6.5) 4.21 dd(11.7, 7.4)	4.38 dd(12.3, 6.2) 4.31 dd(12.3, 7.2)	4.37 dd(12.2, 6.2) 4.30 dd(12.2, 7.3)
2	2.90 ddd(7.5, 7.5, 7.1)	2.53 dddd(7.3, 7.3, 6.9, 6.8)	5.39 t(6.9)	5.59 dd(7.2, 6.2)	5.57 t(6.9)
3	5.58 dd(15.8, 7.5)	1.65, 1.60			
4	5.75 d(15.8)	4.07 dd(9.6, 3.2)	2.05 t(7.2)	3.94 t(6.6)	3.97 t(6.7)
5			1.52 m	1.61 dt(9.4, 6.6)	2.24 t(6.7)
6	1.33 s	1.74 s	1.43 m	1.53 m, 1.36 m	5.10 t(7.1)
7	1.33 s	4.97 s, 4.83 t(1.1)			
8			1.17 s	1.18 s	1.62 s
9	4.92 s, 4.82 s	4.94 t(1.6), 4.87 s	1.17 s	1.17 s	1.69 s

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Table 8-1-5 (continued)

H	8-1-13	8-1-14	8-1-15	8-1-16	8-1-17
10	1.73 s	1.73 s	1.69 s	1.67 s	1.67 s
1′			4.29 d(7.8)	4.30 d(7.8)	4.37 d(7.8)
2′			3.18 dd(9.4, 7.8)	3.18 dd(9.1, 7.8)	3.39 t(8.0)
3′			3.33(ov)	3.35(ov)	3.54 t(8.7)
4′			3.35(ov)	3.28 t(9.4)	3.42 t(9.6)
5′			3.40 ddd(8.9, 5.6, 2.3)	3.25 m	3.30 m
6′			4.09 dd(11.3, 2.3)	3.86 dd(11.4, 2.0)	3.88 dd(11.8, 2.0)
			3.73 dd(11.4, 5.6)	3.67 dd(11.4, 5.5)	3.69 dd(11.8, 5.6)
1″			4.32 d(6.7)		4.55 d(7.5)
2″			3.59 dd(8.7, 6.7)		3.28 dd(8.0, 9.4)
3″			3.52 dd(8.7, 3.3)		3.39 t(8.6)
4″			3.81 td(3.3, 1.9)		3.31(ov)
5″			3.86 dd(12.4, 3.3)		3.32 m
			3.53 dd(12.4, 1.9)		
6″					3.88 dd(11.8, 2.0)
					3.65 dd(11.8, 6.2)

Table 8-1-6: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-18**~**8-1-22**.

H	8-1-18	8-1-19	8-1-20	8-1-21	8-1-22
1	4.36 dd(12.4, 6.2)	4.26 dd(6.8, 12.4)	4.37 dd(12.4, 6.2)	5.21 m	5.20 m
	4.28 dd(12.4, 7.3)	4.29 dd(6.8, 12.4)	4.30 dd(12.4, 7.2)		
2	5.58 dd(6.2, 7.3)	5.49 t(6.8)	5.59 dd(7.2, 6.2)	6.06 dd(10.7, 18.0)	6.04 dd(10.7, 18.0)
4	3.97 t(7.0)	3.89 t(6.6)	4.02 t(6.6)	1.62 m	1.61 m
5	2.24 t(6.6)	2.16 t(6.6)	2.30 t(6.9)	2.04 m	2.04 m
6	5.10 m	5.02 t(6.6)	5.40 t(6.9)	5.08 t(7.0)	5.09 t(7.3)
8	1.62 s	1.54 s	3.92 s	1.56 s	1.58 s
9	1.69 s	1.61 s	1.66 s	1.34 s	1.33 s
10	1.67 s	1.59 s	1.68 s	1.61 s	1.65 s
1′	4.34 d(7.8)	4.23 d(8.0)	4.29 d(7.8)	4.33 d(7.8)	4.32 d(7.8)
2′	3.20 dd(9.0, 7.8)	3.12 t(8.0)	3.18 dd(8.9, 7.8)	3.18 dd(7.8, 8.9)	3.17 dd(7.9, 9.0)

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Table 8-1-6 (continued)

H	8-1-18	8-1-19	8-1-20	8-1-21	8-1-22
3′	3.36 m	3.32 m	3.35 t(8.9)	3.32①	3.31①
4′	3.43 t(9.6)	3.28(ov)	3.28 t(8.9)	3.27①	3.23①
5′	3.44 m	3.28(ov)	3.25 ddd(8.9, 5.6, 2.0)	3.27①	3.26①
6′	4.00 dd(10.7, 4.1), 3.71 dd(10.7, 1.6)	3.66 dd(5.2, 10.6), 4.01 br d(10.6)	3.86 dd(11.9, 2.0), 3.66 dd(11.9, 5.6)	3.56 dd(6.0, 10.4), 3.93 dd(3.6, 10.4)	3.54 dd(6.2, 10.5), 3.92 dd(3.3, 10.5)
1″	4.84 d(3.6)	4.24 d(6.8)		4.77 br s	4.75 br s
2″	3.37 dd(3.6, 9.6)	3.52 dd(6.8, 8.0)		3.98①	3.95①
3″	3.66 t(8.9)	3.47 dd(3.6, 8.0)		4.00①	3.90①
4″	3.68 t(9.9)	3.74 br s		5.18 t(9.6)	5.12 t(9.8)
5″	3.30 m	3.46 dd(3.2, 12.0) 3.79 dd(2.4, 12.0)		3.95 dq(9.6, 6.2)	3.86 dq(9.8, 6.2)
6″	3.80 dd(9.4, 4.3) 3.69 (ov)			1.16 d(6.2)	1.16 d(6.2)
1‴				4.82 d(1.5)	4.79 br s
2‴				3.68 dd(1.5, 3.3)	3.71①
3‴				3.70 dd(3.3, 9.4)	3.70①
4‴				3.35①	3.32①
5‴				3.77 dq(9.4, 6.2)	3.77 dq(9.4, 6.3)
6‴				1.24 d(6.2)	1.24 d(6.2)
2⁗				6.33 d(15.9)	5.77 d(12.9)
3⁗				7.65 d(15.9)	6.92 d(12.9)
5⁗, 9⁗				7.47 d(8.6)	7.69 d(8.7)
6⁗, 8⁗				6.80 d(8.6)	6.76 d(8.7)

① Splitting informations were not given in the literature.

Table 8-1-7: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-23**~**8-1-27**.

H	8-1-23	8-1-24	8-1-25	8-1-26	8-1-27
1	*trans* 5.24 dd (17.6, 0.9)	*trans* 5.23 d (17.3)	5.20 dd(1.5, 11.0)	5.25 br d(11.0)	5.16 br d(11.0)
	cis 5.26 dd(10.8, 0.9)	*cis* 5.24 d(11.1)	5.37 dd(1.5, 17.5)	5.35 br d(17.5)	5.39 br d(17.5)
2	5.88 dd(17.6, 10.8)	5.82 dd(17.3, 11.1)	6.28 dd(11.0, 17.5)	6.24 dd(11.0, 17.5)	6.33 dd(11.0, 17.5)

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Table 8-1-7 (continued)

H	8-1-23	8-1-24	8-1-25	8-1-26	8-1-27
4	2.35 dd(13.6, 7.4) 2.41 dd(13.6, 7.4)	1.54~1.68 m	1.74 m(2H)	1.76 m	1.99 ddd(3.5, 13.0, 13.0), 2.51 ddd(3.5, 13.0, 13.0)
5	5.73 dt(15.9, 7.4)	1.54~1.68	1.60~1.71 m(2H)	2.30 m	1.92 dddd (3.5, 8.5, 13.0, 13.0) 2.28 dddd (3.5, 6.0, 13.0, 13.0)
6	5.59 d(15.9)	4.32 br t (5.4)①	1.19 m, 1.61 m	5.65 dd(7.0, 7.0)	3.77 dd(6.0, 8.5)
7			1.78 m		
8	1.31 s	4.99 s①, 5.00 s①	3.63 dd(7.0, 9.5) 3.72 dd(7.0, 9.5)	4.26 br s	1.46 s
9	1.33 s	1.72 s	1.028 d(7.0)	1.75 s	1.50 s
10	1.40 s	1.38 s	1.58 s	1.51 s	1.62 s
OH	2.82 br s(2′-OH) 2.54 br s(6′-OH)	2.83 br s(2′-OH) 2.52 br s(6′-OH)			
OOH	8.07 br s(7-OOH)	8.20 br s(6-OOH)			
1′	4.56 d(8.0)	4.58 d(7.9)	4.99 d(7.5)	4.91 d(8.0)	5.04 d(8.0)
2′	3.60 br m	3.60 br m	–	–	–
3′	5.29 t(9.6)	5.33 t(9.6)	4.24 dd(8.0, 8.0)	5.24 dd(8.0, 8.0)	4.22 dd(8.0, 8.0)
4′	5.09 t(9.6)	5.07 t(9.6)	–	–	–
5′	3.50 ddd(9.9, 5.1, 2.6)	3.50 ddd(9.6, 4.8, 2.0)	–	–	–
6′	3.60 br m, 3.67 br m	3.60 br m, 3.67 br m	–	–	–
3″	6.08 m	6.08 m			
4″	1.91 d(7.1)	1.92 d(7.0)			
5″	1.83 m	1.84 br s			
3‴	6.08 m	6.08 m			
4‴	1.92 d(7.1)	1.92 d(7.0)			
5‴	1.80 m	1.81 br s			

① Typographic errors exist in the literature, and the assignments were made according to the structure.

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Table 8-1-8: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-28**~**8-1-31**.

H	8-1-28	8-1-29	8-1-30	8-1-31
1	5.16 dd(2.0, 11.0), 5.41 dd(2.0, 17.5)	5.15 dd(1.5, 11.0), 5.36 dd(1.5, 17.5)		
2	6.30 dd(11.0, 17.5)	6.29 dd(11.0, 17.5)		
3			6.76 br t(6.8)	6.72 br t(7.3)
4	1.90 ddd(4.0, 13.0, 13.0) 2.56 ddd(4.0, 13.0, 13.0)	1.91 ddd(3.5, 13.0, 13.0) 2.51 ddd(3.5, 13.0, 13.0)	2.23 m	2.17 m
5	2.04 dddd(4.0, 9.5, 13.0, 13.0) 2.20 dddd(4.0, 4.0, 13.0, 13.0)	1.99 dddd(3.5, 8.5, 13.0, 13.0) 2.20 dddd(3.5, 8.5, 13.0, 13.0)	2.20 m	1.25 m 1.44 m
6	3.73 dd(4.0, 9.5)	3.74 dd(3.5, 8.5)		1.61 m
7			5.38 br t(6.4)	1.44 m, 1.67 m
8	1.46 s	1.46 s	4.30 dd(12.0, 7.5) 4.16 dd(12.0, 6.4)	3.62 m 3.86 m
9	1.49 s	1.48 s	1.77 s	1.78 s
10	1.62 s	1.53 s	1.81 s	0.90 d(6.6)
1′	5.06 d(8.5)	5.00 d(7.5)	4.28 d(7.5)	4.27 d(7.8)
2′	–	–	3.15 t(8.0)	3.19 dd(9.0, 7.8)
3′	4.24 dd(8.0, 8.0)	5.26 dd(9.0, 9.0)	3.34 m	3.31 m
4′	–	–	3.34 m	3.31 m
5′	–	–	3.34 m	3.52 m
6′	–	–	3.82 dd(11.7, 2.5) 3.63 dd(11.7, 5.3)	4.35 dd(11.7, 6.1) 4.48 dd(11.7, 2.2)
2″, 6″				7.45 d(8.5)
3″, 5″				6.80 d(8.5)
7″				7.64 d(15.9)
8″				6.35 d(15.9)

Table 8-1-9: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-32**~**8-1-34**.

H	8-1-32	8-1-33	8-1-34
1	4.27 dd(12.0, 7.5) 4.35 dd(12.0, 5.5)	4.27 br dd(12.0, 7.5) 4.38 br dd(12.0, 6.5)	5.17 d(11) 5.40 d(17.6)
2	5.38 m	5.43 m	6.22 dd(17.6, 11.0)
4	2.06 m	2.75 br d(5.4)	3.02 t(7.9)
5	2.06 m, 2.13 m	5.61 dd(16.0, 6.0)	2.11 dt(14.0, 7.9) 2.15 dt(14.0, 7.9)
6	5.12 m	5.64 d(16.0)	
8	1.69 br s	1.28 s	5.58 s, 5.91 s
9	1.62 br s	1.28 s	1.82 s
10	1.69 br s	1.69 s	1.54 s

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Table 8-1-9 (continued)

H	8-1-32	8-1-33	8-1-34
2′,6′	7.46 d(8.5)	7.46 d(8.5)	
3′,5′	6.82 d(8.5)	6.81 d(8.5)	
7′	7.66 d(16.0)	7.66 d(16.3)	
8′	6.34 d(16.0)	6.33 d(16.3)	
1″	4.37 d(8.0)	4.37 d(8.0)	4.93 d(7.8)
2″	3.40 dd(9.0, 8.0)	3.40 dd(9.0, 8.0)	4.27 dd(7.8, 7.8)
3″	3.82 t(9.0)	3.82 t(9.0)	4.17 m
4″	4.92 t(9.5)	4.92 t(9.0)	4.17 m
5″	3.53~3.62 m	3.52 m	3.81 m
6″	3.53~3.62 m	3.56~3.62 m	3.97 m, 4.43 dd(11.7, 2.7)
1‴	5.20 d(1.5)	5.20 d(1.6)	
2‴	3.92 dd(3.0, 1.5)	3.92 dd(3.1, 1.6)	
3‴	3.57 m	3.58 dd(9.4, 3.1)	
4‴	3.29 t(9.5)	3.29 t(9.4)	
5‴	3.57 m	3.56~3.62 m	
6‴	1.09 d(6.0)	1.09 d(6.3)	

Table 8-1-10: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-35**~**8-1-39**.

H	8-1-35	8-1-36	8-1-37	8-1-38	8-1-39
1	4.37 dd(12.2, 6.1) 4.29 m	4.06 ddd(10.0, 6.7, 6.7) 3.71 ddd(10.0, 6.7, 6.7)	4.55 d(7.0)	4.55 d(7.0)	4.63 d(7.0)
2	5.50 m	2.48 br t(6.7)	5.07 td(8.0, 1.0)	5.05 t(8.0)	5.00 t(7.0)
4	3.14 br s	6.20 m	4.04 td(8.0, 1.0)	4.04 td(7.0, 7.0)	
5			2.30 m	2.30 m	2.30 m
6	6.22 m	6.15 m	5.32 t(7.0)	5.32 t(7.0)	5.32 t(7.0)
8	2.13 d(1.2)	2.13 d(1.2)	1.60 s	1.60 s	1.58 s
9	1.68 br s	2.15 d(1.2)	1.67 s	1.67 s	1.66 s
10	1.91 d(1.2)	1.91 d(1.2)	2.05 s	2.04 s	2.04 s
1′	4.30 d(7.8)	4.27 d(7.8)			
6′	3.86 dd(12.0, 2.2) 3.66 dd(12.0, 5.5)	3.87 dd(11.8, 1.7) 3.65 dd(11.8, 1.4)			

Table 8-1-11: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-40**~**8-1-45**.

H	8-1-40	8-1-41	8-1-42	8-1-43	8-1-44	8-1-45
1		4.15 d(6.6)	4.12 d(6.6)	4.56 s	4.57 s	5.20 dd(17.3, 1.5) 4.98 dd(10.7, 1.5)
2	2.66 m	5.65 t(6.6)	5.65 t(6.6)	5.68 m	5.68 s	6.00 dd(17.3, 10.7)

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Table 8-1-11 (continued)

H	8-1-40	8-1-41	8-1-42	8-1-43	8-1-44	8-1-45
3	2.05 m, 2.13 m					
4	4.75 m	4.50 t(8.1)	4.30 dd(9.3, 6.6)	2.75 d(6.9)	2.13, 2.05	4.07 t(7.8)
5	1.79 dd(3.4, 14.7) 1.95 dd(9.4, 14.7)	2.06 ddd(12.9, 8.1, 6.1) 1.99 ddd(12.9, 8.1, 3.9)	2.35 ddd(12.7, 7.1, 6.6) 1.75 ddd(12.7, 9.3, 7.1)	5.60 m	1.71	1.90 m(2H)
6		3.95 dd(6.1, 3.9)	4.00 t(7.1)	5.69 d(16.0)	4.10 t(7.0)	1.87 m
7	5.92 dd(10.7, 17.3)					
8	5.15 dd(1.1, 10.7) 5.35 dd(1.1, 17.3)	1.20 s	1.18 s	1.32 s	1.74 s	1.21 s
9	1.25 d(7.4)	1.22 s	1.22 s	1.32 s	4.96 s, 4.87 s	1.25 s
10	1.33 s	1.61 s	1.65 s	4.44 s	4.48 s	1.31 s
1′						4.55 d(7.6)
2′						3.14 t(7.6)
3′						3.34~3.50 m
4′						3.34~3.50 m
5′						3.34~3.50 m
6′						3.82 dd(12.0, 2.0) 3.62 dd(12.0, 5.0)

Table 8-1-12: ^{1}H NMR spectroscopic data of acyclic monoterpenoids **8-1-46**~**8-1-48**.

H	8-1-46	8-1-47	8-1-48
1	*α* 4.57 dd(9.5, 12.5) *β* 4.54 dd(9.5, 12.5)		
2	3.84 t(9.5)	2.70 d(19.2), 2.79 d(19.2)	2.68 d(19.2), 2.82 d(19.2)
3a	4.99 s, 5.09 s		
4	1.97 m	4.78 br s	4.78 br s
5	1.34 m		
6	0.96 m 1.36 m	2.42 d(18.4) 3.02 d(18.4)	2.61 d(18.0) 2.75 dd(18.0, 1.2)
7	1.65 m		
7a	3.54 dd(5.7, 10.4) 3.62 dd(5.7, 10.4)		

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Table 8-1-12 (continued)

H	8-1-46	8-1-47	8-1-48
8	0.88 d(7.4)	4.26 d(9.6), 4.34 dd(9.6, 1.2)	4.15 d(10.4), 4.63 d(10.4)
9		3.80 dd(9.6, 1.2), 4.12 d(9.6)	3.85 dd(9.6, 1.2), 4.05 d(9.6)
10		3.72 d(11.6), 3.86 d(11.6)	3.73 d(11.6), 3.83 d(11.6)
1′	5.52 s		
4′	5.36 d(10.0)		
5′	3.90 br d(10.0)		
6′	4.43 m		

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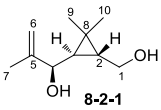
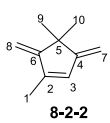
8.2 Monocyclic monoterpenoids

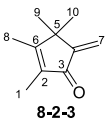
Table 8-2-1: Compounds, MFs, and test solvents of monocyclic monoterpenoid **8-2-1**~**8-2-5**.

No.	Compounds	MFs	Test solvents	References
8-2-1	(2*R*,3*R*,4*R*)-5-chrysanthemen-1,4-diol	$C_{10}H_{18}O_2$	$CDCl_3$	[24]
8-2-2	3,5-dimethylene-1,4,4-trimethylcyclopentene	$C_{10}H_{14}$	$CDCl_3$	[25]
8-2-3	5-methylene-2,3,4,4-tetramethylcyclopent-2-enone	$C_{10}H_{14}O$	$CDCl_3$	[25]
8-2-4	3,4,5,5-tetramethyl-1,3-cyclopentadienecarboxylic acid	$C_{10}H_{14}O_2$	$CDCl_3$	[25]
8-2-5	3,4,5,5-tetramethyl-1,3-cyclopentadienecarboxaldehyde	$C_{10}H_{14}O$	$CDCl_3$	[25]

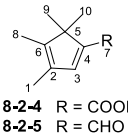


8-2-1


8-2-2



8-2-3



8-2-4 R = COOH
8-2-5 R = CHO

Table 8-2-2: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-1**~**8-2-5**.

H	8-2-1	8-2-2	8-2-3	8-2-4	8-2-5
1	3.52 dd(12.0, 11.0) 3.69 dd(12.0, 5.5)	1.91 d(1.6)	1.77 d(0.8)	1.86 m	1.92 m
2	0.80 ddd(11.0, 5.5, 5.0)				
3	0.70 dd(10.0, 5.0)	6.20 s		7.24 s	7.08 s
4	3.68 d(10.0)				
6	4.98 br s, 4.80 br s				
7	1.70 s	4.74 d(1.5), 4.86 s	5.99 s, 5.27 s		9.60 s
8		4.64 s, 4.82 s	1.97 d(0.8)	1.79 m	1.83 m
9	1.22 s	1.11 s	1.22 s	1.16 s	1.18 s
10	1.12 s	1.11 s	1.22 s	1.16 s	1.18 s

Table 8-2-3: Compounds, MFs, and test solvents of monocyclic monoterpenoid **8-2-6**~**8-2-64**.

No.	Compounds	MFs	Test solvents	References
8-2-6	(1*R*,2*R*,4*S*)-*p*-menthane-1,2,8-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-7	*trans*-*p*-menthane-1α,2β,8-triol	$C_{10}H_{20}O_3$	C_5D_5N	[27]
8-2-8	(1*S*,2*S*,4*R*,8*R*)-*p*-menthane-1,2,8-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-9	(1*S*,2*S*,4*S*,8*R*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]

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Table 8-2-3 (continued)

No.	Compounds	MFs	Test solvents	References
8-2-10	(1*S*,2*S*,4*S*,8*S*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-11	(1*S*,2*R*,4*R*,8*S*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-12	(1*S*,2*R*,4*R*,8*R*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-13	*rel*-(1*R*,2*S*,4*R*,8*S*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-14	*rel*-(1*R*,2*S*,4*R*,8*R*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-15	*rel*-(1*S*,2*S*,4*R*,8*S*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-16	*rel*-(1*S*,2*S*,4*R*,8*R*)-*p*-menthane-2,8,9-triol	$C_{10}H_{20}O_3$	C_5D_5N	[26]
8-2-17	longifone	$C_{10}H_{17}ClO_2$	$CDCl_3$	[28]
8-2-18	(1*R**,2*S**,3*R**,4*R**,6*S**)-1,2,3,6-tetrehydroxy-*p*-menthane	$C_{10}H_{20}O_4$	$CDCl_3$	[29]
8-2-19	(1*S**,2*S**,3*S**,4*R**,6*R**)-1,2,3,6-tetrahydroxy-*p*-menthane	$C_{10}H_{20}O_4$	$CDCl_3$	[29]
8-2-20	*rel*-(1*S*,2*R*,4*R*,8*S*)-*p*-menthane-1,2,8,9-tetrol	$C_{10}H_{20}O_4$	C_5D_5N	[30]
8-2-21	*rel*-(1*S*,2*R*,4*R*,8*R*)-*p*-menthane-1,2,8,9-tetrol	$C_{10}H_{20}O_4$	C_5D_5N	[30]
8-2-22	(1*S*,2*S*,4*R*,8*S*)-*p*-menthane-1,2,8,9-tetrol	$C_{10}H_{20}O_4$	C_5D_5N	[30]
8-2-23	(1*R*,2*S*,4*R*,8*R*)-*p*-menthane-1,2,8,9-tetrol	$C_{10}H_{20}O_4$	C_5D_5N	[30]
8-2-24	*rel*-(1*R*,2*R*,4*R*,8*S*)-*p*-menthane-1,2,8,9-tetrol	$C_{10}H_{20}O_4$	C_5D_5N	[30]
8-2-25	4*β*H-*cis*-*p*-menthane-2*α*,6*α*,8,9-tetrol	$C_{10}H_{20}O_4$	C_5D_5N	[30]
8-2-26	comosoxide A	$C_{10}H_{16}O_2$	CD_3OD	[31]
8-2-27	*trans*-*p*-menth-2-ene-1*α*,7,8-triol	$C_{10}H_{18}O_3$	C_5D_5N	[27]
8-2-28	*cis*-*p*-menth-2-ene-1*α*,7,8-triol	$C_{10}H_{18}O_3$	C_5D_5N	[27]
8-2-29	comosoxide B	$C_{10}H_{16}O_2$	CD_3OD	[31]
8-2-30	(+)-(1*S**,2*R**,6*S**)-trihydroxy-*p*-menth-3-ene	$C_{10}H_{18}O_3$	$CDCl_3$	[32]
8-2-31	(+)-(1*R**,2*R**,6*S**)-trihydroxy-*p*-menth-3-ene	$C_{10}H_{18}O_3$	$CDCl_3$	[32]
8-2-32	(4*S*,8*S*)-8,9-dihydroxy-8,9-dihydrocarvone	$C_{10}H_{16}O_2$	C_5D_5N	[30]
8-2-33	(4*S*,8*R*)-8,9-dihydroxy-8,9-dihydrocarvone	$C_{10}H_{16}O_2$	C_5D_5N	[30]
8-2-34	(+)-(1*S**,2*R**,4*R**)-trihydroxy-*p*-menth-5-ene	$C_{10}H_{18}O_3$	$CDCl_3$	[33]
8-2-35	(–)-(1*S**,2*S**,4*R**)-trihydroxy-*p*-menth-5-ene	$C_{10}H_{18}O_3$	$CDCl_3$	[33]
8-2-36	(1*R**,2*S**)-1,2-dihydroxy-*p*-menth-4(8)-en-3-one	$C_{10}H_{16}O_3$	$CDCl_3$	[34]
8-2-37	(4*S**)-4-methoxy-*p*-mentha-1,8-dien-3-one	$C_{11}H_{16}O_2$	$CDCl_3$	[34]
8-2-38	(3*R**,4*R**,6*S**)-3-acetoxy-6-hydroxy-*p*-mentha-1,8-diene	$C_{12}H_{18}O_3$	$CDCl_3$	[34]
8-2-39	(–)-(1*R*,4*S*)-*p*-mentha-2,8-dien-1-hydroperoxide	$C_{10}H_{16}O_2$	$CDCl_3$	[35]
8-2-40	(–)-(1*S*,4*S*)-*p*-mentha-2,8-dien-1-hydroperoxide	$C_{10}H_{16}O_2$	$CDCl_3$	[35]
8-2-41	(–)-(2*S*,4*S*)-*p*-mentha-1(7),8-dien-2-hydroperoxide	$C_{10}H_{16}O_2$	$CDCl_3$	[35]
8-2-42	(–)-(2*R*,4*S*)-*p*-mentha-1(7),8-dien-2-hydroperoxide	$C_{10}H_{16}O_2$	$CDCl_3$	[35]
8-2-43	(1*S*,2*S*,4*R*,8*R*)-*p*-menthane-1,2,8,9-tetrol 2-*O*-*β*-D-glucopyranoside	$C_{16}H_{30}O_9$	C_5D_5N	[30]
8-2-44	*rel*-(1*R*,2*R*,4*R*,8*S*)-*p*-menthane-1,2,8,9-tetrol 9-*O*-*β*-D-glucopyranoside	$C_{16}H_{30}O_9$	C_5D_5N	[30]
8-2-45	(1*S*,4*S*,8*S*)-8,9-dihydroxytetrahydrocarvone 9-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_8$	C_5D_5N	[36]

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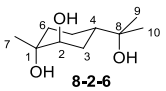
Table 8-2-3 (continued)

No.	Compounds	MFs	Test solvents	References
8-2-46	(1*R*,2*R*)-*p*-menth-3-ene-1,2-diol 1-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[37]
8-2-47	thymuside A	$C_{16}H_{26}O_7$	C_5D_5N	[37]
8-2-48	(1*R*,2*R*)-*p*-menth-4(5)-ene-1,2-diol 1-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[37]
8-2-49	(1*R*,2*R*)-*p*-menth-4(5)-ene-1,2-diol-1 *O*-*β*-D-(6-*O*-acetyl)-glucopyranoside	$C_{18}H_{30}O_8$	C_5D_5N	[37]
8-2-50	(1*S*,2*R*,4*R*)-*p*-menth-5-ene-1,2-diol 1-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[38]
8-2-51	(1*S*,2*S*,4*R*)-*p*-menth-8-ene-1,2-diol 1-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[36]
8-2-52	(1*S*,2*R*,4*R*)-*p*-menth-5-ene-1,2-diol 2-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[38]
8-2-53	(1*S*,2*R*,4*S*)-*p*-menth-5-ene-1,2,4-triol 2-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_8$	C_5D_5N	[38]
8-2-54	(1*S*,2*R*,4*R*)-*p*-menth-8-ene-2,10-diol 2-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[30]
8-2-55	(3*R*,4*S*,6*R*)-*p*-menth-1-ene-3,6-diol 3-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[38]
8-2-56	(3*R*,4*R*,6*R*)-*p*-menth-1-ene-3,4,6-triol 3-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_8$	C_5D_5N	[38]
8-2-57	(4*S*,6*S*)-*p*-menth-1-ene-4,6-diol 4-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[38]
8-2-58	(3*S*,4*S*,6*R*)-*p*-menth-1-ene-3,6-diol 6-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[38]
8-2-59	(4*R*)-*p*-menth-1-ene-7,8-diol 7-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[38]
8-2-60	(–)-oleuropeic acid 8-*O*-*β*-D-glucopyranoside	$C_{16}H_{26}O_8$	C_5D_5N	[39]
8-2-61	limonen-10-ol 10-*O*-*β*-D-glucopyranoside	$C_{16}H_{26}O_6$	C_5D_5N	[40]
8-2-62	comososide	$C_{16}H_{24}O_7$	CD_3OD	[31]
8-2-63	(8*R*)-9-hydroxycuminyl *β*-D-glucopyranoside	$C_{16}H_{24}O_7$	C_5D_5N	[38]
8-2-64	8-hydroxycuminyl *β*-D-glucopyranoside	$C_{16}H_{24}O_7$	C_5D_5N	[38]



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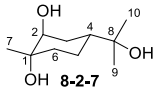

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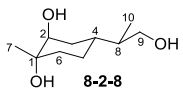

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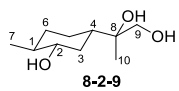

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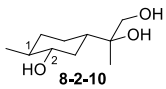

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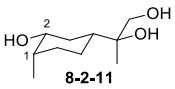
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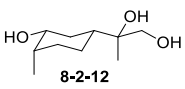
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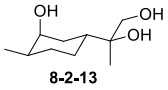
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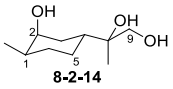
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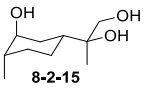
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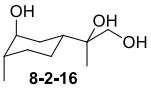
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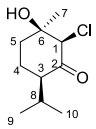
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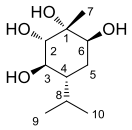
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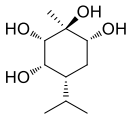
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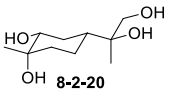
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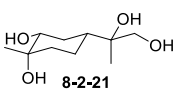
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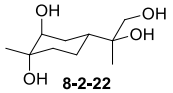
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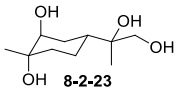
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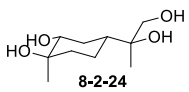
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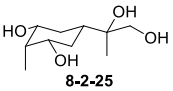
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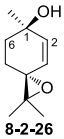
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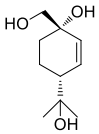
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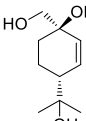
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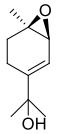
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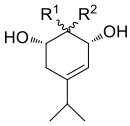
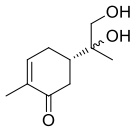
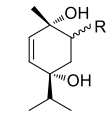
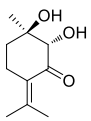

8-2-30 β-Me α-OH
8-2-31 α-Me β-OH


8-2-32 8*S*
8-2-33 8*R*


8-2-34 R = α-OH
6-2-35 R = β-OH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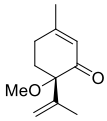
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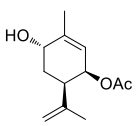
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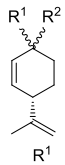
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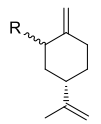
8-2-40 β-OOH α-Me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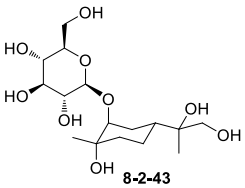
8-2-42 R = β-OOH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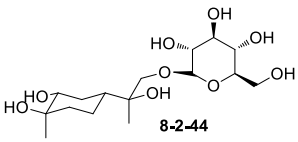
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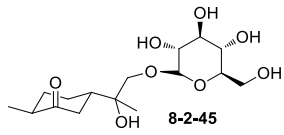
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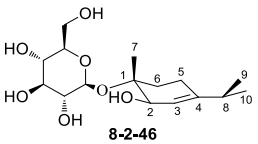
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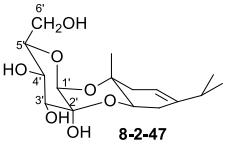
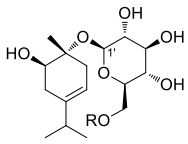

8-2-47


8-2-48 R = H
8-2-49 R = Ac

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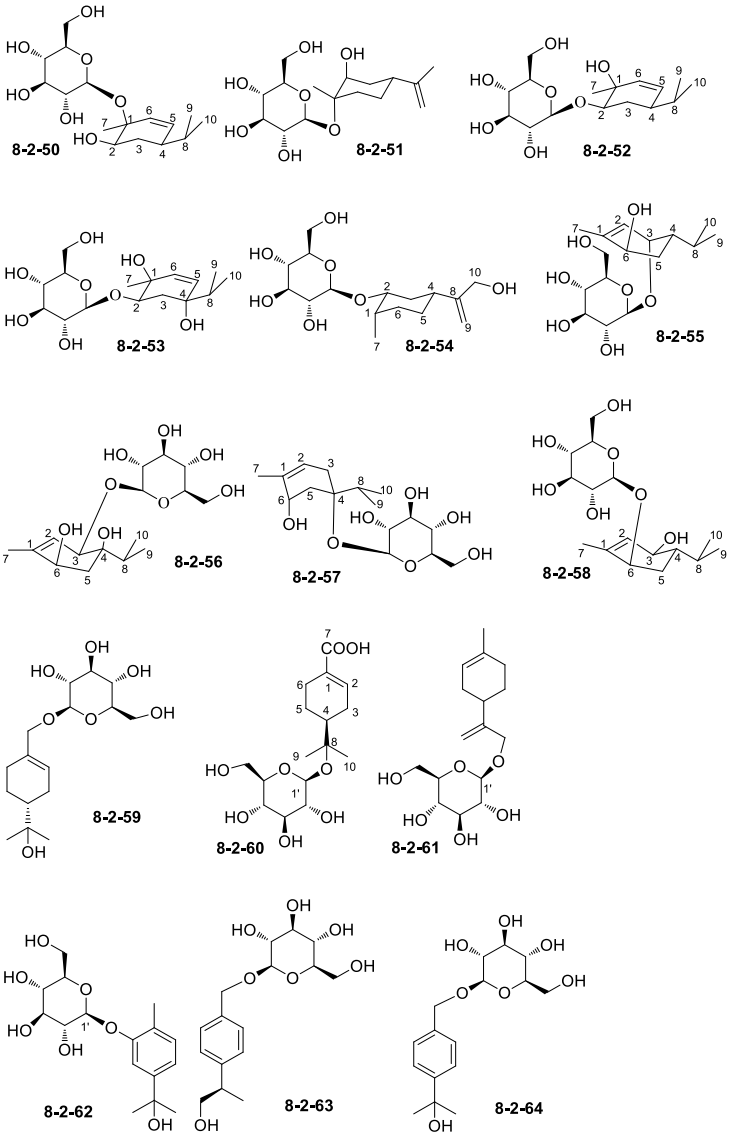

Table 8-2-4: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-6**~**8-2-10**.

H	8-2-6	8-2-7	8-2-8	8-2-9	8-2-10
1				ax 1.56 m	ax 1.56 m
2	eq 4.26 dd (3.0, 3.0)	eq 4.22 t(3.0)	eq 4.18 dd (3.5, 3.5)	ax 3.44 ddd (3.0, 10.0, 11.0)	ax 3.45 ddd (3.5, 10.0, 11.0)

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Table 8-2-4 (continued)

H	8-2-6	8-2-7	8-2-8	8-2-9	8-2-10
3	ax 2.43 ddd (3.0, 12.5, 12.5)	ax 2.39 ddd (3.0, 12.5, 12.5)	ax 2.33 ddd (3.5, 13.0, 13.0)	ax 1.64 ddd (11.0, 12.0, 12.0)	ax 1.73 ddd (11.0, 12.0, 12.0)
	eq 2.36 ddd (3.0, 3.0, 12.5)	eq 2.32 ddd (3.0, 3.0, 12.5)	eq 2.04 ddd (3.5, 3.5, 13.0)	eq 2.58 dddd (3.0, 3.0, 3.0, 12.0)	eq 2.83 dddd (3.5, 3.5, 3.5, 12.0)
4	ax 2.48 dddd (3.0, 3.0, 12.5, 12.5)	ax 2.44 dddd (3.0, 3.0, 12.5, 12.5)	ax 1.86 m	ax 2.09 dddd (3.0, 3.0, 12.0, 12.0)	ax 2.10 dddd (3.5, 3.5, 12.5, 12.0)
5	ax 2.13 dddd (3.0, 12.5, 12.5, 12.5)	ax 2.09 dddd (3.0, 12.5, 12.5, 12.5)	ax 2.05 dddd (3.5, 13.0, 13.0, 13.0)	ax 1.43 dddd (3.0, 12.0, 12.0, 12.0)	ax 1.30 dddd (3.5, 12.0, 12.0, 12.0)
	eq 2.02 ddd (3.0, 3.0, 12.5)	eq 1.98 br ddd (3.0, 3.0, 12.5)	eq 1.71 dddd (3.5, 3.5, 3.5, 13.0)	eq 2.20 dddd (3.0, 3.0, 3.0, 12.0)	eq 1.92 dddd (3.5, 3.5, 3.5, 12.0)
6	ax 2.27 ddd (3.0, 12.5, 12.5)	ax 2.23 ddd (3.0, 12.5, 12.5)	ax 2.22 ddd (3.5, 13.0, 13.0)	ax 1.09 dddd (3.0, 12.0, 12.0, 12.0)	ax 1.09 dddd (3.5, 12.0, 12.0, 12.0)
	eq 1.93 ddd (3.0, 3.0, 12.5)	eq 1.89 ddd (3.0, 3.0, 12.5)	eq 1.85 ddd (3.5, 3.5, 13.0)	eq 1.81 dddd (3.0, 3.0, 3.0, 12.0)	eq 1.79 dddd (3.5, 3.5, 3.5, 12.0)
7	1.69 s	1.69 s	1.69 s	1.24 d(6.5)	1.25 d(6.5)
8			2.42 m		
9	1.44 s	1.40 s	3.78 dd(7.0, 10.5)	3.91 d(10.5)	3.91 d(11.0)
			3.99 dd(5.5, 10.5)	3.96 d(10.5)	3.94 d(11.0)
10	1.44 s	1.40 s	1.17 d(7.0)	1.42 s	1.41 s

Table 8-2-5: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-11**~**8-2-15**.

H	8-2-11	8-2-12	8-2-13	8-2-14	8-2-15
1	eq 2.28 m	eq 2.28 m	ax 1.55 m	ax 1.55 m	eq 2.13 m
2	ax 4.10 ddd (3.5, 3.5, 11.0)	ax 4.10 ddd (4.0, 4.0, 11.0)	eq 4.13 br dd (3.0, 3.0)	eq 4.16 br dd (3.0, 3.0)	eq 4.11 br dd (3.0, 3.0)
3	ax 1.84 ddd (11.0, 12.0, 12.0)	ax 1.94 ddd (11.0, 12.0, 12.0)	ax 1.60 ddd (3.0, 13.0, 13.0)	ax 1.68 ddd (3.0, 13.0, 13.0)	ax 1.83 ddd (3.0, 13.0, 13.0)
	eq 2.24 ddd (3.5, 3.5, 12.0)	eq 2.48 ddd (3.5, 4.0, 12.0)	eq 2.37 ddd (3.0, 3.0, 13.0)	eq 2.62 ddd (3.0, 3.0, 13.0)	eq 2.13 ddd (3.0, 3.0, 13.0)
4	ax 2.05 dddd (3.5, 3.5, 12.0, 12.0)	ax 2.06 dddd (3.5, 3.5, 12.0, 12.0)	ax 2.64 dddd (3.0, 3.0, 13.0, 13.0)	ax 2.66 dddd (3.0, 3.0, 13.0, 13.0)	ax 2.67 dddd (3.0, 3.0, 13.0, 13.0)

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Table 8-2-5 (continued)

H	8-2-11	8-2-12	8-2-13	8-2-14	8-2-15
5	ax 1.64 dddd (3.5, 12.0, 12.0, 12.0)	ax 1.58 dddd (4.0, 12.0, 12.0, 12.0)	ax 1.49 dddd (3.0, 13.0, 13.0, 13.0)	ax 1.35 dddd (3.0, 13.0, 13.0, 13.0)	ax 1.71 dddd (3.0, 13.0, 13.0, 13.0)
	eq 1.92 dddd (3.5, 3.5, 3.5, 12.0)	eq 1.65 m	eq 2.30 dddd (3.0, 3.0, 3.0, 13.0)	eq 2.03 dddd (3.0, 3.0, 3.0, 13.0)	eq 2.01 dddd (3.0, 3.0, 3.0, 13.0)
6	ax 1.58 dddd (3.5, 3.5, 12.0, 12.0)	ax 1.58 dddd (4.0, 4.0, 12.0, 12.0)	ax 1.85 dddd (3.0, 13.0, 13.0, 13.0)	ax 1.84 dddd (3.0, 13.0, 13.0, 13.0)	ax 2.35 dddd (3.0, 3.0, 13.0, 13.0)
	eq 1.72 dddd (3.5, 3.5, 3.5, 12.0)	eq 1.67 dddd (4.0, 6.0, 12.0, 12.0)	eq 1.54 dddd (3.0, 3.0, 3.0, 13.0)	eq 1.51 dddd (3.0, 3.0, 3.0, 13.0)	eq 1.49 br ddd (3.0, 3.0, 13.0)
7	1.22 d(7.0)	1.22 d(7.0)	1.17 d(7.0)	1.17 d(7.0)	1.02 d(7.0)
9	3.92 d(11.0)	3.92 d(11.0)	3.91 d(10.5)	3.89 d(10.5)	3.92 d(10.5)
	3.96 d(11.0)	3.95 d(11.0)	3.95 d(10.5)	3.96 d(10.5)	3.96 d(10.5)
10	1.45 s	1.44 s	1.44 s	1.42 s	1.46 s

Table 8-2-6: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-16**~**8-2-20**.

H	8-2-16	8-2-17	8-2-18	8-2-19	8-2-20
1	eq 2.11 m	4.53 d(0.5)			
2	eq 4.12 br dd (3.0, 3.0)		3.69 d(9.3)	3.81 d(2.7)	ax 3.71 dd(3.0, 12.0)
3	ax 1.88 ddd (3.0, 13.0, 13.0)	2.12 m	3.96 dd (9.3, 11.4)	4.15 t(2.7)	ax 2.10 ddd (12.0, 12.0, 12.0)
	eq 2.34 ddd (3.0, 3.0, 13.0)				eq 2.33 ddd (3.0, 3.0, 12.0)
4	ax 2.66 dddd (3.0, 3.0, 13.0, 13.0)	–	1.97 ddt (11.7, 11.4, 3)	2.06 dt(13.5, 2.7)	ax 2.15 dddd (3.0, 3.0, 12.0, 12.0)
5	ax 1.54 dddd (3.0, 13.0, 13.0, 13.0)	–	ax 1.77 m	ax 1.70 m	ax 2.10 br ddd (12.0, 12.0, 12.0)
			eq 1.59 m	eq 1.78 m	
	eq 1.73 dddd (3.0, 3.0, 3.0, 13.0)				eq 2.07 dddd (3.0, 3.0, 3.0, 12.0)
6	ax 2.31 dddd (3.0, 3.0, 13.0, 13.0)		3.77 t(2.4)	4.29 dd(10.8, 2.4)	ax 1.47 ddd (3.0, 12.0, 12.0)
	eq 1.43 br ddd (3.0, 3.0, 13.0)				eq 2.11 ddd (3.0, 3.0, 12.0)
7	0.99 d(7.0)	1.40 s	1.39 s	1.45 s	1.55 s
8		1.83 m	2.30 m	1.68 m	
9	3.88 d(10.5)	0.92 d(6.5)	0.92 d(7.2)	0.97 d(6.6)	3.92 d(10.5)
	3.93 d(10.5)				3.99 d(10.5)
10	1.42 s	0.88 d(6.5)	0.78 d(7.2)	0.97 d(6.6)	1.45 s

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Table 8-2-7: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-21**~**8-2-25**.

H	8-2-21	8-2-22	8-2-23	8-2-24	8-2-25
1					eq 2.86 m
2	ax 3.73 dd(4.0, 12.0)	eq 4.24 dd(3.0, 3.0)	eq 4.27 dd(3.0, 3.0)	ax 4.10 dd(4.5, 11.5)	ax 4.21 ddd(3.5, 3.5, 12.0)
3	ax 2.25 ddd (12.0, 12.0, 12.0)	ax 2.53 ddd (3.0, 13.0, 13.0)	ax 2.62 ddd (3.0, 13.0, 13.0)	ax 1.81 ddd (11.5, 12.0, 12.0)	ax 2.05 ddd (12.0, 12.0, 12.0)
	eq 2.60 dddd (3.0, 3.0, 4.0, 12.0)	eq 2.27 ddd (3.0, 3.0, 13.0)	eq 2.53 dddd (3.0, 3.0, 3.0, 13.0)	eq 2.47 ddd (3.5, 4.5, 12.0)	eq 2.49 ddd (3.5, 3.5, 12.0)
4	ax 2.12 dddd (3.0, 3.0, 12.0, 12.0)	ax 2.74 dddd (3.0, 3.0, 13.0, 13.0)	ax 2.76 dddd (3.0, 3.0, 13.0, 13.0)	ax 2.20 dddd (3.5, 3.5, 12.0, 12.0)	ax 2.18 dddd (3.5, 3.5, 12.0, 12.0)
5	ax 1.97 dddd (3.0, 12.0, 12.0, 12.0)	ax 2.28 dddd (3.0, 13.0, 13.0, 13.0)	ax 2.15 dddd (3.0, 13.0, 13.0, 13.0)	ax 1.68 dddd (3.5, 12.0, 12.0, 12.0)	ax 1.93 ddd (12.0, 12.0, 12.0)
	eq1.77 dddd (3.0, 3.0, 3.0, 12.0)	eq 2.19 dddd (3.0, 3.0, 3.0, 13.0)	eq 1.90 dddd (3.0, 3.0, 3.0, 13.0)	eq 2.18 m	eq 2.25 ddd (3.5, 3.5, 12.0)
6	ax 1.47 ddd (3.0, 12.0, 12.0)	ax 2.31 ddd (3.0, 13.0, 13.0)	ax 2.26 ddd (3.0, 13.0, 13.0)	ax 1.85 ddd (3.5, 12.0, 12.0)	ax 4.21 ddd (3.5, 3.5, 12.0)
	eq 2.07 ddd (3.0, 3.0, 12.0)	eq 1.92 ddd (3.0, 3.0, 13.0)	eq 1.91 ddd (3.0, 3.0, 13.0)	eq 2.10 ddd (3.5, 3.5, 12.0)	
7	1.55 s	1.71 s	1.71 s	1.60 s	1.50 d(7.0)
9	3.92 d(10.5)	3.97 d(11.0)	3.94 d(10.5)	3.93 d(11.0)	3.96 d(11.0)
	3.97 d(10.5)	4.02 d(11.0)	4.02 d(10.5)	3.96 d(11.0)	3.99 d(11.0)
10	1.44 s	1.52 s	1.49 s	1.46 s	1.47 s

Table 8-2-8: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-26**~**8-2-30**.

H	8-2-26	8-2-27	8-2-28	8-2-29	8-2-30
2	5.73 d(10.3)	6.31 d(10.5)	6.19 d(10.5)	3.92 d(1.4)	*β* 4.77 d(2.5)
3	5.89 d(10.3)	6.48 br d(10.5)	6.36 br d(10.5)	5.60 d(1.4)	5.73 d(2.5)
4		ax 2.45 br dd (5.0, 13.0)	ax 2.52 m		
5	*α* 1.56 ddd (3.4, 7.6, 17.2)	ax 2.09 dddd (3.0, 13.0, 13.0, 13.0)	ax 1.72 dddd (3.0, 13.0, 13.0, 13.0)	*α* 2.24 m *β* 2.11 m	*α* 2.40 dddd (17, 10, 2.5, 2.5)
	β 2.00 ddd (2.8, 13.1, 17.2)	eq 1.98 br ddd (3.0, 5.0, 13.0)	eq 1.97 m		*β* 2.63 dd(17, 6)
6	*α* 1.88 ddd (3.4, 13.1, 16.5)	ax 1.96 ddd (3.0, 13.0, 13.0)	ax 1.96 ddd (3.0, 13.0, 13.0)	*α* 1.64 ddd (2.1, 6.9, 13.1)	*β* 4.27 dd(10, 6.0)
	β 1.68 ddd (2.8, 7.6, 16.5)	eq 2.25 ddd (3.0, 3.0, 13.0)	eq 2.61 ddd (3.0, 3.0, 13.0)	*β* 1.69 ddd (5.5, 11.7, 13.1)	

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Table 8-2-8 (continued)

H	8-2-26	8-2-27	8-2-28	8-2-29	8-2-30
7	1.27 s	3.94 d(11.0) 4.00 d(11.0)	3.98 d(11.0) 4.03 d(11.0)	1.15 s	1.70 s
8					2.02 sept.
9	1.16 s	1.41 s	1.37 s	1.29 s	1.00 d(7.0)
10	1.22 s	1.36 s	1.33 s	1.29 s	0.99 d(7.0)

Table 8-2-9: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-31**~**8-2-35**.

H	8-2-31	8-2-32	8-2-33	8-2-34	8-2-35
2	*β* 3.90 m			3.64 dd(1.5, 1.5)	3.96 dd(13.0, 4.0)
3	5.56 d(3.0)	ax 2.63 dd (13.0, 13.0) eq 3.12 dd(2.0, 13.0)	ax 2.58 dd (14.0, 14.0) eq 2.93 ddd(2.0, 2.0, 14.0)	*α* 2.01 dd(14.0, 1.5) *β* 1.58 dd(14.0, 1.5)	*α* 1.72 ddd (13.0, 4.0, 1.5) *β* 1.59 dd(13.0, 13.0)
4		ax 2.65 m	ax 2.63 m		
5	*α* 1.98 ddd (14.5, 10, 2) *β* 2.44 dd(14.5, 5.5)	ax 2.39 m eq 2.47 ddd (3.5, 5.0, 13.5)	ax 2.50 m eq 2.66 dddd (2.0, 3.0, 5.5, 13.0)	*α* 5.54 d(11.5)	*α* 5.40 dd(10.0, 1.5)
6	*β* 3.89 m	6.62 br d(5.0)	6.65 br d(5.5)	5.46 d(11.5)	5.62 d(10)
7	1.11 s	1.83 s	1.83 s	1.18 s	1.13 s
8	2.26			1.58 qq(7.0, 7.0)	1.67 m
9	1.04	3.87 d(11.0) 3.92 d(11.0)	3.89 d(11.0) 3.92 d(11.0)	0.81 d(7.0)	0.90 d(7.0)
10	1.04	1.41 s	1.42 s	0.76 d(7.0)	0.81 d(7.0)

Table 8-2-10: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-36**~**8-2-40**.

H	8-2-36	8-2-37	8-2-38	8-2-39	8-2-40
2	4.29 s	5.82 br s	5.72 dd(5.5, 1.2)①	5.62 br d(9.9)	5.70 dd(10.3, 2.0)
3			5.36 t(5.5, 4.5)	5.82 dd(9.9, 2.6)	5.82 dd(10.3, 3.4)
4			2.35 m	2.66 br t(7.3)	2.77 m
5	2.66 m 2.38 m	2.38 m 2.20 m	2.09 m 1.78 m	1.68 m	1.53 m 1.94 m
6	2.16 m 1.89 m	2.20 m 2.09 m	4.13 br dd(3.0, 2.5)	1.43 m 2.14 dt(13.8, 4.3)	1.63 m 2.01 m
7	1.31 s	1.91 br s	1.86 br s	1.32 s	1.32 s

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Table 8-2-10 (continued)

H	8-2-36	8-2-37	8-2-38	8-2-39	8-2-40
9	1.97 s	4.89 br s	4.72 br s	4.74 br s	4.79 br s
		5.16 br s	4.82 br s	4.76 br s	4.68 br s
10	1.84 s	1.75 br s	1.78 br s	1.71 s	1.74 s
OMe		3.33(4-OMe)			
OOH				7.29 br s	7.35 br s

① More datum on H-2 is given in the literature.

Table 8-2-11: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-41**~**8-2-45**.

H	8-2-41	8-2-42	8-2-43	8-2-44	8-2-45
1					ax 2.26 m
2	4.45 d(11.6)	4.51 t(2.9)	eq 4.21 dd (3.0, 3.0)	ax 4.03 dd (3.5, 11.5)	
3	2.27 d(11.6) 1.30 q(11.9)	1.54 td(13.6, 3.3) 2.16 dq(14.3, 3)	ax 2.48 ddd (3.0, 13.0, 13.0)	ax 1.71 ddd (11.5, 12.5, 12.5)	ax 2.50 dd (13.0, 13.0)
			eq 2.88 ddd (3.0, 3.0, 13.0)	eq 2.45 ddd (3.0, 3.5, 12.5)	eq 2.99 ddd (1.5, 3.0, 13.0)
4	2.21 tt(12.2, 3.2)	2.35 tt(12.9, 3.2)	ax 2.75 dddd	ax 2.16 dddd	ax 2.29 m
			(3.0, 3.0, 13.0, 13.0)	(3.0, 3.0, 12.5, 12.5)	
5	1.82 d(12.8) 1.27 qd(12.8, 4)	1.86 d(11.9) 1.28 qd(13, 4.1)	ax 2.04 dddd (3.0, 13.0, 13.0, 13.0)	ax 1.60 dddd (3.0, 12.5, 13.0, 13.0)	ax 1.63 dddd (3.0, 13.0, 13.0, 13.0)
			eq 1.74 dddd (3.0, 3.0, 3.0, 13.0)	eq 2.09 dddd (3.0, 3.0, 3.0, 13.0)	eq 1.93 m
6	2.08 t(13.4) 2.43 ddd (13.7, 4, 2.8)	2.29 dt(13.4, 3.2) 2.38 t(13.4)	ax 2.10 ddd (3.0, 13.0, 13.0)	ax 1.79 ddd (3.0, 13.0, 13.0)	ax 1.15 dddd (3.0, 13.0, 13.0, 13.0)
			eq 1.81 ddd (3.0, 3.0, 13.0)	eq 2.05 ddd (3.0, 3.0, 13.0)	eq 1.93 m
7	4.93 d(1.5) 4.84 d(1.5)	5.00 br s 5.01 br s	1.81 s	1.57 s	1.00 d(6.5)
9	4.72 br s	4.68 br s 4.70 br s	3.92 d(11.0) 3.94 d(11.0)	3.84 d(10.5) 4.29 d(10.5)	3.81 d(10.0) 4.19 d(10.0)
10	1.72 s	1.70 s	1.42 s	1.37 s	1.37 s
OOH	8.10 s	7.64 br s			
1′			5.00 d(8.0)	4.96 d(8.0)	4.90 d(8.0)

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Table 8-2-12: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-46**~**8-2-50**.

H	8-2-46	8-2-47	8-2-48	8-2-49	8-2-50
2	ax 4.83 br s	ax 4.93 dd(7.5, 10.0)	ax 4.32 dd(5.0, 10.0)	ax 4.32 dd(5.0, 10.0)	ax 4.41 dd(3.5, 8.0)
3	5.60 br s	ax 2.06 m eq 2.06 m	ax 2.25 dd (10.0, 17.0) eq 2.58 dd(5.0, 17.0)	ax 2.25 dd (10.0, 17.0) eq 2.62 dd(5.0, 17.0)	ax 1.92 ddd (7.0, 8.0, 13.5) eq 2.25 ddd (3.5, 5.0, 13.5)
4					ax 2.30 dddd (3.0, 5.0, 7.0, 7.0)
5	ax 2.03 m eq 2.03 m	5.16 br d(5.0)	5.23 dd(2.5, 5.0)	5.32 dd(2.5, 5.0)	5.86 dd(3.0, 10.0)
6	ax 2.02 m eq 2.02 m	ax 2.45 br d(16.5) eq 2.21 dd(5.0, 16.5)	ax 2.74 br d(17.5) eq 2.35 dd(5.0, 17.5)	ax 2.70 br d(17.0) eq 2.42 dd(5.0, 17.0)	6.15 d(10.0)
7	1.58 s	1.64 s	1.54 s	1.52 s	1.75 s
8	2.11 sept(7.0)	2.08 sept(6.5)	2.13 sept(6.5)	2.16 sept(7.0)	1.64 oct(7.0)
9	0.93 d(7.0)	0.87 d(6.5)	0.95 d(6.5)	0.97 d(7.0)	0.88 d(7.0)
10	0.93 d(7.0)	0.85 d(6.5)	0.95 d(6.5)	0.97 d(7.0)	0.88 d(7.0)
1′	5.29 d(7.5)	5.32 s	5.19 d(8.0)	5.15 d(7.5)	5.17 d(8.0)
2′	–	–	4.06 dd(8.0, 8.0)	4.03 dd(7.5, 8.0)	
3′	–	4.27 d(9.5)	–	–	–
4′	–	4.46 dd(9.5, 9.5)	–	–	–
5′	–	3.89 ddd (2.5, 6.0, 9.5)	–	–	–
6′	–	4.42 dd(6.0, 11.5) 4.60 dd(2.5, 11.5)	4.36 dd(6.0, 12.0) 4.56 dd(2.5, 12.0)	4.75 dd(6.5, 11.0) 4.95 dd(2.0, 11.0)	–
6′-OAc			2.02 s	2.13 s	

Table 8-2-13: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-51**~**8-2-55**.

H	8-2-51	8-2-52	8-2-53	8-2-54	8-2-55
1				eq 2.45 m	
2	eq 4.27 dd(3.0, 3.0)	ax 4.45 dd(3.0, 7.5)	ax 4.57 dd(2.5, 6.0)	ax 4.26 ddd (4.5, 4.5, 12.0)	6.32 d(5.5)
3	ax 2.63 ddd (3.0, 13.0, 3.0) eq 2.00 ddd (3.0, 3.0, 13.0)	ax 2.08 ddd (7.0, 7.5, 13.5) eq 2.16 ddd (3.0, 5.0, 13.5)	ax 2.30 dd(6.0, 14.5) eq 2.69 dd(2.5, 14.5)	ax 1.84 ddd (12.0, 12.0, 12.0) eq 2.14 ddd (3.0, 4.5, 12.0)	eq 4.38 dd(3.0, 5.5)

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Table 8-2-13 (continued)

H	8-2-51	8-2-52	8-2-53	8-2-54	8-2-55
4	ax 2.78 dddd (3.0, 3.0, 13.0, 13.0)	ax 2.40 dddd (3.0, 5.0, 7.0, 7.0)		ax 2.11 dddd (3.0, 3.0, 12.0, 12.0)	ax 1.89 dddd (3.0, 3.0, 7.0, 13.0)
5	ax 2.31 dddd (3.0, 13.0, 13.0, 13.0) eq 1.67 dddd (3.0, 3.0, 3.0, 13.0)	5.66 dd(3.0, 10.0)	5.94 d(10.0)	ax 1.43 dddd (3.0, 12.0, 12.0, 12.0) eq 1.51 dddd (3.0, 3.0, 3.0, 12.0)	ax 2.10 ddd (3.0, 13.0, 13.0) eq 2.16 ddd (3.0, 3.0, 13.0)
6	ax 2.10 ddd (3.0, 13.0, 13.0) eq 2.13 ddd (3.0, 3.0, 13.0)	5.92 d(10.0)	5.96 d(10.0)	ax 1.44 dddd (3.0, 3.0, 12.0, 12.0) eq 1.56 br ddd (3.0, 3.0, 12.0)	eq 4.26 dd (3.0, 3.0)
7	1.80 s	1.67 s	1.71 s	1.18 d(7.0)	1.87 s
8		1.58 sept(7.0)	1.95 sept(7.0)		2.28 dquint(7.0, 7.0)
9	4.74 br s, 4.86 br s	0.86 d(7.0)	1.09 d(7.0)	5.00 d(2.0), 5.28 d(2.0)	1.00 d(7.0)
10	1.72 s	0.85 d(7.0)	1.16 d(7.0)	4.36 br s	1.16 d(7.0)
1′	5.19 d(7.5)	5.04 d(7.5)	5.16 d(8.0)	5.02 d(7.5)	4.99 d(7.5)

Table 8-2-14: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-56**~**8-2-60**.

H	8-2-56	8-2-57	8-2-58	8-2-59	8-2-60
2	5.89 br s	5.49 br s	5.95 br s	5.91 br d(3.0)	7.27 br dd(3.0, 3.0)
3	ax 4.68 br s	ax 2.32 dd(2.0, 18.0) eq 2.60 dd(2.0, 18.0)	ax 4.22 br d(10.0)	ax 2.04 br dd (13.0, 17.0) eq 2.27 ddd (3.0, 3.0, 17.0)	*α* 2.47 br dd (12.0, 16.0) *β* 2.08 br d(16.0)
4	–		ax 2.28 dddd (3.0, 3.0, 10.0, 13.5)	ax 1.69 dddd (3.0, 3.0, 13.0, 13.0)	*α* 1.85 dddd (12.0, 12.0, 4.8, 1.8)
5	ax 1.90 dd(4.5, 14.0) eq 2.31 dd(4.5, 14.0)	ax 1.82 dd(5.0, 14.0) eq 2.45 ddd (2.0, 2.0, 14.0)	ax 1.31 ddd (3.5, 13.5, 13.5) eq 2.26 ddd (3.0, 3.5, 13.5)	ax 1.40 br ddd (4.0, 13.0, 13.0) eq 2.12 br d(13.0)	*α* 2.22 br d(12.0) *β* 1.26 dddd (12.0, 12.0, 12.0, 4.8)

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Table 8-2-14 (continued)

H	8-2-56	8-2-57	8-2-58	8-2-59	8-2-60
6	eq 4.15 dd(4.5, 4.5)	eq 4.17 dd(2.0, 5.0)	eq 4.37 dd(3.5, 3.5)	ax 2.11 br dd (13.0, 16.0) eq 2.40 br dd (4.0, 16.0)	α 2.42 m β 2.80 br d(16.0)
7	1.94 s	1.99 s	1.95 s	4.28 d(12.0) 4.50 d(12.0)	
8	2.33 sept(7.0)	2.22 sept(7.0)	2.50 dquint(3.0, 7.0)		
9	1.09 d(7.0)	1.15 d(7.0)	1.11 d(7.0)	1.30 s	1.39 s
10	1.07 d(7.0)	0.89 d(7.0)	0.91 d(7.0)	1.31 s	1.35 s
1′	5.16 d(8.0)	4.94 d(7.5)	4.94 d(7.5)	4.92 d(8.0)	5.02 d(7.8)
2′	–	–	–	–	3.98 dd(9.0, 7.8)
3′	–	–	–	–	4.26 dd(9.0, 9.0)
4′	–	–	–	–	4.24 dd(9.0, 9.0)
5′	–	–	–	–	3.91 ddd (9.0, 5.2, 2.5)
6′	–	–	–	–	4.35 dd(11.8, 5.2) 4.49 dd(11.8, 2.5)

Table 8-2-15: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-61**~**8-2-64**.

H	8-2-61	8-2-62	8-2-63	8-2-64
2	5.32 br s		7.50 d(8.0)	7.57 d(8.0)
3	1.82 m, 2.14 m	7.25 d(1.8)	7.31 d(8.0)	7.78 d(8.0)
4	2.29 m			
5	1.40 m, 1.75 m	7.01 dd(7.8, 1.8)	7.31 d(8.0)	7.78 d(8.0)
6	1.81 m	7.25 d(7.8)	7.50 d(8.0)	7.57 d(8.0)
7	1.54 s	2.24 s	4.84 d(11.5) 5.18 d(11.5)	4.87 d(12.0) 5.21 d(12.0)
8			3.12 sext(7.0)	
9	4.98 br s 5.38 br s	1.50 s	3.89 dd(7.0, 10.5) 4.00 dd(7.0, 10.5)	1.73 s
10	4.32 d(12.9), 4.62 d(12.9)	1.50 s	1.39 d(7.0)	1.73 s
1′	4.92 d(7.6)	4.89 d(7.7)	5.00 d(7.5)	5.02 d(8.0)
2′	4.08 m	3.49 m	–	–
3′	4.26 m	3.46 m	–	–
4′	4.26 m	3.44 m	–	–
5′	3.97 m	3.46 m	–	–
6′	4.39 dd(11.9, 5.5) 4.57 dd(11.8, 2.2)	3.70 dd(12.0, 5.5) 3.89 dd(12.0, 1.7)	–	–

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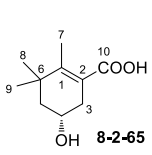
Table 8-2-16: Compounds, MFs, and test solvents of monocyclic monoterpenoid **8-2-65**~**8-2-82**.

No.	Compounds	MFs	Test solvents	References
8-2-65	crocusatin B	$C_{10}H_{16}O_3$	$CDCl_3$	[41]
8-2-66	crocusatin D	$C_{10}H_{16}O_3$	$CDCl_3$	[41]
8-2-67	crocusatin L	$C_{10}H_{16}O_3$	CD_3COCD_3	[42]
8-2-68	crocusatin J	$C_{10}H_{16}O_3$	CD_3COCD_3	[42]
8-2-69	crocusatin K	$C_{10}H_{16}O_3$	CD_3COCD_3	[42]
8-2-70	crocusatin A	$C_9H_{14}O_2$	$CDCl_3$	[41]
8-2-71	robinlin	$C_{11}H_{18}O_3$	$CDCl_3$	[43]
8-2-72	crocusatin C	$C_{10}H_{16}O_2$	$CDCl_3$	[41]
8-2-73	jasminodiol	$C_{10}H_{16}O_3$	CD_3OD	[44]
8-2-74	tschimganical A	$C_{11}H_{16}O_3$	$CDCl_3$	[45]
8-2-75	jasminoside H	$C_{22}H_{36}O_{12}$	CD_3OD	[44]
8-2-76	6′-*O*-sinapoyljasminoside A	$C_{27}H_{36}O_{11}$	CD_3OD	[44]
8-2-77	jasminoside I	$C_{22}H_{36}O_{12}$	CD_3OD	[44]
8-2-78	1,1,5-trimethyl-2-hydroxymethyl-5-cyclohexene-4-one-7-*O*-*β*-D-glucopyranoside	$C_{16}H_{26}O_7$	CD_3OD	[45]
8-2-79	1,1,5-trimethyl-2-hydroxymethyl-2,5-cyclohexadien-4-one-*O*-*β*-D-glucopyranoside	$C_{16}H_{24}O_7$	CD_3OD	[45]
8-2-80	6′-*O*-sinapoyljasminoside C	$C_{27}H_{34}O_{11}$	CD_3OD	[44]
8-2-81	(3*S*,5*R*,6*R*,7*E*,9*R*)-3,6-epoxy-7-megastigmen-5,9-diol-9-*O*-*β*-D-glucopyranoside	$C_{19}H_{32}O_8$	D_2O	[46]
8-2-82	2,3,4-trimethylbenzylalcohol-*O*-*β*-D-glucopyranoside	$C_{16}H_{24}O_6$	CD_3OD	[45]



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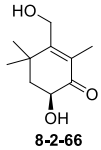

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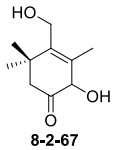

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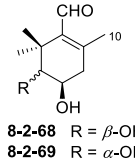
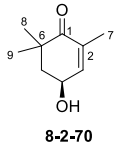


8-2-68 R = *β*-OH
8-2-69 R = *α*-OH



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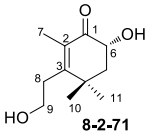

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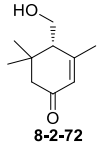

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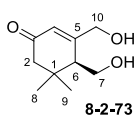

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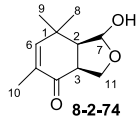

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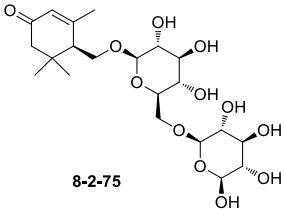

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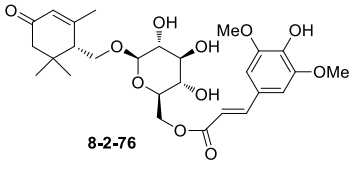

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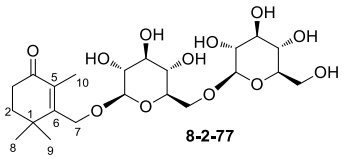

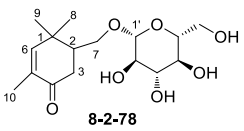

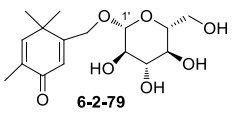

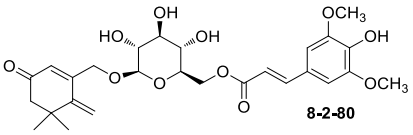

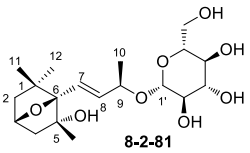

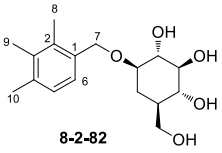

Table 8-2-17: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-65**~**8-2-69**.

H	8-2-65	8-2-66	8-2-67	8-2-68	8-2-69
3	ax 1.88 dd (16.4, 9.6) eq 2.23 dd (16.4, 6.0)		5.79 s	ax 1.74 dd (12.0, 12.0) eq 1.38 dd (12.0, 4.0)	ax 1.49 dd (12.8, 12.8) eq 1.62 dd (12.8, 4.0)
4	3.93 dddd (9.6, 8.0, 6.0, 3.6)	4.32 dd(12.8, 5.6)		3.78 ddd (12.0, 4.0, 4.0)	3.70 ddd (12.8, 8.0, 4.0)
5	ax 1.38 t(8.0) eq 1.67 dd (8.0, 3.6)	ax 1.78 t(12.8) eq 2.15 dd (12.8, 5.6)	ax 2.80 d(17.2) eq 2.03 d(17.2)	3.95 d(4.0)	3.90 d(8.0)
7	1.68 s	1.94 s	3.80 d(11.2) 3.76 d(11.2)	10.15 s	10.11 s
8	1.22 s	1.30 s	1.10 s	1.22 s	1.17 s
9	1.12 s	1.24 s	1.01 s	1.21 s	1.22 s
10		4.35 d(12.0) 4.28 d(12.0)	1.99 s	2.22 s	2.18 s
OH		3.60 br s	4.34 br, 3.99 br		

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Table 8-2-18: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-70**~**8-2-74**.

H	8-2-70	8-2-71	8-2-72	8-2-73	8-2-74
1			1.99 t(3.6)		
2				2.74 d(17.1) 2.03 d(17.1)	2.39 t(4.7)
3	6.60 d(1.6)		5.98 s		2.99 t(5.0)
4	4.58 ddd(5.2, 2.4, 1.6)			6.17 s	
5	2.15 dd(12.8, 5.2)	1.751 t(14.0)	ax 2.05 d(17.2)		
	1.83 dd(12.8, 2.4)	2.143 dd(6.0, 14.0)	eq 2.63 d(17.2)		
6		4.250 dd(6.0, 14.0)		2.08 t(4.2)	6.49 s
7	1.79 s	1.875 s	3.95 dd(11.6, 3.6) 3.88 dd(11.6, 3.6)	3.84 br d(4.2)	5.32 d(4.7)
8	1.11 s	2.525 ddd(6.5, 9.5, 13.0) 2.649 ddd(6.5, 9.5, 13.0)	2.03 s	1.15 s	1.25 s
9	1.15 s	3.717 ddd(6.5, 9.5, 13.0) 3.732 ddd(6.5, 9.5, 10.5)	1.15 s	1.03 s	1.26 s
10		1.275 s	1.03 s	4.40 dd(17.4, 1.2) 4.20 dd(17.4, 1.2)	1.77 s
11		1.207 s			4.37 d(8.3) 4.11 dd(5.0, 8.3)

Table 8-2-19: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-75**~**8-2-79**.

H	8-2-75	8-2-76	8-2-77	8-2-78	8-2-79
2	2.65 d(16.8) 2.00 d(16.8)	2.73 d(17.1) 1.96 d(17.1)	1.85 m	2.21 m	
3			2.49 br t(6.6)	2.69 dd(4.4, 16.0) 2.41 dd(12.5, 16.0)	6.54 s
4	5.90 br s	5.86 br s			
6	2.25 t(4.2)	2.20 t(3.6)		6.46 s	6.75 s
7	4.19 dd(10.8, 4.2)	4.13 dd(10.5, 3.6)	4.67 d(10.8)	4.15 dd(4.1, 9.6)	4.72 d(15.9)
	3.82 dd(10.8, 4.2)	3.81 dd(10.5, 3.6)	4.23 d(10.8)	3.42 t(9.6)	4.44 d(15.9)

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Table 8-2-19 (continued)

H	8-2-75	8-2-76	8-2-77	8-2-78	8-2-79
8	1.15 s	1.12 s	1.24 s	1.04 s	1.28 s
9	1.05 s	1.01 s	1.22 s	1.22 s	1.29 s
10	2.10 d(1.2)	2.04 d(0.9)	1.84 s	1.71 s	1.89 s
1′	4.22 d(7.8)	4.27 d(7.8)	4.32 d(7.5)	4.24 d(7.8)	4.38 d(7.7)
2′	3.13 m	3.13 m	3.20 m	3.18 t(7.8)	3.35~3.27 m
3′	3.33 m	3.36 m	3.38 m	3.37~3.26 m	3.35~3.27 m
4′	3.31 m	3.35 m	3.32 m	3.37~3.26 m	3.35~3.27 m
5′	3.46 m	3.51 m	3.50 m	3.37~3.26 m	3.35~3.27 m
6′	4.15 dd(12.0, 2.1)	4.48 dd(12.0, 2.4)	4.18 dd(12.0, 2.1)	3.87 d(10.7)	3.89 d(11.8)
	3.77 dd(12.0, 5.4)	4.38 dd(12.0, 6.0)	3.82 dd(12.0, 5.4)	3.67 dd(4.8, 10.7)	3.68 br d(11.8)
1″	4.38 d(7.8)		4.42 d(7.8)		
2″	3.21 m	6.42 d(15.9)	3.23 m		
3″	3.50 m	7.62 d(15.9)	3.39 m		
4″	3.28 m		3.28 m		
5″	3.26 m	6.92 s	3.36 m		
6″	3.86 dd(12.0, 2.1)		3.88 dd(12.0, 2.1)		
	3.67 dd(12.0, 5.4)		3.67 dd(12.0, 5.4)		
9″		6.92 s			
OMe		3.88 s(6″-OMe)			
		3.88 s(8″-OMe)			

Table 8-2-20: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-80**~**8-2-82**.

H	8-2-80	8-2-81	8-2-82
2	2.35 s	1.65 d(11.7)	
		1.82 dd(11.7, 5.7)	
3		4.46 m	
4	6.30 br s	1.69 d(12.3)	
		2.04 dd(12.3, 5.1)	
5			6.93 d(7.5)
6			7.09 d(7.5)
7	5.48 br s	5.87 d(15.9)	4.93 d(11.3)
	5.36 d(1.5)		4.63 d(11.3)
8	1.17 s	5.65 dd(15.9, 7.2)	2.29 s
9	1.16 s	4.46 m	2.19 s
10	4.67 dd(15.3, 1.5)	1.33 d(6.3)	2.26 s
	4.53 dd(15.3, 1.5)		

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Table 8-2-20 (continued)

H	8-2-80	8-2-81	8-2-82
11		0.85 s	
12		1.37 s	
13		1.19 s	
1′	4.39 d(7.5)	4.51 d(8.1)	4.30 d(7.7)
2′	3.30 m	3.25 m	3.25 t(7.7)
3′	3.40 m	3.44 m	3.40~3.30 m
4′	3.37 m	3.40 m	3.40~3.30 m
5′	3.54 m	3.38 m	3.40~3.30 m
6′	4.49 dd(12.0, 2.4)	3.72 dd(12.3, 4.5)	3.90 dd(1.9, 11.9)
	4.36 dd(12.0, 6.0)	3.84 dd(12.3, 1.2)	3.68 dd(5.6, 11.9)
2″	6.66 d(15.9)		
3″	7.62 d(15.9)		
5″	6.94 s		
9″	6.94 s		
OMe	3.88 s(6″-OMe)		
	3.88 s(8″-OMe)		

Table 8-2-21: Compounds, MFs, and test solvents of monocyclic monoterpenoid **8-2-83**~**8-2-99**.

No.	Compounds	MFs	Test solvents	References
8-2-83	(3*R*,4*R*,6*S*)-3,6-dihydroxy-l-menthene	$C_{10}H_{18}O_2$	CD_3OD	[47]
8-2-84	(1*S*,2*R*,3*R*,4*R*,6*S*)-3,6-dihydroxy-1,2-epoxymenthane	$C_{10}H_{18}O_3$	CD_3OD	[47]
8-2-85	6-*O*-*β*-D-glucopyranosyloxy-3-hydroxy-*p*-menth-l-ene	$C_{16}H_{28}O_7$	CD_3OD	[48]
8-2-86	*p*-menthane-1,7,8-triol	$C_{10}H_{20}O_3$	$CDCl_3$	[49]
8-2-87	paeonilactone A	$C_{10}H_{14}O_4$	$CDCl_3$	[50]
8-2-88	paeonilactone C	$C_{17}H_{18}O_6$	$CDCl_3$	[50]
8-2-89	paeonilactone B	$C_{10}H_{12}O_4$	$CDCl_3$	[50]
8-2-90	3-formyl-2,2,6-trimethyl-3,5-cyclohexadienyl angelate	$C_{15}H_{20}O_3$	$CDCl_3$	[51]
8-2-91	3-formyl-2,2,4-trimethyl-3,5-cyclohexadienyl angelate	$C_{15}H_{20}O_3$	$CDCl_3$	[51]
8-2-92	euglobal G8	$C_{23}H_{30}O_5$	$CDCl_3$	[52]
8-2-93	euglobal G9	$C_{23}H_{30}O_5$	$CDCl_3$	[52]
8-2-94	euglobal G10	$C_{23}H_{30}O_5$	$CDCl_3$	[52]
8-2-95	euglobal G11	$C_{23}H_{30}O_5$	$CDCl_3$	[52]
8-2-96	euglobal G12	$C_{23}H_{30}O_5$	$CDCl_3$	[52]
8-2-97	piscrocin A	$C_9H_{12}O_4$	CD_3OD	[53]
8-2-98	piscrocin B	$C_9H_{10}O_5$	CD_3OD	[53]
8-2-99	piscrocin C	$C_{10}H_{12}O_5$	CD_3OD	[53]

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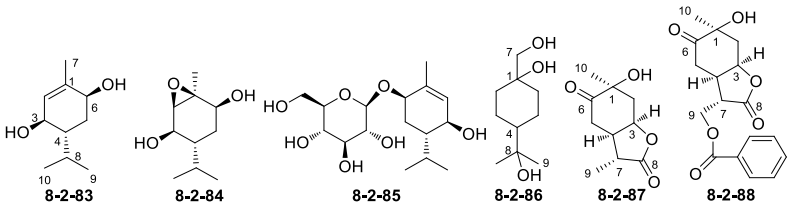

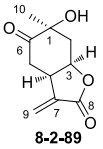

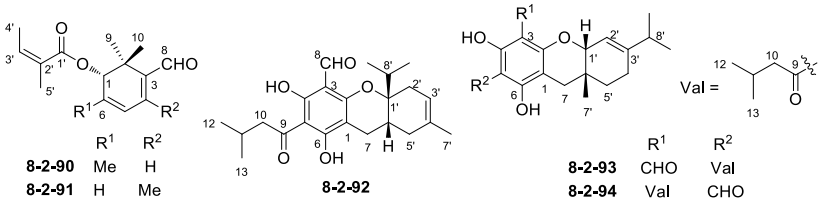

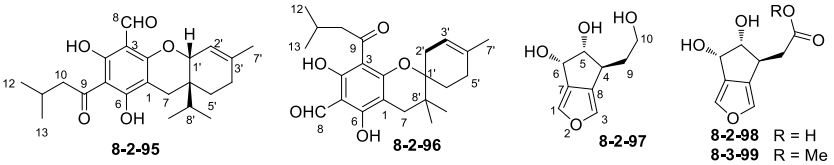

Table 8-2-22: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-83**~**8-2-86**.

H	8-2-83	8-2-84	8-2-85	8-2-86
2	5.46 br s	3.14 d(2)	5.75 m	1.3~1.9 m
3	3.84 br d(10)	3.67 dd(10, 2)	4.18 br d(8.8)	1.3~1.9 m
4	1.58 dddd(13.5, 10, 3, 2.7)	1.58 dddd(12, 10, 3, 2.7)	1.78 m(ov)	1.3~1.9 m
5	1.71 ddd(13.5, 3, 2.7)	1.47 ddd(14.5, 2.7, 2.7)	ax 1.50 ddd(13.8, 13.8, 3.8)	1.3~1.9 m
	1.37 ddd(13.5, 13.5, 3)	1.21 ddd(14.5, 12, 5)	eq 1.78 m(ov)	
6	3.90 t(3)	3.89 dd(5, 2.7)	4.0 dd(3.8, 2.0)	1.3~1.9 m
7	1.76 br s	1.37 s	1.85 s	3.75 d(10.8)
				3.42 d(10.8)
8	2.10 sept d(7, 3)	2.04 sept d(7, 3)	2.25 dqq(7.5, 3.8)	
9	0.97 d(7)	0.91 d(7)	0.99 d(7.5)	1.24 or 1.11 s
10	0.82 d(7)	0.77 d(7)	0.89 d(7.5)	1.11 or 1.24 s
1′			4.48 d(7.5)	
2′			3.38 dd(7.5, 9.0)	

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Table 8-2-22 (continued)

H	8-2-83	8-2-84	8-2-85	8-2-86
3′			3.25 dd(9.0, 9.0)	
4′			3.43 dd(9.0, 9.0)	
5′			3.3~3.5 m	
6′			3.75 dd(11.2, 5)	
			3.90 dd(11.2, 2.5)	

Table 8-2-23: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-87**~**8-2-91**.

H	8-2-87	8-2-88	8-2-89	8-2-90	8-2-91
1				5.35 s	5.11 d(4.5)
2α	2.61 dd(14, 6)	2.65 dd(14, 6)	2.51 dd(14, 6)		
2β	1.89 dd(14, 11)	1.97 dd(14, 10)	1.98 dd(14, 9)		
3	4.93 ddd(11, 6, 6)	5.00 ddd(10, 8, 6)	5.01 m		
4	2.77 br ddd (12, 8, 6)	3.19 m	3.69 m	6.71 d(5.7)	
5	α 2.94 dd(15, 8) β 2.64 dd(15, 2)	α 2.95 dd(16, 8) β 2.81 dd(16, 4)	α 2.97 dd(16, 8) β 2.78 dd(16, 4)	6.16 d(5.7)	6.03 d(9.5)
6					6.23 d(9.5, 4.5)
7	2.38 dq(12, 7)	2.85 m		1.96 s	2.21 s
8				9.42 s	10.18 s
9	1.26 d(7)	4.60 dd(12, 5) 4.81 dd(12, 4)	5.70 d(3) 6.36 d(3)	1.20 s	1.20 s
10	1.47 s	1.47 s	1.40 s	1.30 s	1.29 s
3′				6.11 qq(7.1, 1.5)	6.05 qq(7.1, 1.5)
4′				1.96 dq(7.1, 1.5)	1.95 dq(7.1, 1.5)
5′				1.83 dq(1.5, 1.5)	1.86 dq(1.5, 1.5)
OH	3.84 s	3.73 s	3.47 s		

Table 8-2-24: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-92**~**8-2-96**.

H	8-2-92	8-2-93	8-2-94	8-2-95	8-2-96
7	2.62 dd(16.6, 5.7)	2.44 d(16.5)	2.50 d(16.2)	2.45 d(16.8)	2.47 d(17.1)
	2.38 dd(16.5, 5.2)	2.20 d(15.6)	2.25 d(16.5)	2.27 d(16.5)	2.39 d(17.1)
8	10.02 s	10.05 s	10.18 s	10.03 s	10.20 s
10	2.97 d(6.7)	2.97 d(6.7)	2.88 d(6.7)	2.97 d(7.3)	2.99 dd(16.8, 6.1) 2.64 dd(17.1, 7.3)
11	2.26 m	2.26 m	2.19 m	2.25 m	2.21 m
12	0.98 d(7.0)	0.98 d(6.7)	0.98 d(6.7)	0.99 d(6.7)	0.93 d(7.0)
13	0.98 d(7.0)	0.98 d(6.7)	0.97 d(6.7)	0.98 d(6.7)	0.92 d(7.0)

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Table 8-2-24 (continued)

H	8-2-92	8-2-93	8-2-94	8-2-95	8-2-96
1′		4.47 s	4.46 s	4.70 s	
2′	2.27 m	5.43 s	5.52 s	5.46 d(1.8)	1.94 m
3′	5.24 d(1.5)				5.40 s
4′		2.20 m, 2.08 m	2.12 m	2.07 m	
5′	2.06 m, 1.87 dd(17.4, 8.5)	1.76 m, 1.54 m	1.72 m, 1.48 m	1.56 m	2.43 m, 2.25 m
6′	2.32 m				1.94 m, 1.72 m
7′	1.65 br s	1.04 s	1.04 s	1.70 s	1.71 s
8′	2.15 sept(6.7)	2.19 m	2.25 m	1.82 m	
9′	0.96 d(6.7)	1.01 d(6.7)	1.03 d(7.6)	0.95 d(7.0)	1.09 s
10′	1.00 d(7.0)	1.01 d(6.7)	1.03 d(7.6)	0.87 d(7.0)	1.00 s
OH	15.35 s(6-OH)	15.42 s(6-OH)	13.21 s(6-OH)	15.41 s(6-OH)	13.19 s(6-OH)
	14.43 s(4-OH)	14.48 s(4-OH)	15.38 s(4-OH)	14.44 s(4-OH)	15.58 s(4-OH)

Table 8-2-25: ^{1}H NMR spectroscopic data of monocyclic monoterpenoid **8-2-97**~**8-2-99**.

H	8-2-97	8-2-98	8-2-99
1	7.40 s	7.40 s	7.41 s
3	7.22 s	7.16 s	7.15 s
4	2.97 m	3.24 m	2.98 m
5	3.92 dd(4.8, 8.4)	3.92 dd(4.8, 8.4)	3.94 dd(5.0, 8.5)
6	4.75 d(4.8)	4.75 d(4.8)	4.76 d(4.9)
9	1.76 dd(10.0, 15.6)	2.46 dd(10.0, 15.5)	2.46 dd(10.0, 16.0)
	2.00 dd(4.4, 15.6)	2.88 dd(5.0, 15.5)	2.88 dd(5.0, 15.5)
10	3.78 m		
OMe			3.72 s

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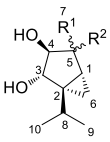
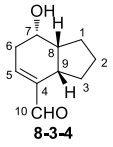
8.3 Dicyclic monoterpenoids

Table 8-3-1: Compounds, MFs, and test solvents of dicyclic monoterpenoids **8-3-1**~**8-3-4**.

No.	Compounds	MFs	Test solvents	References
8-3-1	(+)-(3*S**,4*R**,5*R**)-trihydroxysabinane	$C_{10}H_{18}O_3$	$CDCl_3$	[54]
8-3-2	(+)-(3*S**,4*R**)-dihydroxy-(5*R**)-methoxysabinane	$C_{11}H_{20}O_3$	$CDCl_3$	[54]
8-3-3	(+)-(3*S**,4*R**,5*S**)-trihydroxysabinane	$C_{10}H_{18}O_3$	$CDCl_3$	[54]
8-3-4	tsaokoin	$C_{10}H_{14}O_2$	$CDCl_3$	[55]



	R^1	R^2
8-3-1	β-Me	α-OH
8-3-2	β-Me	α-OMe
8-3-3	α-Me	β-OH



8-3-4

Table 8-3-2: ^{1}H NMR spectroscopic data of dicyclic monoterpenoids **8-3-1**~**8-3-4**.

H	8-3-1	8-3-2	8-3-3	8-3-4
1	β 1.20 dd(8.5, 3.5)	β 1.18	β 1.29	α 1.76 m, β 1.54 m
2				α 1.52 m, β 1.50 m
3	β 3.91 d(6.5)	β 3.96	β 4.20	α 2.05 m, β 1.41 m
4	α 3.42 d(6.5)	α 3.44	α 3.18	
5				6.69 ddd(1.4, 4.2, 4.6)
6	α 0.93 dd(6.5, 3.5)	α 0.41	α 0.62	α 2.41 ddd(4.2, 4.8, 15.0)
	β 0.44 dd(8.5, 6.5)	β 0.47	β 0.53	β 2.49 ddd(4.6, 9.3, 15.0)
7	1.22 s	1.20 s	1.27 s	4.03 ddd(4.8, 4.9, 9.3)
8	1.46	1.44	1.51	2.40 m
9	0.93	0.93	0.99	2.95 m
10	0.99	0.99	1.00	9.37 s
OMe		3.31 s		

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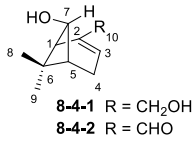
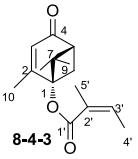
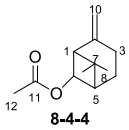
8.4 Tricyclic monoterpenoids

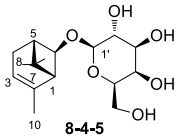
Table 8-4-1: Compounds, MFs, and test solvents of tricyclic monoterpenoids **8-4-1**~**8-4-19**.

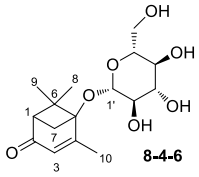
No.	Compounds	MFs	Test solvents	References
8-4-1	7-hydroxymyrtenol	$C_{10}H_{16}O_2$	$CDCl_3$	[56]
8-4-2	7-hydroxymyrtenal	$C_{10}H_{14}O_2$	$CDCl_3$	[56]
8-4-3	ferulagone	$C_{15}H_{20}O_3$	$CDCl_3$	[57]
8-4-4	7,7-dimethyl-2-methylenebicyclo[3.1.1]heptan-6-ol acetate	$C_{12}H_{18}O_2$	$CDCl_3$	[58]
8-4-5	(–)-*cis*-chrysanthenol-*β*-D-galactopyranoside	$C_{16}H_{28}O_6$	C_5D_5N	[59]
8-4-6	vervenone-5-*O*-*β*-D-glucopyranoside	$C_{16}H_{24}O_7$	CD_3OD	[60]
8-4-7	vervenone-8-*O*-*β*-D-glucopyranoside	$C_{16}H_{24}O_7$	CD_3OD	[60]
8-4-8	2-*endo*-bornyl piperate	$C_{22}H_{26}O_4$	$CDCl_3$	[61]
8-4-9	(1*S*,2*S*,4*R*,6*S*)-bornane-2,6-diol 2-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[62]
8-4-10	(1*R*,4*S*,6*S*)-6-hydroxycamphor-*β*-D-apiofuranosyl-(1→6)-*β*-D-glucopyranoside	$C_{21}H_{34}O_{11}$	C_5D_5N	[63]
8-4-11	(1*R*,2*S*,4*R*,7*S*)-vicodiol 9-*O*-*β*-D-glucopyranoside	$C_{16}H_{28}O_7$	C_5D_5N	[62]
8-4-12	6′-*O*-benzoyl-4″-hydroxy-3″-methoxy-paeoniflorin	$C_{31}H_{34}O_{14}$	C_5D_5N	[64]
8-4-13	acetoxypaeoniflorin	$C_{25}H_{30}O_{12}$	C_5D_5N	[65]
8-4-14	*α*-benzoyloxypaeoniflorin	$C_{30}H_{32}O_{13}$	CD_3OD	[66]
8-4-15	paeonin A	$C_{30}H_{32}O_{12}$	–	[67]
8-4-16	paeonin B	$C_{23}H_{28}O_{11}$	–	[67]
8-4-17	4-*O*-ethylpaeoniflorin	$C_{25}H_{32}O_{11}$	C_5D_5N	[64]
8-4-18	6′-*O*-benzoylalbiflorin	$C_{30}H_{32}O_{13}$	C_5D_5N	[64]
8-4-19	*β*-benzoyloxypaeoniflorin	$C_{30}H_{32}O_{13}$	CD_3OD	[66]

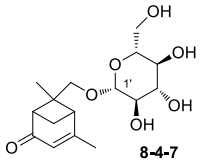


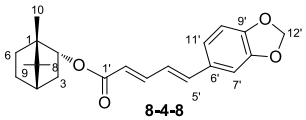












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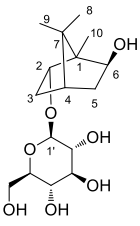
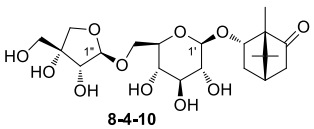


8-4-9



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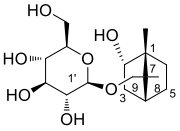
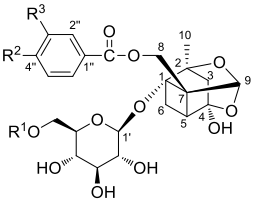
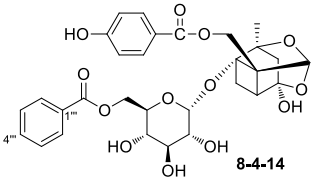


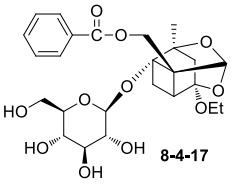
8-4-11



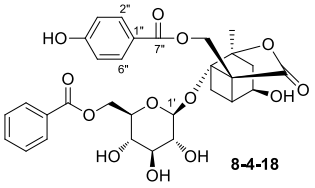
	R^1	R^2	R^3
8-4-12	Bz	OH	OMe
8-4-13	Ac	H	H
8-4-15	Bz	H	H
8-4-16	H	H	H
8-4-19	Bz	OH	H



8-4-14



8-4-17



8-4-18

Table 8-4-2: ^{1}H NMR spectroscopic data of tricyclic monoterpenoids **8-4-1**~**8-4-5**.

H	8-4-1	8-4-2	8-4-3	8-4-4	8-4-5
1	2.09 d(7.0)	2.84 d(7.0)		2.60 s	2.12 br s
3	5.38 br s	6.76 br s	5.57 q(1.4)	1.91 m, 2.01 m	5.20 br s
4	2.24 m	2.64 m		2.26 m, 2.47 m	2.32 d(16.5)
5	1.93 m	2.11 m	2.73 br d(6.0)	2.11 m	2.12 br s
6			2.92 br d(6.0) 2.92 dd(6.0, 9.6)	4.65 s	3.94 s
7	3.84 br s	3.78 br s			
8	1.49 s	1.63 s	1.23 s	0.76 s	0.90 s
9	0.80 s	0.80 s	1.44 s	1.39 s	1.48 s
10	3.84 m	9.38 s	1.93 d(1.4)	4.61 s 4.68 s	1.60 br s
12				2.04 s	

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Table 8-4-2 (continued)

H	8-4-1	8-4-2	8-4-3	8-4-4	8-4-5
1′					4.45 d(8)
2′					3.46 dd(9.0, 8.5)
3′			6.17 qq(1.4, 7.1)		3.35 dd(9.0, 8.0)
4′			2.02 dq(1.6, 7.1)		3.40 dd(8.5, 8.5)
5′			1.94 qq(1.4, 1.6)		3.48 m
6′					3.85 m

Table 8-4-3: ^{1}H NMR spectroscopic data of tricyclic monoterpenoids **8-4-6**~**8-4-10**.

H	8-4-6	8-4-7	8-4-8	8-4-9	8-4-10
1	2.55 dd(2.3, 6.8)	2.79 t(5.6)			
2			4.96 br ddd (13.1, 2.6, 2.6)	ex 4.37 dd (3.5, 10.0)	
3	5.67 s	5.75 s	*α* 1.01 dd (13.1, 4.3)	en 1.49 br dd (3.5, 13.5)	en 2.02 br d (18.0)
			β 2.38 m	ex 2.37 dddd (3.5, 4.5, 10.0, 13.5)	ex 2.32 ddd (4.0, 4.0, 18.0)
4			1.68 br t(4.3)	1.70 br dd(4.5, 4.5)	1.92 br dd(4.0, 4.0)
5		2.69 t(5.7)	*α* 1.24 m	en 1.97 br dd (8.0, 12.5)	en 1.92 br dd (4.0, 13.5)
			β 1.74 m	ex 2.08 ddd (4.5, 7.5, 12.5)	ex 2.67 dddd (4.0, 4.0, 9.0, 13.5)
6			*α* 2.00 m, *β* 1.33 m	en 5.08 dd(7.5, 8.0)	ex 4.37 br d(9.0)
7	3.16 dd(2.3, 9.3)	2.12 m			
	2.47 d(9.3)	2.92 m			
8	1.46 s	4.29 d(9.9), 3.87 d(9.9)	0.91 s	1.32 s	0.85 s
9	1.04 s	1.10 s	0.87 s	0.85 s	0.68 s
10	2.06 s	2.09 s	0.84 s	1.46 s	1.20 s
1′	4.56 d(7.5)	4.33 d(7.7)		4.98 d(7.5)	4.78 d(7.5)
2′	3.21 t(7.6)	3.21 t(7.6)	5.96 d(15.3)	–	–
3′	3.35~3.27 m	3.35~3.27 m	7.38 dd(15.3, 10.8)	–	–
4′	3.35~3.27 m	3.35~3.27 m	6.69 dd(15.7, 10.8)	–	–
5′	3.35~3.27 m	3.35~3.27 m	6.80 d(15.7)	–	–
6′	3.85 d(11.9)	3.85 d(11.5)		–	–
	3.68 dd(5.3, 11.9)	3.68 dd(3.7, 11.5)			
7′			6.98 d(1.5)		

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Table 8-4-3 (continued)

H	8-4-6	8-4-7	8-4-8	8-4-9	8-4-10
10′			6.77 d(8.2)		
11′			6.90 dd(8.2, 1.5)		
12′			5.97 s		
1″					5.81 d(2.5)

Table 8-4-4: ^{1}H NMR spectroscopic data of tricyclic monoterpenoids **8-4-11**~**8-4-15**.

H	8-4-11	8-4-12	8-4-13	8-4-14	8-4-15
2	ex 4.40 ddd (2.0, 3.5, 9.0)				
3	en 1.35 br dd (3.5, 13.0) ex 2.55 ddd (4.5, 9.0, 13.0)	*α* 2.46 d(12.3) *β* 2.28 d(12.3)	2.37 d(12.3) 2.58 d(12.3)	1.74 d(12.1) 1.87 d(12.1)	2.05 d(12.5) 2.42 d(12.5)
4	2.23 br dd(4.5, 4.5)				
5	en 1.41 br ddd (4.5, 9.0, 13.0) ex 1.74 dddd (4.5, 9.0, 13.0, 13.0)	*α* 3.04 d(6.8)	3.10 d(6.6)	2.52 d(6.6)	2.60 br d(6.6)
6	en 2.53 ddd (4.5, 9.0, 13.0) ex 1.31 dddd (2.0, 4.5, 13.0, 13.0)				
7		*α* 2.86 dd (10.8, 6.8) *β* 2.27 d(10.8)	2.26 d(10.8) 2.85 dd (10.8, 6.9)	1.40 d(10.4) 1.64 dd (10.4, 6.6)	1.8 br d(10.9) 2.48 dd (10.9, 6.6)
8	1.19 s	5.02 d(12.1) 5.16 d(12.1)	5.06 d(12.4) 5.20 d(12.4)	4.70 s(2H)	4.59 d(12.1) 4.72 d(12.1)
9	3.86 d(10.0) 4.13 d(10.0)	*α* 5.88 s	5.93 s	5.39 s	5.43 s
10	1.05 s	1.68 s	1.66 s	1.26 s	1.46 s
1′	4.86 d(7.5)	5.12 d(7.8)	5.08 d(8.4)	4.95 br s	4.57 d(7.5)
2′	–	4.01 t(8.8)	3.98 t(8.4)	3.27 m	3.29 t(7.5)
3′	–	4.18 t(8.8)	4.15 t(8.4)	3.38 m	3.38 br t(7.5)
4′	–	4.07 t(8.8)	3.95 (ov)	3.32 m	3.30 t(1.5)①
5′	–	4.10 dd(8.8, 5.3)	3.93 (ov)	3.59 dd(7.2, 5.6)	3.60 br t(7.1)
6′	–	4.95 dd(11.6, 6.9) 5.22 dd(11.6, 1.8)	4.63 dd(10.8, 6.5) 4.92 d(10.8)	4.45 dd(11.0, 5.6) 5.05 d(11.0)	4.48 dd(11.5, 7.1) 4.6 dd(11.5, 1.9)

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Table 8-4-4 (continued)

H	8-4-11	8-4-12	8-4-13	8-4-14	8-4-15
6′-OAc			1.99 s		
2″		7.91 d(1.9)	8.10 d(7.8)	7.89 d(8.0)	8.02 d(7.5)
3″			7.30 t(7.8)	6.83 d(8.0)	7.46 t(7.5)
4″			7.47 t(7.8)		7.60 t(7.5)
5″		7.21 d(8.1)	7.30 t(7.8)	6.83 d(8.0)	7.46 t(7.5)
6″		7.98 dd(8.1, 1.9)	8.10 d(7.8)	7.89 d(8.0)	8.02 d(7.5)
2‴, 6‴		8.10 dd(7.4, 1.2)		8.04 d(7.9)	8.02 d(7.5)
3‴, 5‴		7.28 t(7.4)		7.49 t(7.9)	7.46 t(7.5)
4‴		7.43 t(7.4)		7.62 t(7.9)	7.60 t(7.5)
3″-OMe		3.78 s			

① The discrepancy between the value of coupling constant and the structure is a typographic error in the literature.
Note: ex denotes *exo* and en *endo*.

Table 8-4-5: ^{1}H NMR spectroscopic data of tricyclic monoterpenoids **8-4-16**~**8-4-19**.

H	8-4-16	8-4-17	8-4-18	8-4-19
3	2.06 d(12.7)	*α* 2.19 s	*α* 2.34 dd(12.5, 6.0)	1.61 d(12.2)
	2.43 d(12.7)		*β* 2.12 d(12.5)	1.79 d(12.2)
4			*α* 4.45 dt(7.2, 6.0)	
5	2.59 br d(6.7)	*α* 3.03 d(6.8)	*α* 3.13 m	2.40 d(6.7)
7	1.82 br d(11.0)	*α* 2.83 dd(11.0, 6.8)	*α* 3.08 dd(10.5, 7.0)	1.38 d(10.3)
	2.50 dd(11.0, 6.7)	*β* 2.17 d(11.0)	*β* 2.28 d(10.5)	1.59 dd(10.3, 6.7)
8	4.58 d(12.2)	5.09 d(12.1)	5.12 d(12.0)	4.56 s(2H)
	4.73 d(12.2)	5.17 d(12.1)	5.24 d(12.0)	
9	5.41 s	*α* 5.81 s		5.26 s
10	1.48 s	1.64 s	1.66 s	1.24 s
1′	4.53 d(7.6)	5.12 d(7.7)	5.03 d(8.0)	4.47 d(7.8)
2′	3.28 t(7.5)	3.99 t(8.9)	4.03 t(8.0)	3.19 m
3′	3.35 br t(7.5)	4.15 t(8.9)	4.15 t(8.0)	3.24 m
4′	3.29 t(1.6)	4.14 t(8.9)	4.07 t(8.0)	3.28 m
5′	3.60 br t(7.2)	3.89 m	4.08 dd(8.0, 5.0)	3.52 dd(7.7, 6.0)
6′	4.48 dd(12.1, 7.2)	4.28 dd(11.7, 5.8)	5.15 dd(11.5, 5.0)	4.32 dd(11.2, 6.0)
	4.65 dd(12.1, 1.9)	4.52 dd(11.7, 2.4)	5.21 d(11.5)	4.98(11.2)①
2″, 6″	8.05 d(7.6)	8.16 d(7.5)	8.26 dd(8.7, 3.1)	7.79 d(8.1)
3″, 5″	7.50 t(7.6)	7.31 t(7.5)	7.03 d(8.7)	6.72 d(8.1)
4″	7.62 t(7.6)	7.45 t(7.5)		
2‴, 6‴			8.22 d(7.8)	7.95 d(7.8)
3‴, 5‴			7.25 t(7.8)	7.39 t(7.8)
4‴			7.56 t(7.8)	7.52 t(7.8)
$O\underline{CH_2}CH_3$		3.75 q(7.0)		
$OCH_2\underline{CH_3}$		1.14 t(7.0)		

① Peak-type was not given in the literature.

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8.5 Iridoids

8.5.1 Normal iridoids

Table 8-5-1: Compounds, MFs, and test solvents of normal iridoids **8-5-1**~**8-5-11**.

No.	Compounds	MFs	Test solvents	References
8-5-1	jioglutin D	$C_{11}H_{18}O_6$	CD_3OD	[68]
8-5-2	jioglutin E	$C_{11}H_{20}O_5$	CD_3OD	[68]
8-5-3	longiflorone	$C_{10}H_{16}O_5$	CD_3OD	[69]
8-5-4	artselaenin A	$C_{11}H_{16}O_3$	$CDCl_3$	[70]
8-5-5	artselaenin B	$C_{11}H_{16}O_3$	$CDCl_3$	[70]
8-5-6	artselaenin C	$C_9H_{12}O_4$	DMSO-d_6	[70]
8-5-7	alyxialactone	$C_{10}H_{16}O_4$	$CDCl_3$	[71]
8-5-8	4-*epi*-alyxialactone	$C_{10}H_{16}O_4$	$CDCl_3$	[71]
8-5-9	iridolactone	$C_9H_{12}O_4$	CD_3OD	[72]
8-5-10	viteoid I	$C_9H_{12}O_4$	CD_3OD	[73]
8-5-11	viteoid II	$C_9H_{12}O_4$	CD_3OD	[73]

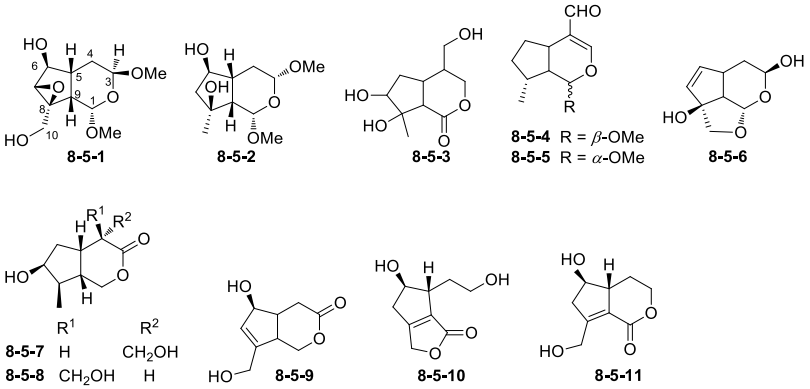

Table 8-5-2: ^{1}H NMR spectroscopic data of normal iridoids **8-5-1**~**8-5-4**.

H	8-5-1	8-5-2	8-5-3	8-5-4
1	4.92 d(4.0)	4.68 br d(5.5)		5.10 d(3.6)
3	4.71 dd (6.6, 2.7)	4.75 ddd (6.9, 4.0, 0.5)	4.19 dd(10.5, 6.0) 4.54 dd(10.5, 3.0)	7.14 s
4	*β* 1.81 ddd(13.7, 7.7, 6.6) *α* 1.89 ddd(13.7, 5.3, 2.7)	*β* 1.40 ddd(13.7, 9.9, 6.9) *α* 1.87 ddd(13.7, 6.5, 4.0)	1.78 m	

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Table 8-5-2 (continued)

H	8-5-1	8-5-2	8-5-3	8-5-4
5	1.97 dddd (8.2, 8.1, 7.7, 5.3)	2.42 m	2.50 m	2.74 m
6	4.03 dd(8.2, 1.3)	4.03 dddd(6.8, 4.4, 4.2, 0.5)	1.92 ddd(13.5, 8.0, <1)①	2.17~2.35 m
			2.04 ddd(13.5, 9.5, 4.0)	
7	*α* 3.32 d(1.3)	*α* 2.09 dd(14.2, 6.8) *β* 1.77 ddt(14.2, 4.4, 0.9)	3.71 dd(4.0, <1)①	2.17~2.35 m
8				1.96 m
9	2.67 dd(8.1, 4.0)	2.15 dd(8.8, 5.5)	2.86 d(11.0)	2.08 dd(7.3, 3.6)
10	3.49 d(12.7) 3.96 d(12.7)	1.28 s	1.48 s	1.08 d(6.8)
11			3.45 dd(11.0, 8.0) 3.58 dd(11.0, 5.5)	9.30 s
OMe	3.32 s, 3.41 s	3.43 s, 3.44 s		3.44 s

① The coupling constant <1 is given in the literature.

Table 8-5-3: ^{1}H NMR spectroscopic data of normal iridoids **8-5-5**~**8-5-8**.

H	8-5-5	8-5-6	8-5-7	8-5-8
1	4.82 d(6.1)	5.40 d(6.6)	ax 4.32 dd(11, 4) eq 4.21 d(11)	ax 3.97 dd(12, 11) eq 4.44 dd(12, 6)
3	7.18 s	4.82 dd(9.2. 2.6)		
4		*β* 1.53 ddd(13.5, 9.2, 6.8) *α* 1.73 ddd(13.5, 2.8, 2.6)	2.88 ddd(4, 4.5, 8.5)	2.54 ddd(7.5, 3.5, 11)
5	2.92 m	3.21 m	2.98 m	2.45 m
6	2.11~2.29 m	5.60 dd(6.4, 2.6)	*α* 1.26 ddd(10.5, 13, 2.5) *β* 1.85 dd(7.5, 13)	*α* 1.53 ddd(9, 13, 3) *β* 2.20 dd(7, 13)
7	2.11~2.29 m	5.73 dd(6.4, 2.0)	4.11 dd(2.5, 3)	4.21 dd(3, 3)
8	1.92 m		1.92 m	1.73 m
9	1.47 m	2.21 dd(8.4. 6.6)	2.20 td(4, 9.5)	2.32 m
10	1.04 d(6.8)	*α* 3.67 d(9.0) *β* 3.44 d(9.0)	1.09 d(7)	1.09 d(7)
11	9.24 s		3.58 dd(11, 4.5) 3.90 dd(11, 8.5)	3.75 dd(11.5, 7.5) 3.80 dd(11.5, 3.5)
OMe	3.54 s			

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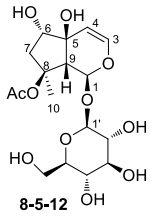
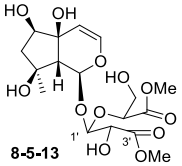
Table 8-5-4: ^{1}H NMR spectroscopic data of normal iridoids **8-5-9**~**8-5-11**.

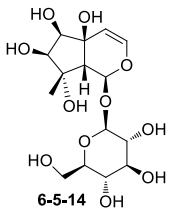
H	8-5-9	8-5-10	8-5-11
1	4.43 dd(11.8, 3.9) 4.33 dd(11.8, 4.1)		
3		3.73 m	*α* 4.43 ddd(2.4, 4.9, 11.6) *β* 4.31 ddd(3.1, 11.6, 11.6)
4	2.91 dd(14.9, 7.5) 2.56 dd(14.9, 4.2)	1.75 dddd(6.7, 6.7, 6.7, 14.0) 1.82 dddd(6.7, 6.7, 6.7, 14.0)	*β* 2.23 dddd(2.4, 3.1, 4.8, 13.4) *α* 1.65 dddd(4.9, 11.6, 11.6, 13.4)
5	2.70 m	2.76 br s	2.86 m
6	4.45(ov)	4.55 ddd(3.7, 3.7, 6.7)	4.09 ddd(7.3, 7.3, 7.6)
7	5.77 br s	3.05 m, 2.52 m	2.49 m, 2.95 m
9	3.36 m		
10	4.21 dd(14.8, 0.9) 4.19 dd(14.8, 1.1)	4.88 br d(1.2)	4.64 ddd(1.2, 2.4, 16.5) 4.54 ddd(1.2, 2.4, 16.5)

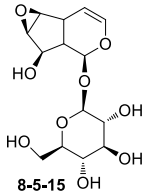
Table 8-5-5: Compounds, MFs, and test solvents of normal iridoids **8-5-12**~**8-5-29**.

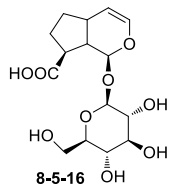
No.	Compounds	MFs	Test solvents	References
8-5-12	6-*epi*-8-*O*-acetylharpagide	$C_{17}H_{26}O_{11}$	D_2O	[74]
8-5-13	clandonoside II	$C_{17}H_{26}O_{12}$	D_2O	[74]
8-5-14	8-*epi*-muralioside	$C_{15}H_{24}O_{11}$	D_2O	[75]
8-5-15	isounedoside	$C_{14}H_{20}O_9$	D_2O	[76]
8-5-16	grandifloric acid	$C_{15}H_{22}O_9$	D_2O	[76]
8-5-17	8-*O*-feruloylharpagide	$C_{25}H_{32}O_{13}$	CD_3OD	[77]
8-5-18	8-*O*-(2-hydroxycinnamoyl)harpagide	$C_{24}H_{30}O_{12}$	DMSO-d_6	[77]
8-5-19	6-*O*-*α*-D-galactopyranosylharpagoside	$C_{30}H_{40}O_{16}$	CD_3OD	[77]
8-5-20	picroside IV	$C_{24}H_{28}O_{12}$	C_5D_5N	[78]
8-5-21	10-*O*-*cis*-*p*-coumaroylcatalpol	$C_{24}H_{28}O_{12}$	CD_3OD	[79]
8-5-22	10-*O*-*trans*-*p*-methoxycinnamoylcatalpol	$C_{25}H_{30}O_{12}$	CD_3OD	[79]
8-5-23	10-*O*-*cis*-*p*-methoxycinnamoylcatalpol	$C_{25}H_{30}O_{12}$	CD_3OD	[79]
8-5-24	10-*O*-*trans*-*p*-caffeoylcatalpol	$C_{24}H_{28}O_{13}$	CD_3OD	[79]
8-5-25	10-*O*-*trans*-isoferuloylcatalpol	$C_{25}H_{30}O_{13}$	CD_3OD	[79]
8-5-26	10-*O*-*trans*-*p*-methoxycinnamoylasystasioside E	$C_{25}H_{31}ClO_{12}$	CD_3OD	[79]
8-5-27	10-*O*-*cis*-*p*-methoxycinnamoylasystasioside E	$C_{25}H_{31}ClO_{12}$	CD_3OD	[79]
8-5-28	10-*O*-*trans*-*p*-coumaroylasystasioside E	$C_{24}H_{29}ClO_{12}$	CD_3OD	[79]
8-5-29	10-*O*-*cis*-*p*-coumaroylasystasioside E	$C_{24}H_{29}ClO_{12}$	CD_3OD	[79]











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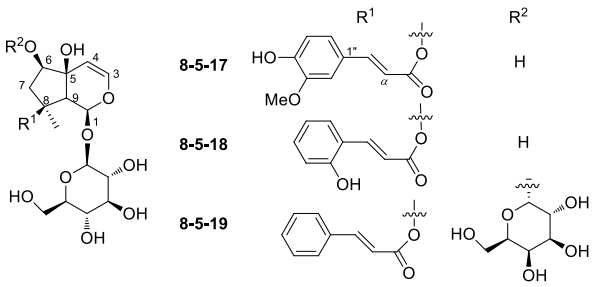
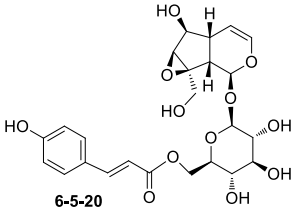
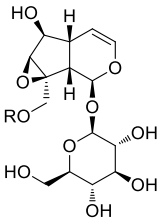
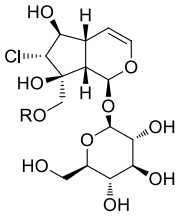






8-5-21 R = *Z*-coum
8-5-22 R = *E*-*p*-OMe-Cinn
8-5-23 R = *Z*-*p*-OMe-Cinn
8-5-24 R = *E*-caff
8-5-25 R = *E*-isofer



8-5-26 R = *E*-*p*-OMe-Cinn
8-5-27 R = *Z*-*p*-OMe-Cinn
8-5-28 R = *E*-coum
8-5-29 R = *Z*-coum

Table 8-5-6: ^{1}H NMR spectroscopic data of normal iridoids **8-5-12**~**8-5-16**.

H	8-5-12	8-5-13	8-5-14	8-5-15	8-5-16
1	5.95 s	6.05 s	5.70 d(1.0)	5.35 d(1.2)	5.11 d(3.2)
3	6.51 dd(6.4, 1.0)	6.42 d(6.4)	6.31 d(6.5)	6.14 dd(6.3, 1.8)	6.05 m
4	5.11 d(6.5)	4.97 dd(6.4, 1.4)	5.11 dd(6.5, 0.5)	4.72 dd(6.3, 1.2)	4.70 m
5				2.86 ddd(1.8, 6.3, 8.7)	2.57 m
6	4.27 dd(12.5, 6.6)	3.80 d(4.2)	4.10 d(4.2)	3.48 d(2.1)	1.84 m, 1.53 m
7	1.57 dd(13.5, 12.5) 2.44 dd(13.5, 6.6)	1.98 dd(15.7, 4.2) 2.14 d(15.7)	3.96 d(4.2)	3.52 dd(2.1, 1.5)	1.84 m, 1.33 m
8				4.06 dd(1.5, 8.1)	2.25 m

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Table 8-5-6 (continued)

H	8-5-12	8-5-13	8-5-14	8-5-15	8-5-16
9	2.70 s	2.54 s	2.68 m	1.78 ddd(1.5, 8.7, 8.1)	2.43 m
10	1.44 s	1.24 s	1.68 s	1.44 s	
OAc	2.03 s				
1′	4.71 dd(8.0, 1.0)	5.26 d(3.3)	4.68 d(8.0)	4.58 d(11.7)①	4.61 d(7.8)
2′	3.25 ddd(8.2, 9.3, 1.1)	4.45 d(3.3)	3.21 dd(9.2, 8.0)	3.12 dd(9.2, 7.9)	3.16~3.36 m
3′	3.44~3.50		3.32 t(9.2)	3.19~3.41 m	3.16~3.36 m
4′	3.38 dd(9.9, 1.0)		3.40 t(9.2)	3.19~3.41 m	3.16~3.36 m
5′	3.44~3.50	4.55 dd(4.6, 3.8)	3.39 ddd(9.2, 4.6, 2.2)	3.19~3.41 m	3.16~3.36 m
6′	3.71 dd(12.4, 5.6)	3.65 dd(11.4, 3.9)	3.74 dd(12.5, 2.2)	3.54~3.78 m	3.90 dd(13.8, 9.8)
	3.91 d(12.4)	3.68 dd(11.3, 4.5)	3.62 dd(12.5, 4.6)		3.73 dd(13.8, 3.3)
OMe		3.76 s, 3.78 s			

① The value of coupling constant given in the literature is incorrect.

Table 8-5-7: ^{1}H NMR spectroscopic data of normal iridoids **8-5-17**~**8-5-20**.

H	8-5-17	8-5-18	8-5-19	8-5-20
1	6.01 s	5.99 s	6.02 s	5.53 d(10.0)
3	6.25 d(6.4)	6.39 d(6.3)	6.29 d(6.4)	6.46 dd(6.0, 1.5)
4	4.77 dd(6.4, 1.4)	4.90 d(6.3)	4.79 dd(6.4, 1.0)	5.32 dd(6.0, 4.5)
5				2.84 tdd(8.0, 4.5, 1.5)
6	3.59 d(4.0)	3.61 d(4.0)	3.55 d(4.0)	4.32 d(8.0)
7	1.85 dd(15.3, 4.0)	1.83 dd(14.8, 4.0)	1.88 dd(15.4, 4.0)	3.87 s
	2.08 d(15.3)	2.16 d(14.6)	2.31 d(15.3)	
9	2.76 s	2.67 s	2.75 s	2.92 dd(10.0, 8.0)
10	1.35 s	1.44 s	1.38 s	4.66 d(13.0)
				4.46 d(13.0)
1′	4.46 d(7.9)	4.41 d(8.0)	4.44 d(7.8)	5.50 d(8.0)
2′	3.05 t(9.1)	2.99 t(8.4)	3.06 t(8.3)	4.16 t(8.0)
3′	3.24 t(8.8)	3.14 m	3.24 t(8.8)	4.29 dd(9.0, 8.0)
4′	3.14 t(7.9)	3.08 t(9.0)	3.14 dd(8.7, 6.4)	4.18 t(9.0)
5′	3.19 dd(5.7, 2.0)	3.14 m	3.20 dd(6.4, 2.0)	4.09 m

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Table 8-5-7 (continued)

H	8-5-17	8-5-18	8-5-19	8-5-20
6′	3.55 dd(12.1, 5.7)	3.49 dd(11.8, 5.7)	3.55 m	5.01 d(12.0, 2.0)
	3.77 dd(12.1, 2.0)	3.70 br d(11.8)	3.78 dd(12.0, 2.0)	4.87 d(12.0, 5.0)
α	6.18 d(15.8)	6.53 d(16)	6.36 d(16.1)	6.56 d(16)
β	7.42 d(15.8)	7.78 d(16)	7.51 d(16.1)	7.94 d(16)
2″	7.01 d(1.6)		7.46 m	7.52 d(8.5)
3″		6.91 d(7.6)	7.24 m	7.11 d(8.5)
4″		7.23 t(7.8)	7.24 m	
5″	6.64 d(8.4)	6.82 t(7.6)	7.24 m	7.11 d(8.5)
6″	6.90 dd(8.4, 1.6)	7.57 d(7.8)	7.46 m	7.52 d(8.5)
1‴			4.85 d(3.8)	
2‴			3.63 dd(10.0, 3.7)	
3‴			3.50 dd(9.9, 3.2)	
4‴			3.67 d(2.9)	
5‴			4.08 t(6.3)	
6‴			3.55 m	

Table 8-5-8: ^{1}H NMR spectroscopic data of normal iridoids **8-5-21**~**8-5-24**.

H	8-5-21	8-5-22	8-5-23	8-5-24
1	5.04 d(10)	5.07 d(10)	5.04 d(10)	5.06 d(10)
3	6.35 dd(2, 6)	6.36 dd(2, 6)	6.35 dd(2, 6)	6.35 dd(2, 6)
4	5.06 dd(6, 5)	5.08 dd(6, 5)	5.05 dd(6, 5)	5.07 dd(6, 5)
5	2.27 ddt(2, 5, 8)	2.30 ddt(2, 5, 8)	2.26 ddt(2, 5, 8)	2.30 ddt(2, 5, 8)
6	3.92 dd(1, 8)	3.96 dd(1, 8)	3.92 dd(1, 8)	3.95 br d(8)
7	3.42 d(1)	3.50 d(1)	3.42 dd(1)	3.48 br s
9	2.57 dd(8, 10)	2.67 dd(8, 10)	2.56 dd(8, 10)	2.65 dd(8, 10)
10	4.25 d(13),	4.28 d(13),	4.21 d(13),	4.27 d(13),
	4.93 d(13)	4.99 d(13)	4.96 d(13)	4.97 d(13)
1′	4.75 d(8)	4.75 d(8)	4.75 d(8)	4.75 d(8)
2′	3.22 dd(8, 9)	3.20 dd(8, 9)	3.22 dd(8, 9)	3.19 dd(8, 9)
3′		3.37 t(9)		3.37 t(9)
6′	3.66 dd(12, 6)	3.68 dd(12, 6)	3.66 dd(12, 6)	3.67 dd(12, 6)
	3.92 dd(12, 2.)	3.92 dd(12, 2.)	3.92 dd(12, 2.)	3.94 dd(12, 2)
OMe		3.82 s	3.81 s	
α	5.80 d(13)	6.40 d(16)	5.86 d(13)	6.29 d(16)
β	6.88 d(13)	7.66 d(16)	6.93 d(13)	7.57 d(16)
2″	7.64 d(9)	7.56 d(9)	7.69 d(9)	7.06 d(2)
3″	6.77 d(9)	6.95 d(9)	6.92 d(9)	
5″	6.77 d(9)	6.95 d(9)	6.92 d(9)	6.78 d(8)
6″	7.64 d(9)	7.56 d(9)	7.69 d(9)	6.96 dd(2, 8)

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Table 8-5-9: ^{1}H NMR spectroscopic data of normal iridoids **8-5-25**~**8-5-29**.

H	8-5-25	8-5-26	8-5-27	8-5-28	8-5-29
1	5.06 d(10)	5.62 d(4)	5.59 d(3)	5.61 d(4)	5.58 d(3)
3	6.35 dd(2, 6)	6.23 dd(2, 6)	6.20 dd(2, 6)	6.22 dd(2, 6)	6.20 dd(2, 6)
4	5.07 dd(6, 5)	5.11 dd(6, 3)	5.08 dd(6, 3)	5.11 dd(6, 3)	5.07 dd(6, 3)
5	2.30 ddt(2, 5, 8)	2.72 dddd (2, 3, 6, 11)	2.69 dddd (2, 3, 6, 11)	2.72 dddd (2, 3, 6, 11)	2.67 dddd (2, 3, 5, 11)
6	3.95 dd(1, 8)	3.93 dd(6, 8)	3.90 dd(6, 8)	3.94 dd(6, 8)	3.89 dd(6, 8)
7	3.48 d(1)	4.07 d(8)	4.04 d(8)	4.06 d(8)	4.03 d(8)
9	2.65 dd(8, 10)	2.64 dd(4, 11)	2.61 dd(3, 11)	2.64 dd(4, 11)	2.61 dd(3, 11)
10	4.27 d(13)	4.31 d(12)	4.27 d(12)	4.30 d(12)	4.26 d(12)
	4.98 d(13)	4.55 d(12)	4.47 d(12)	4.55 d(12)	4.46 d(12)
1′	4.74 d(8)	4.63 d(8)	4.62 d(8)	4.63 d(8)	4.62 d(8)
2′	3.19 dd(8, 9)	3.22 dd(8, 9)	3.20 dd(8, 9)	3.22 dd(8, 9)	3.21 dd(8, 9)
6′	3.66 dd(12, 6)	3.68 dd(12, 5)	3.67 dd(12, 5)	3.68 dd(12, 5)	3.66 dd(12, 5)
	3.89 dd(12, 2.)	3.84 dd(12, 2)	3.85 dd(12, 2)	3.83 dd(12, 2)	3.85 dd(12, 2)
OMe	3.88 s	3.83 s	3.82 s		
α	6.34 d(16)	6.38 d(16)	5.85 d(13)	6.33 d(16)	5.80 d(13)
β	7.59 d(16)	7.68 d(16)	6.90 d(13)	7.66 d(16)	6.86 d(13)
2″	7.09 d(2)	7.57 d(9)	7.74 d(9)	7.47 d(9)	7.68 d(9)
3″		6.96 d(9)	6.89 d(9)	6.81 d(9)	6.75 d(9)
5″	6.94 d(8)	6.96 d(9)	6.89 d(9)	6.81 d(9)	6.75 d(9)
6″	7.06 dd(2, 8)	7.57 d(9)	7.74 d(9)	7.47 d(9)	7.68 d(9)

Table 8-5-10: Compounds, MFs, and test solvents of normal iridoids **8-5-30**~**8-5-61**.

No.	Compounds	MFs	Test solvents	References
8-5-30	6*β*-hydroxyboschnaloside	$C_{16}H_{24}O_9$	D_2O	[80]
8-5-31	8-deoxylamiol	$C_{16}H_{26}O_9$	D_2O	[80]
8-5-32	5,8-bisdeoxylamiol	$C_{16}H_{26}O_8$	D_2O	[80]
8-5-33	(1*S*,3*S*)-1-(*β*-D-glucopyranosyloxy)-1,3,5,6-tetrahydro-3-methoxy-7-methylcyclopenta[c]pyran-4-carboxaldehyde	$C_{17}H_{24}O_9$	CD_3OD	[81]
8-5-34	(1*S*,3*R*)-1-(*β*-D-glycopyranosyloxy)-1,3,5,6-tetrahydro-3-methoxy-7-methylcyclopenta[*c*]pyran-4-carboxaldehyde	$C_{17}H_{24}O_9$	CD_3OD	[81]
8-5-35	nepetanudoside B	$C_{16}H_{22}O_9$	CD_3OD	[82]
8-5-36	nepetanudoside C	$C_{16}H_{22}O_8$	CD_3OD	[82]
8-5-37	nepetanudoside D	$C_{16}H_{22}O_8$	CD_3OD	[82]
8-5-38	nepetacilicioside	$C_{16}H_{22}O_9$	CD_3OD	[83]
8-5-39	7,8-epoxy-8-*epi*-loganic acid	$C_{16}H_{22}O_{10}$	CD_3OD	[84]
8-5-40	9-hydroxy-8-epihastatoside	$C_{17}H_{24}O_{12}$	–	[85]

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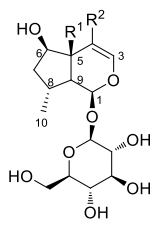
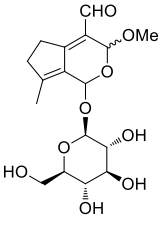
Table 8-5-10 (continued)

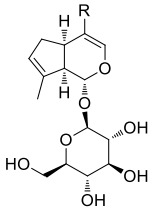
No.	Compounds	MFs	Test solvents	References
8-5-41	(5*αH*)-6*α*-8-epidihydrocornin	$C_{17}H_{26}O_{10}$	D_2O	[86]
8-5-42	(5*αH*)-6*α*-hydroxy-8-epiloganin	$C_{17}H_{26}O_{11}$	D_2O	[86]
8-5-43	5,6*β*-dihydroxyadoxoside	$C_{17}H_{26}O_{12}$	D_2O	[87]
8-5-44	asperulosidic acid ethyl ester	$C_{20}H_{28}O_{12}$	D_2O	[88]
8-5-45	6′-acetyl deacetylasperuloside	$C_{18}H_{22}O_{11}$	D_2O	[88]
8-5-46	10-*O*-benzoyl deacetyl asperulosidic acid methyl ester	$C_{24}H_{28}O_{12}$	CD_3OD	[89]
8-5-47	10-*O*-benzoyl scandoside methyl ester	$C_{24}H_{28}O_{12}$	CD_3OD	[89]
8-5-48	10-*O*-*p*-hydroxybenzoyl scandoside methyl ester	$C_{24}H_{28}O_{13}$	CD_3OD	[89]
8-5-49	4′-acetyl-2′-*m*-hydroxybenzoyl loganin	$C_{26}H_{32}O_{13}$	CD_3OD	[90]
8-5-50	6′-acetyl-2′-*m*-hydroxybenzoyl loganin	$C_{26}H_{32}O_{13}$	CD_3OD	[90]
8-5-51	10-*O*-*β*-D-glucopyranosyltheviridoside	$C_{23}H_{34}O_{16}$	C_5D_5N	[91]
8-5-52	3′-*O*-*β*-D-glucopyranosyltheviridoside	$C_{23}H_{34}O_{16}$	C_5D_5N	[91]
8-5-53	caryoptosidic acid	$C_{16}H_{24}O_{11}$	CD_3OD	[92]
8-5-54	lippioside I	$C_{25}H_{30}O_{13}$	CD_3OD	[92]
8-5-55	lippioside II	$C_{25}H_{30}O_{14}$	CD_3OD	[92]
8-5-56	jashemsloside A	$C_{27}H_{40}O_{12}$	CD_3OD	[93]
8-5-57	jashemsloside B	$C_{27}H_{40}O_{12}$	CD_3OD	[93]
8-5-58	jashemsloside C	$C_{33}H_{50}O_{17}$	CD_3OD	[93]
8-5-59	jashemsloside D	$C_{33}H_{50}O_{17}$	CD_3OD	[93]
8-5-60	6′-*O*-*trans*-*p*-coumaroylloganin	$C_{26}H_{32}O_{12}$	CD_3OD	[93]
8-5-61	6′-*O*-*cis*-*p*-coumaroylloganin	$C_{26}H_{32}O_{12}$	CD_3OD	[93]



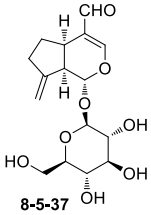
R1 R2
8-5-30 H CHO
8-5-31 OH Me
8-5-32 H Me



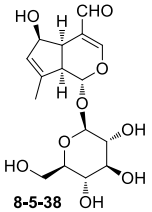
8-5-33 3α-H
8-5-34 3β-H



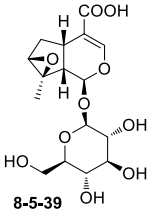
8-5-35 R = COOH
8-5-36 R = CHO



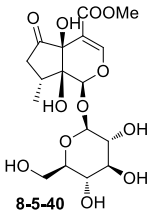
8-5-37



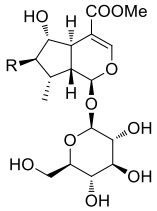
8-5-38



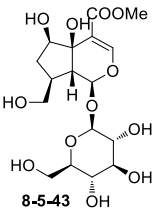
8-5-39



8-5-40



8-5-41 R=H
8-5-42 R=OH



8-5-43

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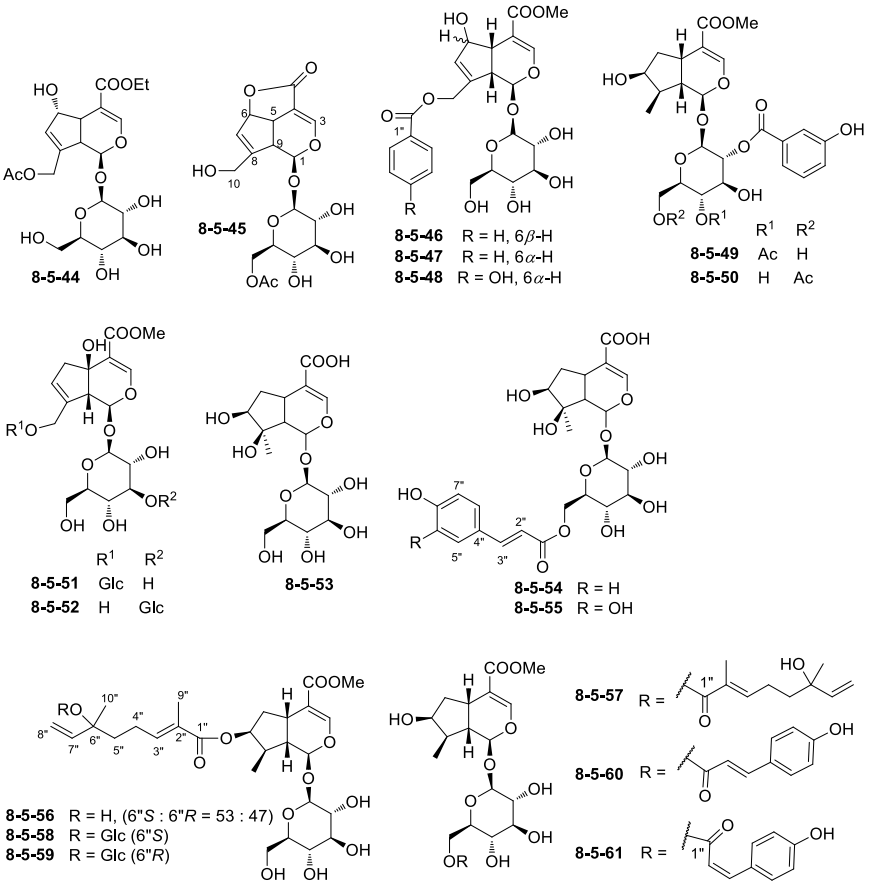

Table 8-5-11: ^{1}H NMR spectroscopic data of normal iridoids **8-5-30**~**8-5-33**.

H	8-5-30	8-5-31	8-5-32	8-5-33
1	5.66 d(2.3)	5.50 s	5.31 d(1.7)	6.22 s
3	7.38 br s	6.05 d(1.4)	5.93 s	5.41 s
5	2.81 d(8.7)		2.36 d(8.3)	
6	4.19 t(2.3)	3.96 t(3.7)	4.19 m	3.11 br t①
7	*α* 1.38 ddd(14.0, 9.5, 4.6) *β* 1.71 dd(14.0, 6.8)	*α* 1.36 ddd(13.4, 8.5, 4.6) *β* 1.68 ddd(13.4, 7.1, 3.2)	*α* 1.43 ddd(13.4, 8.9, 4.7) *β* 1.60~1.74 m	2.75 br t①
8	2.50 m	2.40~2.57 m	2.33~2.46 m	
9	2.65 dt(9.2, 2.3)	2.45 s	2.52 ddd(10.1, 8.4, 1.6)	
10	0.94 d(7.2)	0.84 d(6.8)	0.91 d(7.1)	2.09 s
11	9.05 s	1.51 d(1.4)	1.49 s	9.71 s

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Table 8-5-11 (continued)

H	8-5-30	8-5-31	8-5-32	8-5-33
OMe				3.55 s
1′	4.75	4.59 d(8.0)	4.60 d(8.2)	4.85 d(8)
2′	3.16 dd(9.2, 8.3)	3.19 dd(9.3, 8.0)	3.16 dd(8.9, 8.2)	3.20 dd(9.2, 8)
3′	3.41 dd(9.2, 9.1)	3.40 dd(9.3, 8.9)	3.39 dd(9.3, 8.9)	3.43 t(9.2, 9)
4′	3.30 dd(9.5, 9.1)	3.29 dd(9.6, 8.9)	3.28 dd(9.3, 9.0)	3.27 t(9, 9)
5′	3.40 m	3.40 m	3.34 m	3.39 ddd(9, 6.3, 2.1)
6′	3.85 dd(12.3, 1.8)	3.82 dd(12.3, 1.9)	3.81 dd(12.4, 1.8)	3.93 dd(11.8, 2.1)
	3.63 dd(12.3, 5.7)	3.62 dd(12.3, 5.7)	3.62 dd(12.4, 5.5)	3.67 dd(11.8, 6.3)

① Incomplete literature data and lack of coupling constants.

Table 8-5-12: ^{1}H NMR spectroscopic data of normal iridoids **8-5-34**~**8-5-37**.

H	8-5-34	8-5-35	8-5-36	8-5-37
1	6.09 s	5.13 d(5.6)	5.40 d(4.6)	5.48 d(5.0)
3	5.50 s	7.43 s	7.38 s	7.38 s
5		3.13 m	3.15 m	3.24 m
6	3.04 dd(8.3, 3.6)	2.10 m, 2.72 m	2.16 m, 2.72 m	1.92 m
7	2.69 br t①	5.48 m	5.45 m	2.31 m
9		2.72 m	2.89 m	2.99 m
10	2.13 s	1.85 s	1.83 s	5.11 d(2.0), 5.81 d(2.0)
11	9.66 s		9.19 s	9.19 s
OMe	3.50 s			
1′	4.80 d(7.8)	4.58 d(7.6)	4.61 d(7.6)	4.61 d(8.0)
2′	3.26 dd(9.1, 7.8)	–	–	–
3′	3.42 m	–	–	–
4′	3.32 m	–	–	–
5′	3.4 m	–	–	–
6′	3.91 dd(11.9, 1.8)	3.69 dd(11.9, 4.7)	3.68 dd(12.0, 3.8)	3.70 dd(12.0, 4.0)
	3.68 dd(11.9, 5.6)	3.84 dd(11.9, 1.8)	3.85 br d(12.0)	3.86 d(12.0)

Table 8-5-13: ^{1}H NMR spectroscopic data of normal iridoids **8-5-38**~**8-5-41**.

H	8-5-38	8-5-39	8-5-40	8-5-41
1	5.49 d(3.4)	5.12 d(9.5)	5.70 s	5.69 d(9.7)
3	7.36 s	7.20 s	7.72 s	7.51 d(2.4)
5	2.98 dd(7.3, 2.0)	2.80 m		2.64 ddd(13.0, 8.9, 2.3)
6	4.45 s	α 1.41 dd(10.4, 13.6)		4.04 ddd(8.9, 6.5, 5.2)
		β 2.60 dd(7.5, 13.6)		

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Table 8-5-13 (continued)

H	8-5-38	8-5-39	8-5-40	8-5-41
7	5.50 s	3.28 m	2.56 dd(17.6, 9.6)	2.54 ddd(13.9, 8.9, 5.3)
			2.25 dd(17.6, 7.0)	1.24 ddd(13.9, 6.5, 2.7)
8			2.39 m	2.25 m
9	3.31	2.19 dd(7.4, 9.5)		1.91 ddd(13.1, 9.7, 7.1)
10	1.87 d(1.0)	1.60 s	1.13 d(7.2)	1.01 d(7.1)
11	9.23 s			
OMe			3.66 s	3.69 s
1′	4.61 d(7.8)	4.81 d(7.9)	4.73 d(8)	4.82 d(8.1)
2′	3.23 dd(7.8, 7.8)	3.19~3.44 m	3.29 dd①	3.28 dd(9.2, 8.0)
3′	–	3.19~3.44 m	3.46 t①	3.46 dd(9.2, 8.7)
4′	–	3.19~3.44 m	3.37 t①	3.39 dd(9.8, 8.7)
5′	–	3.19~3.44 m	3.44 m	3.43 m
6′	3.67 dd(11.7, 3.4)	3.64 dd(11.9, 5.8)	3.86 dd①	3.85 dd(12.5, 1.8)
	3.85 br d(11.7)	3.90 dd(11.9, 1.9)	3.69 dd①	3.68 dd(12.5, 5.1)

① The coupling constants are not given in the literature.

Table 8-5-14: ^{1}H NMR spectroscopic data of normal iridoids **8-5-42**~**8-5-45**.

H	8-5-42	8-5-43	8-5-44	8-5-45
1	5.68 d(9.3)	5.77 d(2.0)	5.03 d(9.0)	5.73 d(2.0)
3	7.51 d(2.1)	7.66 s	7.75 d(1.0)	7.25 d(2.0)
5	2.73 ddd(12.9, 9.6, 1.8)		3.18 br t(6.1)	3.54 m
6	3.85 m	4.32 dd(5.1, 3.1)	4.88 m	5.54 m
7	3.73 dd(4.7, 1.6)	2.00 m, 1.40 br ddd(14.2, 4.5, 3.1)	6.13 br s	5.56 m
8	2.04 m	1.93 m		
9	2.18 m	2.37 dd(8.7, 2.0)	2.78 t(8.2)	3.21 m
10	1.06 d(7.6)	3.68~3.61 m	4.96 d(14.7) 4.90 d(14.7)	4.08 br s
OMe	3.69 s	3.74 s		
CH_2			4.25 q(7.2)	
CH_3			1.32 t(7.2)	
1′	4.81 d(8.0)	4.75(ov)	4.87 d(9.0)	4.73 d(9.1)
2′	3.29 dd(9.2, 8.0)	3.29 dd(9.0, 8.1)	3.36~3.53 m	3.15 t(8.5)
3′	3.43 dd(9.2, 8.7)	3.49 t(9.1)	3.36~3.53 m	3.36~3.56 m

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Table 8-5-14 (continued)

H	8-5-42	8-5-43	8-5-44	8-5-45
4′	3.38 dd(9.8, 8.7)	3.40 br t(9.5)	3.36~3.53 m	3.36~3.56 m
5′	3.43 m	3.49 m	3.36~3.53 m	3.36~3.56 m
6′	3.83 m, 3.69 m	3.91 dd(12.3, 2.0)	3.90 dd(1.7, 12.4)	4.29 dd(2.1, 12.3)
		3.72 dd(12.3, 5.6)	3.71 dd(6.0, 12.4)	4.17 dd(5.0, 12.3)
OAc			2.18 s(10-OAc)	1.99 s(6′-OAc)

Table 8-5-15: ^{1}H NMR spectroscopic data of normal iridoids **8-5-46**~**8-5-49**.

H	8-5-46	8-5-47	8-5-48	8-5-49
1	5.12 d(9)	5.268 d(7)	5.26 d(7)	5.40 d(3)
3	7.67 d(2)	7.537 d(2)	7.53 d(2)	7.33 d(1)
5	3.09 dd(2, 8)	3.06 ddd(1, 5, 8)	3.05 ddd(2, 5, 8)	2.98 m
6		4.54 td(2, 5)	4.58 td(2, 5)	2.18 ddd(14.5, 8.5, 1.5)
				1.70 dt(14.5, 5.5)
7	6.11 d(2)	5.93 d(2)	5.89 d(2)	4.02 m
8				1.76 dqd(11, 6.5, 4.5)
9	2.72 t(8)	3.15 t(7)	3.13 t(8)	2.13 ddd(11, 9, 3)
10	5.02 d(15)	5.01 d(15)	4.94 d(15)	1.08 d(6.5)
	5.22 d(15)	5.11 d(15)	5.07 d(15)	
OMe	3.75 s	3.76 s	3.75 s	3.70 s
10-OAc				1.98 s
1′	4.75 d(8)	4.70 d(8)	4.70 d(8)	4.92 d(8)
2′	3.28 dd(8, 9)	3.24 dd(8, 9)	3.23 dd(8, 9)	4.82 dd(9.5, 8)
3′	–	–	–	3.90 t(9.5)
4′	3.39 t(9)	3.37 t(9)	–	5.06 t(9.5)
5′	–	–	–	3.71 m
6′	3.63 dd(6, 12)	3.64 dd(6, 12)	3.64 dd(7, 12)	3.69 dd(12.5, 2)
	3.86 dd(2, 12)	3.85 dd(2, 12)	3.85 dd(2, 12)	3.59 dd(12.5, 6)
2″	8.07 dd(1, 8)	8.07 dd(1, 8)	7.92 d(9)	7.44 dd(1.5, 1)
3″	7.50 t(8)	7.50 t(8)	6.84 d(9)	
4″	7.62 tt(1, 8)	7.62 tt(1, 8)		7.02 ddd(7.5, 1.5, 1)
5″	7.50 t(8)	7.50 t(8)	6.84 d(9)	7.29 t(7.5)
6″	8.07 dd(1, 8)	8.07 dd(1, 8)	7.92 d(9)	7.52 dt(7.5, 1)

Table 8-5-16: ^{1}H NMR spectroscopic data of normal iridoids **8-5-50**~**8-5-53**.

H	8-5-50	8-5-51	8-5-52	8-5-53
1	5.10 d(3.5)	5.84 d(7)	5.79 d(7)	5.51 d(4.0)
3	7.32 d(1)	7.62 s	7.66 s	7.39 s
5	2.95 m			3.20 ddd(10.5, 9.5, 5.0)

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Table 8-5-16 (continued)

H	8-5-50	8-5-51	8-5-52	8-5-53
6	2.14 ddd(14.5, 8, 1.5)	2.90 br d(17)	2.94 br d(17)	2.26 ddd(15.5, 9.5, 5.0)
	1.52 ddd(14.5, 7.5, 5)	3.16 br d(17)	3.21 br d(17)	1.75 dt(15.5, 5.0)
7	3.92 m	5.92 br s	5.99 s	3.66 dd(5.0, 2.5)
8	1.69 dqd(9, 6.5, 4.5)			
9	1.98 m	3.55 d(7)	3.47 d(7)	2.59 dd(10.5, 4.0)
10	0.95 d(6.5)	4.94 br d(13)	4.74 br d(14)	1.25 s
11		4.56 br d(13)	4.50 br d(14)	
OMe	3.68 s	3.59 s	3.62 s	
10-OAc	1.97 s			
1′	4.84 d(8.5)	5.35 d(8)	5.33 d(8)	4.69 d(7.8)
2′	4.72 dd(9, 8.5)	4.06 t(8)	4.05 t(8)	3.26 dd(7.8, 9.5)
3′	3.59 t(9)	4.21 t(8)	4.24 t(8)	3.44 t(9.5)
4′	3.53 t(9)	4.24 t(8)	4.05 t(8)	3.33 t(9.5)
5′	3.66 m	3.98 m	3.89 m	3.36 m
6′	4.60 dd(12, 2.5)	4.49 dd(12, 1)	4.38 dd(12, 2)	3.72 dd(12.0, 2.5)
	4.52 dd(12, 5.5)	4.30 dd(12, 5)	4.19 dd(12, 5)	3.92 dd(12.0, 4.5)
2″	7.44 dd(1.5, 1)			
4″	7.00 ddd(7.5, 1.5, 1)			
5″	7.25 t(7.5)			
6″	7.50 dt(7.5, 1)			
1‴		4.88 d(8)	5.30 d(8)	
2‴		4.03 t(8)	4.05 t(8)	
3‴		4.19 t(8)	4.22 t(8)	
4‴		4.17 t(8)	4.17 t(8)	
5‴		3.85 m	3.99 m	
6‴		4.49 dd(12, 1)	4.51 dd(12, 2)	
		4.30 dd(12, 5)	4.29 dd(12, 5)	

Table 8-5-17: ^{1}H NMR spectroscopic data of normal iridoids **8-5-54**, **8-5-55**, **8-5-60**, and **8-5-61**.

H	8-5-54	8-5-55	8-5-60	8-5-61
1	5.49 d(4.5)	5.49 d(4.5)	5.05 d(5.0)	5.01 d(5.0)
3	7.36 br s	7.36 br s	7.39 d(1.5)	7.39 d(1.5)
5	3.19 ddd(10.5, 9.5, 5.0)	3.18 ddd(10.5, 9.5, 5.0)	3.08 br q(8.0)	3.08 br q(8.0)
6	2.24 ddd(16.0, 9.5, 5.0)	2.25 ddd(16.0, 9.5, 5.0)	1.45 ddd(14.0, 9.0, 5.0)	1.46 ddd(14.0, 9.0, 5.0)
	1.74 dt(16.0, 5.0)	1.74 dt(16.0, 5.0)	2.17 ddd(14.0, 7.5, 1.5)	2.19 ddd(14.0, 8.0, 1.5)
7	3.68 dd(5.0, 2.5)	3.67 dd(5.0, 2.5)	3.98 t(5.0)	3.93 td(5.0, 1.5)
8			1.83 m	1.81 m
9	2.61 dd(10.5, 4.5)	2.61 dd(10.5, 4.5)	1.93 td(9.0, 5.5)	1.94 td(9.0, 5.0)
10	1.26 s	1.26 s	1.03 d(7.0)	1.02 d(7.0)

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Table 8-5-17 (continued)

H	8-5-54	8-5-55	8-5-60	8-5-61
OMe			3.66 s	3.68 s
1′	4.75 d(7.8)	4.76 d(7.8)	4.66 d(8.0)	4.62 d(8.0)
2′	3.25 dd(7.8, 9.5)	3.25 dd(7.8, 9.5)	3.23 br t(8.5)	3.21 dd(9.0, 8.0)
3′	3.46 t(9.5)	3.46 t(9.5)	3.40 t(9.0)	3.38 t(9.0)
4′	3.34 t(9.5)	3.34 t(9.5)	3.36 t(9.0)	3.34 m
5′	3.58 m	3.59 m	3.56 ddd(9.0, 6.5, 2.5)	3.51 ddd(9.5, 6.5, 2.0)
6′	4.44 dd(12.0, 2.5)	4.44 dd(12.0, 2.5)	4.42 dd(12.0, 6.5)	4.33 dd(12.0, 6.5)
	4.55 dd(12.0, 4.5)	4.55 dd(12.0, 4.5)	4.47 dd(12.0, 2.5)	4.46 dd(12.0, 2.0)
2″	6.44 d(16.0)	6.26 d(16.0)	6.34 d(16.0)	5.77 d(13.0)
3″	7.73 d(16.0)	7.57 d(16.0)	7.62 d(16.0)	6.87 d(13.0)
5″	7.55 d(8.0)	7.04 d(1.5)	7.44 (8.5)①	7.65 (8.5)①
6″	6.88 d(8.0)		6.80 (8.5)①	6.75 (8.5)①
8″	6.88 d(8.0)	6.77 d(8.0)	6.80 (8.5)①	6.75 (8.5)①
9″	7.55 d(8.0)	6.94 dd(8.0, 1.5)	7.44 (8.5)①	7.64 (8.5)①

① Coupling system of AA′BB′.

Table 8-5-18: ^{1}H NMR spectroscopic data of normal iridoids **8-5-56**~**8-5-59**.

H	8-5-56	8-5-57	8-5-58	8-5-59
1	5.30 d(5.0)	5.05 d(5.5)	5.31 d(4.5)	5.31 d(5.0)
3	7.43 d(1.5)	7.42 d(1.0)	7.43 s	7.43 d(1.0)
5	3.11 q(8.0)	3.11 q(8.0)	3.11 q(8.0)	3.11 q(8.0)
6	1.76 ddd(14.5, 8.0, 5.0)	1.50 ddd(14.0, 8.5, 4.5)	1.76 ddd(15.0, 8.0, 5.0)	2.28 ddd(15.0, 8.0, 1.5)
	2.28 ddd(14.5, 8.0, 1.5)	2.25 ddd(14.0, 7.5, 1.5)	2.28 ddd(15.0, 8.0, 1.0)	1.71~1.79 m
7	5.18 td(5.0, 1.5)	4.01 t(4.5)	5.18 td(5.0, 1.0)	5.18 m
8	2.15 m	1.83 m	2.14 m	2.14 m
9	2.08 td(8.5, 5.0)	1.95 td(9.0, 5.5)	2.10 td(8.0, 4.5)	2.10 td(8.5, 5.0)
10	1.06 d(6.5)	1.05 d(7.0)	1.06 d(7.0)	1.06 d(6.5)
OMe	3.69 s	3.69 s	3.69 s	3.69 s
1′	4.66 d(8.0)	4.64 d(8.0)	4.66 d(8.0)	4.66 d(8.0)
2′	3.19 dd(9.0, 8.0)	3.20 dd(9.0, 8.0)	3.20 dd(9.0, 8.0)	3.20 dd(9.0, 8.0)
3′	3.37 t(9.0)	3.38 t(9.0)		
4′		3.34 t(9.0)		
5′		3.52 ddd(9.0, 6.5, 2.5)		
6′	3.66 dd(12.0, 6.0)	4.28 dd(12.0, 6.5)	3.66 dd(12.0, 6.0)	3.66 dd(12.0, 6.0)
	3.90 dd(12.0, 2.0)	4.48 dd(12.0, 2.5)	3.90 dd(12.0, 2.0)	3.90 dd(12.0, 2.0)
3″	6.77 tq(8.0, 1.5)	6.78 tq(7.0, 1.5)	6.78 tq(7.5, 1.5)	6.79 tq(7.5, 1.5)
4″	2.23 m	2.22 m	2.32 m	2.35 m

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Table 8-5-18 (continued)

H	8-5-56	8-5-57	8-5-58	8-5-59
5″	1.62 m	1.59 m	1.71 m	1.71~1.79 m
7″	5.92 dd(17.0, 11.0)	5.90 dd(17.5, 11.0)	5.95 dd(18.0, 11.0)	6.10 dd(17.5, 11.0)
8″	5.06 dd(11.0, 1.5) 5.23 dd(17.0, 1.5)	5.22 dd(17.5, 1.5) 5.05 dd(11.0, 1.5)	5.22 dd(11.0, 1.0) 5.28 dd(18.0, 1.0)	5.18 dd(11.0, 1.0) 5.24 dd(17.5, 1.0)
9″	1.83 d(1.5)	1.82 br s	1.83 s	1.84 s
10″	1.27 s	1.26 s	1.41 s	1.36 s
1‴			4.37 d(8.0)	4.34 d(8.0)
2‴			3.17 dd(9.0, 8.0)	3.17 dd(9.0, 8.0)
6‴			3.63 dd(12.0, 5.5) 3.81 dd(12.0, 2.0)	3.65 dd(12.0, 5.5) 3.79 dd(12.0, 2.0)

Table 8-5-19: Compounds, MFs, and test solvents of normal iridoids **8-5-62**~**8-5-102**.

No.	Compounds	MFs	Test solvents	References
8-5-62	buddlejoside A_2	$C_{33}H_{42}O_{16}$	CD_3OD	[94]
8-5-63	buddlejoside A_3	$C_{33}H_{42}O_{17}$	CD_3OD	[94]
8-5-64	buddlejoside A_4	$C_{33}H_{42}O_{17}$	CD_3OD	[94]
8-5-65	buddlejoside A_5	$C_{33}H_{42}O_{17}$	CD_3OD	[94]
8-5-66	buddlejoside A_6	$C_{33}H_{42}O_{17}$	CD_3OD	[94]
8-5-67	buddlejoside A_7	$C_{33}H_{42}O_{17}$	CD_3OD	[94]
8-5-68	buddlejoside A_8	$C_{32}H_{42}O_{17}$	CD_3OD	[94]
8-5-69	buddlejoside A_9	$C_{34}H_{44}O_{18}$	CD_3OD	[94]
8-5-70	buddlejoside A_{10}	$C_{34}H_{44}O_{18}$	CD_3OD	[94]
8-5-71	buddlejoside A_{11}	$C_{34}H_{44}O_{18}$	CD_3OD	[94]
8-5-72	buddlejoside A_{12}	$C_{33}H_{42}O_{18}$	CD_3OD	[94]
8-5-73	buddlejoside A_{13}	$C_{46}H_{56}O_{24}$	CD_3OD	[94]
8-5-74	buddlejoside A_{14}	$C_{47}H_{58}O_{24}$	CD_3OD	[94]
8-5-75	buddlejoside A_{15}	$C_{46}H_{56}O_{24}$	CD_3OD	[94]
8-5-76	buddlejoside A_{16}	$C_{46}H_{56}O_{24}$	CD_3OD	[94]
8-5-77	scrophuloside A_1	$C_{26}H_{32}O_{12}$	CD_3OD	[95]
8-5-78	scrophuloside A_2	$C_{32}H_{40}O_{17}$	CD_3OD	[95]
8-5-79	scrophuloside A_3	$C_{32}H_{40}O_{17}$	CD_3OD	[95]
8-5-80	scrophuloside A_4	$C_{43}H_{50}O_{19}$	CD_3OD	[95]
8-5-81	scrophuloside A_5	$C_{33}H_{42}O_{17}$	CD_3OD	[95]
8-5-82	scrophuloside A_6	$C_{35}H_{44}O_{18}$	CD_3OD	[95]
8-5-83	scrophuloside A_7	$C_{35}H_{44}O_{18}$	CD_3OD	[95]
8-5-84	scrophuloside A_8	$C_{35}H_{44}O_{19}$	CD_3OD	[95]
8-5-85	gmelinoside A	$C_{30}H_{38}O_{15}$	CD_3OD	[96]
8-5-86	gmelinoside B	$C_{34}H_{42}O_{17}$	CD_3OD	[96]
8-5-87	gmelinoside C	$C_{30}H_{38}O_{16}$	CD_3OD	[96]
8-5-88	gmelinoside D	$C_{30}H_{38}O_{17}$	CD_3OD	[96]

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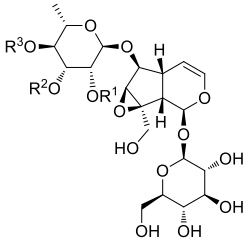
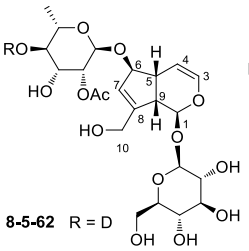
Table 8-5-19 (continued)

No.	Compounds	MFs	Test solvents	References
8-5-89	gmelinoside E	$C_{35}H_{44}O_{19}$	CD_3OD	[96]
8-5-90	gmelinoside F	$C_{30}H_{38}O_{17}$	CD_3OD	[96]
8-5-91	gmelinoside G	$C_{41}H_{48}O_{20}$	CD_3OD	[96]
8-5-92	gmelinoside H	$C_{43}H_{50}O_{21}$	CD_3OD	[96]
8-5-93	gmelinoside I	$C_{39}H_{44}O_{18}$	CD_3OD	[96]
8-5-94	gmelinoside J	$C_{35}H_{40}O_{16}$	CD_3OD	[96]
8-5-95	gmelinoside K	$C_{35}H_{40}O_{16}$	CD_3OD	[96]
8-5-96	gmelinoside L	$C_{32}H_{40}O_{16}$	CD_3OD	[96]
8-5-97	unduloside	$C_{31}H_{40}O_{16}$	CD_3OD	[97]
8-5-98	scrovalentinoside	$C_{35}H_{44}O_{18}$	CD_3OD-C_6D_6(9:1)	[98]
8-5-99	verbaspinoside heptaacetate	$C_{44}H_{52}O_{22}$	$CDCl_3$	[99]
8-5-100	6-*O*-*α*-L-(4″-*O*-*trans*-cinnamoyl)rhamnopyranosylcatalpol	$C_{30}H_{38}O_{15}$	CD_3OD	[100]
8-5-101	6-*O*-*α*-L-(2″-*O*-*trans*-cinnamoyl)rhamnopyranoslycatalpol	$C_{30}H_{38}O_{15}$	CD_3OD	[100]
8-5-102	6-*O*-*α*-L-(3″-*O*-*trans*-cinnamoyl)rhamnopyranosylcatalpol	$C_{30}H_{38}O_{15}$	CD_3OD	[100]

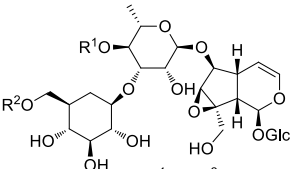
A = *E*-Cinn
B = Van
C = *E*-Coum
D = *E*-*p*-OMe-Cinn
E = *Z*-*p*-OMe-Cinn
F = *E*-Caff
G = *E*-Fer
K = *p*-Hydroxybenzoyl
L = *E*-Isofer
M = *E*-3,4-Dimethoxycinnamoyl
N = *Z*-3,4-Dimethoxycinnamoyl



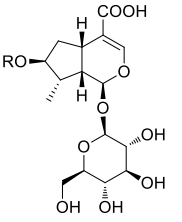
	R^1	R^2	R^3		R^1	R^2	R^3
8-5-63	Ac	H	D	**8-5-68**	H	H	M
8-5-64	H	Ac	D	**8-5-69**	Ac	H	M
8-5-65	Ac	D	H	**8-5-70**	H	Ac	M
8-5-66	Ac	H	E	**8-5-71**	H	Ac	N
8-5-67	H	Ac	E	**8-5-72**	H	Ac	G



8-5-62 R = D



	R^1	R^2
8-5-73	D	F
8-5-74	D(G)	G(D)
8-5-75	C(G)	G(C)
8-5-76	E	F



8-5-77 R = D

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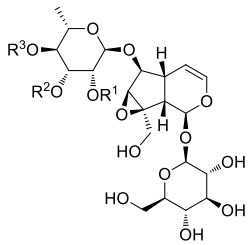
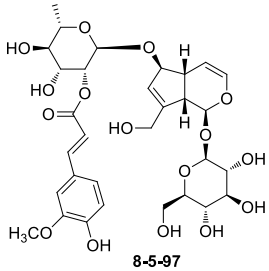
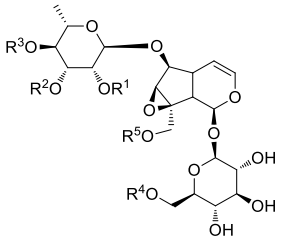


	R^1	R^2	R^3
8-5-78	Ac	H	C
8-5-79	H	Ac	C
8-5-80	Ac	D	D
8-5-81	Ac	E	H
8-5-82	Ac	E	Ac
8-5-83	Ac	Ac	E
8-5-84	Ac	Ac	L

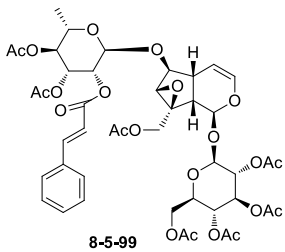


8-5-97

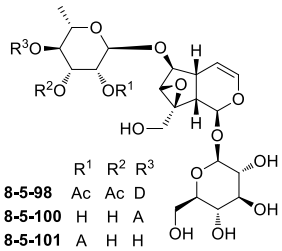


	R^1	R^2	R^3	R^4	R^5
8-5-85	H	H	H	H	A
8-5-86	Ac	Ac	H	H	A
8-5-87	H	H	H	H	C
8-5-88	H	H	H	H	F
8-5-89	Ac	H	Ac	H	G
8-5-90	H	H	H	Ac	K

	R^1	R^2	R^3	R^4	R^5
8-5-91	G	G	H	H	H
8-5-92	G	G	Ac	H	H
8-5-93	C	H	C	H	H
8-5-94	Bz	H	Bz	H	H
8-5-95	H	Bz	Bz	H	H
8-5-96	H	Ac	A	H	H



8-5-99



	R^1	R^2	R^3
8-5-98	Ac	Ac	D
8-5-100	H	H	A
8-5-101	A	H	H
8-5-102	H	A	H

Table 8-5-20: ^{1}H NMR spectroscopic data of normal iridoids **8-5-62**~**8-5-66**.

H	8-5-62	8-5-63	8-5-64	8-5-65	8-5-66
1	4.94 d(7)	5.08 d(10)	5.11 d(9)	5.09 d(10)	5.07 d(10)
3	6.34 dd(6, 2)	6.39 dd(6, 2)	6.40 dd(6, 1.5)	6.38 dd(6, 2)	6.37 dd(6, 1.5)
4	5.11 dd(6, 4)	5.06 dd(6, 5)		5.10 dd(6, 5)	4.99 (ov)
5	2.84 m	2.44 m	2.48 m	2.48 m	2.41 m
6	4.48 m	4.03 dd(8, 1)	4.06 d(8)	4.05 dd(8, 1)	4.00 d(8)
7	5.88 br s	3.64 br s	3.69 br s	3.65 br s	3.62 br s
9	2.92 br t(7)	2.57 dd(10, 8)	2.60 dd(9, 8)	2.59 dd(10, 8)	2.56 dd(9, 8)
10	4.20 br d(15)	3.81 d(13)	3.84 d(13)	3.81 d(13)	①
	4.38 br d(15)	4.16 d(13)	4.17 d(13)	4.15 d(13)	4.14 d(13)
	4.38 br d(15)	4.15 d(13)	4.17 d(13)	4.15 d(13)	4.14 d(13)
Sugar					
Glc-1	4.68 d(8)	4.77 d(8)	4.80 d(8)	4.78 d(8)	4.76 d(8)
Glc-2	3.22 t(8)	–	3.3 (ov)	–	3.25 (ov)

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Table 8-5-20 (continued)

H	8-5-62	8-5-63	8-5-64	8-5-65	8-5-66
Glc-3	3.27 (ov)	–	3.43 t(9)	–	3.39 t(9)
Glc-4	3.27 (ov)	–	3.3 (ov)	–	3.25 (ov)
Glc-5	3.3 (ov)	–	3.3 (ov)	–	3.3 (ov)
Glc-6	3.64 dd(12, 5)	3.62 dd(12, 6)	3.66 dd(12, 6)	3.61 dd(12, 5)	3.62 dd(12, 6)
	3.86 dd(12, 2)	3.92 dd(12, 2)	3.94 br d(12)	3.92 dd(12, 2)	3.91 dd(12, 2)
	3.86 dd(12, 2)	3.92 dd(12, 2)	3.94 br d(12)	3.92 dd(12, 2)	3.91 dd(12, 2)
Rha-1	4.90 d(1.5)	5.02 d(1.5)	5.04 br s	5.01 d(1.5)	5.00 br s
Rha-2	5.03 dd(3.5, 1.5)	5.12 dd(3.5, 1.5)	4.11 dd(3, 1.5)	5.31 dd(3.5, 1.5)	5.10 dd(3, 1.5)
Rha-3	4.07 dd(9.5, 3.5)	4.13 dd(9.5, 3.5)	5.25 dd(9.5, 3)	5.21 dd(9.5, 3.5)	4.05 dd(9.5, 3)
Rha-4	5.03 t(9.5)	5.04 t(9.5)	5.29 t(9.5)	3.62 t(9.5)	4.98 t(9.5)
Rha-5	3.95 dd(10, 6)	–	–	–	–
Rha-6	1.19 d(6)	1.18 d(6)	1.22 d(6)	1.32 d(6)	1.15 d(6)
Acyls					
Ac	2.15 s	2.16 s	2.02 s	2.11 s	2.15 s
β	6.42 d(16)	6.43 d(16)	6.37 d(16)	6.36 d(16)	5.87 d(13)
γ	7.69 d(16)	7.70 d(16)	7.67 d(16)	7.65 d(16)	6.97 d(13)
2	7.57 d(9)	7.57 d(9)	7.56 d(8.5)	7.56 d(9)	7.72 d(9)
3	6.95 d(9)	6.96 d(9)	6.96 d(8.5)	6.95 d(9)	6.89 d(9)
5	6.95 d(9)	6.96 d(9)	6.96 d(8.5)	6.95 d(9)	6.89 d(9)
6	7.57 d(9)	7.57 d(9)	7.56 d(8.5)	7.56 d(9)	7.72 d(9)
OMe	3.83 s	3.83 s	3.83 s	3.83 s	3.81 s

① Typographic errors exist in the literature, giving one less H-10 data.

Table 8-5-21: ^{1}H NMR spectroscopic data of normal iridoids **8-5-67**~**8-5-71**.

H	8-5-67	8-5-68	8-5-69	8-5-70	8-5-71
1	5.10 d(9)	5.09 d(9.5)	5.08 d(10)	5.10 d(9)	5.09 d(9.5)
3	6.39 dd(6, 1.5)	6.38 dd(6, 2)	6.38 dd(6, 1.5)	6.39 dd(6, 1.5)	6.38 dd(6, 2)
4	5.02 dd(6, 1)	5.01 dd(6, 2)	5.04	5.08 dd(6, 5)	5.03 dd(6, 4.5)
5	2.45 m	2.42 m	2.43 m	2.46 m	2.44 m
6	4.03 d(8)	4.03 br d(8)	4.03 d(8)	4.05 br d(8)	4.02 br d(8)
7	3.67 br s	3.65 br s	3.64 br s	3.67 br s	3.65 br s
9	2.58 dd(9, 8)	2.57 dd(9.5, 8)	2.57 dd(9, 7)	2.58 dd(9, 8)	2.57 dd(9.5, 8)
10	3.83 d(13)	3.82 d(13)	3.81 d(13)	3.82 d(13)	3.81 d(13)
	4.16 d(13)	4.15 d(13)	4.15 d(13)	4.15 d(13)	4.15 d(13)
Sugars					
Glc-1	4.79 d(8)	4.78 d(8)	4.77 d(8)	4.78 d(8)	4.77 d(8)
Glc-2	3.27 (ov)	3.25 (ov)	3.25 (ov)	3.25 (ov)	3.25 (ov)
Glc-3	3.41 t(9)	3.40 t(8.5)	3.40 t(8.5)	3.40 t(9)	3.40 t(9)
Glc-4	3.27 (ov)	3.25 (ov)	3.25 (ov)	3.25 (ov)	3.25 (ov)
Glc-5	3.3 (ov)	–	3.3 (ov)	3.3 (ov)	3.3 (ov)
Glc-6	3.64 dd(12, 6)	3.63 dd(12, 6)	3.63 dd(12, 6)	3.63 dd(12, 6)	3.62 dd(12, 6)
	3.93 dd(12, 2)	3.91 dd(12, 2)	3.91 dd(12, 2)	3.92 dd(12, 2)	3.91 dd(12, 2)

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Table 8-5-21 (continued)

H	8-5-67	8-5-68	8-5-69	8-5-70	8-5-71
Rha-1	5.01 br s	5.00 br s	5.02 d(1.5)	5.02 d(1.5)	4.99 d(1.5)
Rha-2	4.08 dd(3, 1.5)	3.92 dd(3.5, 1.5)	5.12 dd(3, 1.5)	4.08 dd(3, 1.5)	4.07 dd(3, 1.5)
Rha-3	5.13 dd(9.5)①	–	–	5.22 dd(9.5, 3)	5.13 dd(9.5, 3)
Rha-4	5.23 t(9.5)	5.08 t(9.5)	5.04 t(9.5)	5.28 t(9.5)	5.23 t(9.5)
Rha-5	–	–	–	4.00 m	–
Rha-6	1.18 d(6)	1.18 d(6)	1.19 d(6)	1.20 d(6)	1.18 d(6)
Acyls					
Ac	2.02 s		2.16 s	2.01 s	1.99 s
	p-MeOCinn	3,4-DMeOCinn②	3,4-DMeOCinn	3,4-DMeOCinn	3,4-DMeOCinn
β	5.81 d(13)	6.46 d(16)	6.47 d(16)	6.40 d(16)	5.80 d(13)
γ	6.98 d(13)	7.67 d(16)	7.69 d(16)	7.64 d(16)	6.95 d(13)
2	7.70 d(8.5)	7.23 d(2)	7.23 d(2)	7.22 d(2)	7.75 d(2)
3	6.91 d(8.5)				
5	6.91 d(8.5)	6.97 d(8)	6.97 d(8)	6.97 d(8.5)	6.92 d(8)
6	7.70 d(8.5)	7.19 dd(8, 2)	7.19 d(8, 2)	7.17 d(8.5, 2)	7.22 dd(8, 2)
OMe	3.83 s	3.86 s (×2)	3.86 s (×2)	3.86 s (×2)	3.84 s, 3.85 s

① Typographic error exists in the literature, giving one less *J* value.
② 3,4-dimethoxycinnamoyl.

Table 8-5-22: ^{1}H NMR spectroscopic data of normal iridoids **8-5-72**~**8-5-76**.

H	8-5-72	8-5-73	8-5-74	8-5-75	8-5-76
1	5.10 d(9.5)	4.95 d(9.5)	4.93 d(9.5)	4.93 d(9.5)	4.94 d(9.5)
3	6.39 dd(6, 2)	6.29 dd(6, 2)	6.29 dd(6, 2)	6.29 dd(6, 2)	6.29 dd(6, 2)
4	5.09 dd(6, 4)	5.02 dd(6, 5)	5.00 dd(6, 4)	5.00 dd(6, 5)	4.96 dd(6, 5)
5	2.46 m	2.27 m	2.26 m	2.25 m	2.26 m
6	4.05 d(8)	3.65 d(8)	3.66 dd(8, 1)	3.66 d(8)	3.65 d(8)
7	3.67 br s	3.37 br s	3.38 br s	3.38 br s	3.37 br s
9	2.58 dd(9.5, 7)	2.41 dd(9.5, 8)	2.30 dd(9.5, 8)	2.29 dd(9.5, 8)	2.38 dd(9.5, 8)
10	3.82 d(13)	3.73 d(13)	3.72 d(13)	3.71 d(13)	3.72 d(13)
	4.15 d(13)	4.11 d(13)	4.06 d(13)	4.06 d(13)	4.10 d(13)
Sugars					
Glc-1	4.78 d(8)	4.78 d(8)	4.77 d(8)	4.77 d(8)	4.78 d(8)
Glc-2	3.25 (ov)	3.27 (ov)	–	–	3.27 (ov)
Glc-3	3.40 t(8.5)	3.41 t(8)	3.40 t(9)	3.40 t(9)	3.41 t(9)
Glc-4	3.25 (ov)	3.3 (ov)	–	–	3.3 (ov)
Glc-5	–	3.35 m	–	–	3.35 (ov)
Glc-6	3.63 dd(12, 6)	3.67 dd(12, 5.5)	3.66 dd(12, 6)	3.65 dd(12.5, 5.5)	3.67 dd(12, 6)
	3.92 dd(12, 2)	3.95 dd(12, 2)	3.94 dd(12, 2)	3.94 dd(12.5, 2)	3.95
Rha-1	5.02 d(1.5)	4.86 br s	–	4.88 br s	4.93 d(1.5)
Rha-2	4.08 dd(3, 1.5)	4.09 dd(3.5, 1.5)	4.08 dd(3.5, 1.5)	4.08 dd(3.5, 1.5)	4.04 dd(3.5, 1.5)
Rha-3	5.22 dd(9.5, 3)	4.05 dd(9.5, 3.5)	–	4.05 dd(9.5, 3.5)	3.95 (ov)

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Table 8-5-22 (continued)

H	8-5-72	8-5-73	8-5-74	8-5-75	8-5-76
Rha-4	5.28 t(9)	5.19 t(9.5)	5.20 t(9.5)	5.19 t(9.5)	5.12 t(9.5)
Rha-5	–	3.91 dd(10, 6)	–	–	3.88 m
Rha-6	1.20 d(6)	1.14 d(6.5)	1.14 d(6)	1.13 d(6.5)	1.12 d(6.5)
Glc-1		4.44 d(8.5)	4.45 d(8)	4.44 d(8)	4.35 d(8)
Glc-2		3.22 t(8.5)	–	3.21 t(8.5)	3.22 t(8)
Glc-3		–	–	–	3.3 (ov)
Glc-4		–	–	–	3.3 (ov)
Glc-5		3.57 m	3.57 m	3.57 m	3.53 m
Glc-6		4.39 dd(12, 7)	4.41 dd(12, 7)	4.41 dd(12, 7)	4.38 dd(12, 7)
		4.51 dd(12, 2)	4.50 dd(12, 2)	4.50 dd(12, 2)	4.49 dd(12, 2)
Acyls					
Ac	2.01 s				
On-Rha	Fer	*p*-MeOCinn	*p*-MeOCinn	Coum	*p*-MeOCinn
β	6.35 d(16)	6.40 d(16)	6.40 d(16)	6.40 d(16)	5.87 d(13)
γ	7.63 d(16)	7.66 d(16)	7.66 d(16)	7.67 d(16)	6.95 d(13)
2	7.20 d(2)	7.56 d(9)	7.56 d(9)	7.47 d(9)	7.68 d(9)
3		6.94 d(9)	6.95 d(9)	6.80 d(9)	6.89 d(9)
5	6.81 d(8)	6.94 d(9)	6.95 d(9)	6.80 d(9)	6.89 d(9)
6	7.09 dd(8, 2)	7.56 d(9)	7.56 d(9)	7.47 d(9)	7.68 d(9)
OMe	3.89 s	3.82 s	3.82 s		3.80 s
On-Glc		Caff	Fer	Fer	Caff
β		6.32 d(16)	6.41 d(16)	6.36 d(16)	6.31 d(16)
γ		7.60 d(16)	7.67 d(16)	7.64 d(16)	7.60 d(16)
2		7.07 d(2)	7.18 d(2)	7.18 d(2)	7.07 d(2)
5		6.80 d(8)	6.84 d(8)	6.84 d(8)	6.80 d(8)
6		6.97 d(8, 2)	7.12 dd(8, 2)	7.12 dd(8, 2)	6.98 dd(8, 2)
OMe			3.90 s	3.89 s	

Table 8-5-23: ^{1}H NMR spectroscopic data of normal iridoids **8-5-77**~**8-5-81**.

H	8-5-77	8-5-78	8-5-79	8-5-80	8-5-81
1	5.55 d(5)	5.08 d(10)	5.10 d(10)	5.11 d(10)	5.09 d(10)
3	7.43 br s	6.38 dd(6, 2)	6.40 dd(6, 2)	6.41 dd(6, 2)	6.38 dd(6, 2)
4		5.06 (ov)	5.10 (ov)	5.12 (ov)	5.10 (ov)
5	3.11 m	2.44 m	2.47 m	2.52 m	2.47 m
6	2.01 m, 2.26 m	4.03 dd(8, 1)	4.05 dd(8, 1)	4.09 dd(8, 1)	4.04 dd(8, 1)
7	4.94 m	3.64 br s	3.67 br s	3.69 br s	3.65 br s
8	2.46 m				
9	2.60 m	2.57 dd(10, 7.5)	2.58 dd(10, 7.5)	2.61 dd(10, 7.5)	2.57 dd(9, 7.5)
10	1.23 d(6)	3.81 d(13)	3.83 d(13)	3.84 d(13)	3.81 d(13)
		4.15 d(13)	4.15 d(13)	4.17 d(13)	4.14 d(13)
Sugers					
Glc-1	4.70 d(8)	4.77 d(7.5)	4.78 d(8)	4.79 d(8)	4.77 d(7.5)
Glc-2	3.20 dd(9, 8)	3.26 (ov)	3.26 (ov)	3.27 (ov)	3.25 (ov)

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Table 8-5-23 (continued)

H	8-5-77	8-5-78	8-5-79	8-5-80	8-5-81
Glc-3	3.37 dd(9, 9)	3.39 dd(9, 9)	3.40 dd(9, 9)	3.41 dd(9, 9)	3.39 dd(9, 9)
Glc-4	3.25 dd(9, 8.5)	3.26 (ov)	3.26 (ov)	3.27 (ov)	3.25 (ov)
Glc-5	3.31 m	3.32 m	3.31 m	3.33 m	3.32 m
Glc-6	3.65 dd(12, 6)	3.62 dd(12, 6)	3.92 dd(12, 2)	3.64 dd(12, 6)	3.61 dd(12, 6)
	3.91 dd(12, 2)	3.91 dd(12, 2)	–	3.93 dd(12, 2)	3.91 dd(12, 2)
Rha-1		5.02 d(2)	5.02 d(2)	5.11(ov)	5.00 d(2)
Rha-2		5.11 dd(3, 2)	4.08 dd(3, 2)	5.39 dd(3, 2)	5.27 dd(3, 2)
Rha-3		4.12 dd(10, 3)	5.22 dd(10, 3)	5.48 dd(10, 3)	5.19 dd(10, 3)
Rha-4		5.03 dd(10, 10)	5.27 dd(10, 10)	5.28 dd(10, 10)	3.56 dd(10, 10)
Rha-5		3.93 m	4.12 m	4.13 m	3.86 m
Rha-6		1.18 d(6)	1.20 d(6)	1.25 d(6)	1.31 d(6)
Acyl					
	On C-7	Rha C-4	Rha C-4	Rha C-4	Rha C-3
β	6.37 d(16)	6.38 d(16)	6.31 d(16)	6.34 d(16)	5.80 d(13)
γ	7.62 d(16)	7.67 d(16)	7.63 d(16)	7.64 d(16)	6.91 d(13)
2	7.55 d(9)	7.48 d(9)	7.47 d(9)	7.48 d(9)	7.69 d(9)
3	6.96 d(9)	6.81 d(9)	6.81 d(9)	6.89 d(9)	6.89 d(9)
5	6.96 d(9)	6.81 d(9)	6.81 d(9)	6.89 d(9)	6.89 d(9)
6	7.55 d(9)	7.48 d(9)	7.47 d(9)	7.48 d(9)	7.69 d(9)
OMe	3.83 s			3.79 s	3.82 s
				Rha C-3	
β				6.23 d(16)	
γ				7.55 d(16)	
2				7.44 d(9)	
3				6.88 d(9)	
5				6.88 d(9)	
6				7.44 d(9)	
OMe				3.79 s	
OAc		2.16 s	2.00 s	2.17 s	2.02 s

Table 8-5-24: ^{1}H NMR spectroscopic data of normal iridoids **8-5-82**~**8-5-85**.

H	8-5-82	8-5-83	8-5-84	8-5-85
1	5.09 d(10)	5.08 d(10)	5.09 d(10)	5.01 d(9.6)
3	6.39 dd(6, 2)	6.38 dd(6, 2)	6.39 dd(6, 1.5)	6.38 dd(6.5, 1.7)
4	5.07 (ov)	5.00 dd(6, 4)	5.08 (ov)	5.06 dd(6.5, 4.5)
5	2.48 m	2.45 m	2.48 m	2.45 m
6	4.05 dd(8, 1)	4.03 dd(8, 1)	4.05 d(8)	4.04 dd(8.2, 1.7)
7	3.66 br s	3.65 br s	3.67 s	3.66 s
9	2.58 dd(10, 7.5)	2.57 dd(10, 7.5)	2.59 dd(10, 7.5)	2.57 dd(9.6, 7.6)
10	3.81 d(13)	3.18 d(13)	3.82 d(13)	4.65 d(13.1)
	4.15 d(13)	4.14 d(13)	4.16 d(13)	5.69 d(13.1)

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Table 8-5-24 (continued)

H	8-5-82	8-5-83	8-5-84	8-5-85
Sugars				
Glc-1	4.77 d(8)	4.76 d(8)	4.79 d(8)	4.78 d(7.9)
Glc-2	3.26 dd(9, 8)	3.25 (ov)	3.28 dd(9, 8)	3.26 dd(7.9, 9.2)
Glc-3	3.40 dd(9, 9)	3.39 dd(9, 9)	3.42 dd(9, 9)	3.40 t(9.2)
Glc-4	3.25 dd(9, 9)	3.25 (ov)	3.27 dd(9, 9)	3.27 t(9.2)
Glc-5	3.25 m	3.29 (ov)	3.34 m	3.30 m
Glc-6	3.63 dd(12, 5)	3.62 dd(12, 6)	3.64 dd(12, 6)	3.63 dd(11.9, 6.6)
	3.91 dd(12, 2)	3.91 dd(12, 2.5)	3.92 dd(12, 1)	3.91 dd(12.0, 2.0)
Rha-1	5.05 d(2)	5.05 d(2)	5.07 d(1.5)	5.10 d(1.7)
Rha-2	5.31 dd(4, 2)	5.29 dd(4, 2)	5.31 dd(3, 1.5)	3.89 dd(3.7, 2.0)
Rha-3	5.35 dd(10, 4)	5.24 dd(10, 4)	5.36 dd(10, 3)	3.81 dd(3.7, 9.3)
Rha-4	5.08 dd(10, 10)	5.10 dd(10, 9.5)	5.17 dd(10, 10)	3.49 t(9.5)
Rha-5	4.01 m	3.94 m	4.07 m	3.97 dd(10.0, 6.2)
Rha-6	1.20 d(6)	1.18 d(6)	1.22 d(6)	1.18 d(6.3)
Acyls				
	Rha C-3	Rha C-4	Rha C-4	
β	5.70 d(13)	5.81 d(12.5)	6.31 d(16)	
γ	6.92 d(13)	7.00 d(12.5)	7.61 d(16)	
2	7.69 d(9)	7.69 d(9)	7.09 d(2)	
3	6.90 d(9)	6.91 d(9)		
5	6.90 d(9)	6.91 d(9)	6.94 d(8)	
6	7.69 d(9)	7.69 d(9)	7.07 dd(8, 2)	
OMe	3.82 s	3.82 s	3.88 s	
OAc	2.01 s(R2-OAc)	2.15 s(R2-OAc)	2.16 s(R2-OAc)	
	2.06 s(R4-OAc)	1.96 s(R3-OAc)	1.93 s(R3-OAc)	

Table 8-5-25: ^{1}H NMR spectroscopic data of normal iridoids **8-5-86**~**8-5-89**.

H	8-5-86	8-5-87	8-5-88	8-5-89
1	5.08 d(9.6)	5.13 d(9.5)	5.10 d(9.5)	5.07 d(9.5)
3	6.36 dd(6.0, 1.7)	6.34 dd(6.0, 1.8)	6.43 dd(6.2, 1.8)	6.53 dd(6.0, 1.7)
4	5.05 dd(6.0, 5.0)	5.07 dd(6, 4.5)	5.12 dd(6.2, 4.4)	5.10 dd(6.0, 4.3)
5	2.53 m	2.55 m	2.67 m	2.46 m
6	4.07 dd(8.0, 1.0)	4.04 dd(8.2, 1.7)	4.01 dd(8.0, 1.6)	4.11 dd(8.2, 1.7)
7	3.67 s	3.63 s	3.63 s	3.65 s
9	2.60 dd(9.6, 7.7)	2.63 dd(9.5, 8.0)	2.59 dd(9.5, 8.2)	2.65 dd(9.5, 8.2)
10	4.76 d(12.5)	4.71 d(13.0)	4.68 d(13.0)	4.81 d(12.5)
	5.72 d(12.5)	5.65 d(13.0)	5.86 d(13.0)	5.69 d(12.5)
Sugars				
Glc-1	4.76 d(7.9)	4.83 d(7.8)	4.98 d(8.0)	4.79 d(7.8)
Glc-2	3.27 dd(7.9, 9.3)	3.34 dd(7.8, 9.5)	3.43 dd(8.0, 9.1)	3.28 dd(7.8, 9.1)
Glc-3	3.40 t(9.1)	3.67 t(9.5)	3.49 t(9.1)	3.45 t(9.0)

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Table 8-5-25 (continued)

H	8-5-86	8-5-87	8-5-88	8-5-89
Glc-4	3.25 t(9.1)	3.44 t(9.5)	3.38 t(9.0)	3.28 t(9.0)
Glc-5	3.34 m	3.18 m	3.12 m	3.29 m
Glc-6	3.67 dd(11.9, 6.7)	3.54 dd(12.0, 5.8)	3.65 dd(11.7, 5.7)	3.77 dd(11.8, 5.7)
	3.94 dd(11.9, 2.1)	3.95 dd(12.0, 1.8)	3.88 dd(11.7, 1.8)	3.85 dd(11.8, 2.0)
Rha-1	5.12 d(1.7)	5.11 d(1.8)	5.19 d(1.6)	5.12 d(1.7)
Rha-2	5.31 dd(3.4, 1.7)	3.94 d(3.8)	4.03 dd(3.5, 1.8)	5.43 dd(3.5, 1.8)
Rha-3	5.37 dd(3.4, 9.9)	3.90 dd(3.7, 9.0)	3.88 dd(3.5, 9.5)	3.97 dd(3.5, 9.5)
Rha-4	3.41 t(9.9)	3.68 t(9.2)	3.48 t(9.5)	4.92 t(9.6)
Rha-5	3.95 dd(10.0, 6.0)①	3.88 dd(10.0, 6.3)①	3.73 dd(10.2, 6.3)①	3.82 dd(10.2, 6.2)①
Rha-6	1.22 d(6.2)	1.29 d(6.5)	1.23 d(6.0)	1.22 d(6.2)
Acyls				
	Cinn	Coum	Caff	Fer
α	6.52 d(16.0)	6.29 d(16.1)	6.36 d(15.9)	6.43 d(15.9)
β	7.77 d(16.0)	7.59 d(16.1)	7.65 d(15.9)	7.69 d(15.9)
2	7.42 d(8.2)	7.46 d(8.7)	7.06 d(2.0)	7.19 d(2.0)
3	6.79 t(8.5)	6.81 d(8.7)		
4	7.43 m			
5	6.79 t(8.5)	6.81 d(8.7)	6.78 d(8.2)	6.92 d(8.5)
6	7.42 t(8.2)	7.46 d(8.7)	6.95 dd(8.2, 2.0)	7.06 dd(8.5, 1.8)
OMe				3.89 s
OAc	1.89 s, 2.12 s			1.88 s, 2.03 s

① Typographic errors exist in the literature, the correct peaktype should be dq.

Table 8-5-26: ^{1}H NMR spectroscopic data of normal iridoids **8-5-90**~**8-5-94**.

H	8-5-90	8-5-91	8-5-92	8-5-93	8-5-94
1	5.09 d(9.2)	5.00 d(9.4)	5.16 d(9.5)	5.14 d(9.5)	5.18 d(9.5)
3	6.40 dd(6.0, 2.0)	6.41 dd(6.5, 1.8)	6.33 dd(6.0, 1.2)	6.44 dd(6.3, 2.0)	6.37 dd(6.0, 1.9)
4	5.12 dd(6.0, 4.5)	5.13 dd(6.5, 4.5)	5.18 dd(6.0, 4.0)	5.21 dd(6.3, 4.5)	5.11 dd(6.0, 4.5)
5	2.50 m	2.59 m	2.45 m	2.55 m	2.50 m
6	4.07 dd(8.0, 1.5)	4.08 dd(8.5, 1.8)	4.06 dd(8.2, 1.5)	4.11 dd(8.0, 1.5)	4.09 dd(8.0, 1.5)
7	3.70 s	3.66 s	3.75 s	3.78 s	3.70 s
9	2.71 dd(9.2, 8.0)	2.67 dd(9.4, 7.8)	2.60 dd(9.5, 7.9)	2.64 dd(9.6, 8.0)	2.61 dd(9.5, 7.9)
10	4.74 d(12.9)	3.84 d(13.2)	3.92 d(13.3)	3.80 d(12.9)	3.81 d(13.5)
	5.83 d(12.9)	4.05 d(13.2)	4.29 d(13.3)	4.14 d(12.9)	4.17 d(13.5)
Sugars					
Glc-1	4.86 d(8.0)	4.87 d(8.1)	4.99 d(8.0)	4.63 d(7.8)	4.78 d(8.0)
Glc-2	3.49 dd(8.0, 9.5)	3.37 dd(8.1, 9.5)	3.27 dd(8.0, 9.2)	3.23 dd(7.8, 8.8)	3.26 dd(7.8, 9.5)
Glc-3	3.71 t(9.5)	3.26 t(9.5)	3.40 t(9.2)	3.39 t(9.0)	3.41 t(9.5)
Glc-4	3.49 t(9.5)	3.43 t(10.1)	3.32 t(9.2)	3.24 t(9.0)	3.28 t(9.5)
Glc-5	3.24 m	3.40 m	3.27 m	3.29 m	3.31 m

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Table 8-5-26 (continued)

H	8-5-90	8-5-91	8-5-92	8-5-93	8-5-94
Glc-6	4.18 dd(11.9, 6.7)	3.72 dd(11.6, 6.5)	3.69 dd(12.1, 6.5)	3.67 dd(11.7, 5.4)	3.63 dd(11.9, 6.8)
	4.39 dd(11.9, 2.0)	3.90 dd(11.6, 2.2)	3.93 dd(12.1, 2.1)	3.86 dd(11.7, 3.0)	3.90 dd(11.9, 2.3)
Rha-1	5.14 d(1.8)	5.10 d(1.9)	5.07 d(1.8)	5.09 d(1.8)	5.09 d(2.1)
Rha-2	3.78 dd(3.3, 1.8)	5.33 dd(3.5, 1.9)	5.42 dd(3.5, 1.7)	5.23 dd(9.2, 3.5)①	5.53 dd(3.8, 2.1)
Rha-3	3.69 dd(3.3, 9.5)	4.98 dd(3.5, 9.5)	5.53 dd(3.5, 9.2)	4.08 dd(3.5, 9.5)	4.01 dd(3.8, 9.8)
Rha-4	3.40 t(9.3)	3.55 t(9.5)	4.98 t(9.9)	4.84 t(9.5)	5.38 t(9.8)
Rha-5	3.87 dd(10.0, 6.2)②	3.71 dd(10.0, 6.2)②	4.00 dq(10.0, 6.5)	3.94 dd(9.5, 6.6)②	3.81 dq(9.7, 6.0)
Rha-6	1.21 d(6.3)	1.38 d(6.5)	1.18 d(6.2)	1.23 d(6.1)	1.26 d(6.4)
Acyls					
	p-HydrBz	Fer	Fer	Coum	Bz
α		6.46 d(16.0)	6.42 d(15.9)	6.47 d(16.5)	
β		7.57 d(16.0)	7.59 d(15.9)	7.68 d(16.5)	
2	7.93 d(8.8)	7.21 d(1.8)	7.37 d(2.1)	7.49 d(8.6)	8.13 dd(8.0, 1.0)
3	6.98 d(8.8)③			6.76 d(8.6)	7.41 t(8.0)
4					7.54 tt(8.0)
5	7.28 d(8.4)③	6.79 d(8.5)	6.96 d(8.0)	6.76 d(8.6)	7.41 t(8.0)
6	7.93 d(8.8)	7.10 dd(8.5, 1.8)	7.21 d(8.0, 2.1)	7.49 d(8.6)	8.13 dd(8.0, 1.0)
OMe		3.90 s, 3.78 s	3.93 s, 3.87 s		
Ac	2.1 s		1.96 s		
α		6.32 d(16.5)	6.35 d(15.9)	6.39 d(16.5)	
β		7.38 d(16.5)	7.67 d(15.9)	7.56 d(16.5)	
2		7.18 d(2.0)	7.24 d(2.1)	7.33 d(8.6)	8.08 dd(8.0, 1.0)
3				6.65 d(8.6)	7.39 t(8.0)
4					7.49 tt(8.0)
5		6.88 d(8.0)	6.91 d(8.2)	6.65 d(8.6)	7.39 t(8.0)
6		6.92 dd(8.0, 2.0)	7.13 dd(8.2, 1.8)	7.33 d(8.6)	8.08 dd(8.0, 1.0)

① The value of $J = 9.2$ Hz may be an error in literature.
② Typographic errors exist in the literature, the correct peaktype should be dq.
③ There is an error in δ value in the literature.

Table 8-5-27: ^{1}H NMR spectroscopic data of normal iridoids **8-5-95**~**8-5-99**.

H	8-5-95	8-5-96	8-5-97	8-5-98	8-5-99
1	5.12 d(9.5)	5.08 d(9.6)	4.99 d(7)	5.14 d(9.6)	4.74 d(9.9)
3	6.46 dd(6.0, 1.8)	6.39 dd(6.0, 1.7)	6.44 dd(6, 1.5)	6.33 dd(6.0, 1.7)	6.30 dd(6.0, 1.7)
4	5.12 dd(6.2, 4.4)	5.11 dd(6.0, 4.6)	5.23 dd(6, 3.5)	5.07 dd(6.0, 4.6)	5.06 dd(6.0, 4.6)
5	2.67 m	2.47 m	2.90 m	2.55 dddd (8.1, 7.3, 4.6, 1.7)	2.49 m

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Table 8-5-27 (continued)

H	8-5-95	8-5-96	8-5-97	8-5-98	8-5-99
6	4.01 dd(8.0, 1.6)	4.06 dd(8.0, 1.7)	4.53 m	4.03 dd(8.1, 0.8)	3.92 d(8.3)
7	3.65 s	3.67 s	5.95 s	3.61 s	3.56 s
9	2.59 dd(9.5, 8.2)	2.58 dd(9.6, 7.6)	2.90 m	2.68 dd(9.6, 7.3)	2.61 dd(9.9, 7.9)
10	3.98 d(12.8)	3.82 d(13.0)	4.44 d(13)	4.24 d(13.2)	4.80 d(13.1)
	4.62 d(12.8)	4.16 d(13.0)	4.22 d(13)	3.90 d(13.2)	3.95 d(13.1)
Sugars					
Glc-1	4.98 d(8.0)	4.78 d(7.9)	4.74 d(8.0)	4.89 d(7.9)	4.97~4.91 m
Glc-2	3.43 dd(8.0, 9.1)	3.29 dd(7.9, 9.3)	3.92-3.08 (ov)	3.43 m	4.97~4.91 m
Glc-3	3.49 t(9.1)	3.43 t(9.3)	3.92-3.08 (ov)	3.55 t(8.7)	5.20 t(9.5)
Glc-4	3.38 t(9.1)	3.34 t(9.1)	3.92-3.08 (ov)	3.43 m	5.10~5.17 m
Glc-5	3.12 m	3.25 m	3.92-3.08 (ov)	3.40 m	3.66 m
Glc-6	3.65 dd(11.7, 5.7)	3.66 dd(11.9, 6.8)	3.92-3.08 (ov)	3.75 dd(12.9, 1.7)	4.31 dd(12.4, 2.2)
	3.88 dd(11.7, 1.8)	3.92 dd(11.9, 1.9)	4.11 dd(12, 1.5)	3.99 dd(12.9, 5.8)	4.13 dd(12.4, 3.3)
Rha-1	5.19 d(1.8)	5.02 d(1.6)	4.95 d(1.5)	5.10 d(1.7)	5.00 d(1.7)
Rha-2	4.03 dd(3.5, 1.8)	4.09 dd(3.0, 1.6)	5.13 dd(3.5, 1.5)	5.45 dd(3.4, 1.7)	5.41 dd(3.3, 1.7)
Rha-3	5.38 dd(3.5, 9.5)	5.29 dd(3.0, 10.0)	3.92-3.08 (ov)	5.57 dd(10.1, 3.4)	5.36 dd(3.3, 9.9)
Rha-4	5.48 t(9.5)	5.42 t(10.0)	3.92-3.08 (ov)	5.38 t(10.1)	5.10~5.17 m
Rha-5	3.63 dd(10.2, 6.3)①	4.00 dq(10.0, 6.0)	3.92-3.08 (ov)	4.17 dq(10.1, 6.3)	3.96 m
Rha-6	1.19 d(6.2)	1.21 d(6.2)	1.38 d(6)	1.27 d(6.3)	1.22 d(6.2)
Acyls					
	Bz	Cinn	Fer	*p*-MeOCinn	Cinn
α		6.52 d(16.0)	6.53 d(16.0)	6.36 d(16.0)	6.53 d(16.2)
β		7.76 d(16.0)	7.76 d(16.0)	7.75 d(16.0)	7.72 d(16.2)
2	7.96 dd(8.5, 1.2)	7.69 d(8.2)	7.33 dd(2)	7.40 d(8.8)	7.58~7.53 m
3	7.47 t(7.8)	7.13 t(8.2)		6.84 d(8.8)	7.41~7.37 m
4	7.62 tt(7.6)②	7.34 m			7.41~7.37 m
5	7.47 t(7.8)	7.13 t(8.2)	6.92 d(9)	6.84 d(8.8)	7.41~7.37 m
6	7.96 dd(8.5, 1.2)	7.69 d(8.2)	7.20 dd(9, 2)	7.40 d(8.8)	7.58~7.53 m
OMe			3.94 s	3.64 s	
OAc		1.90 s		2.02 s, 1.84 s	
Acyl	Benzoyl				
2	7.85 dd(8.5, 1.2)				
3	7.45 t(7.8)				
4	7.59 tt(8.0)				
5	7.45 t(7.8)				
6	7.85 dd(8.5, 1.2)				

① Typographic error exists in the literature, the correct peaktype should be dq.
② Typographic error exists in the literature, giving one less *J* value.

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Table 8-5-28: ^{1}H NMR spectroscopic data of normal iridoids **8-5-100**~**8-5-102**.

H	8-5-100	8-5-101	8-5-102
1	5.08 d(10)	5.08 d(10)	5.10 d(10)
3	6.38 dd(6, 2)	6.37 dd(6, 2)	6.38 dd(6, 2)
4	5.05 dd(6, 5)	5.07 dd(6, 5)	5.13 dd(6, 5)
5	2.42 m	2.45 m	2.45 m
6	4.04 dd(8, 2)	4.03 dd(8, 2)	4.05 dd(8, 2)
7	3.65 d(2)	3.65 br s	3.66 br s
9	2.56 dd(10, 8)	2.56 dd(10, 8)	2.57 dd(10, 8)
10	3.81 d(13)	3.81 d(13)	3.83 d(13)
	4.13 d(13)	4.15 d(13)	4.15 d(13)
Sugars			
Glc-1	4.77 d(8)	4.77 d(8)	4.78 d(8)
Glc-2	3.25 dd(8, 9)	3.22~3.29(ov)	3.22~3.29(ov)
Glc-3	3.40 dd(9, 8)	3.38 t(9)	3.39 t(9)
Glc-4	3.24 dd(8, 10)	3.22~3.29(ov)	3.22~3.29(ov)
Glc-5	3.3 m	3.3 m	3.3 m
Glc-6	3.64 dd(12, 6)	3.63 dd(12, 6)	3.64 dd(12, 6)
	3.91 dd(12, 2)	3.89 dd(12, 2)	3.91 dd(12, 2)
Rha-1	4.99 d(2)	5.04 d(2)	4.98 d(2)
Rha-2	3.88~3.95(ov)	5.16 dd(2, 4)	4.09 dd(2, 4)
Rha-3	3.88~3.95(ov)	3.92 dd(4, 9)	5.12 dd(9, 4)
Rha-4	5.09 t(10)	3.48 t(9)	3.69 t(9)
Rha-5	3.88~3.95(ov)	3.73~3.86(ov)	3.73~3.86(ov)
Rha-6	1.17 d(6)	1.30 d(6)	1.32 d(6)
Cinn			
α	6.58 d(16.0)	6.60 d(16.0)	6.61 d(16.0)
β	7.73 d(16.0)	7.75 d(16.0)	7.78 d(16.0)
2	7.62 m	7.63 m	7.63 m
3	7.41 m	7.41 m	7.41 m
4	7.41 m	7.41 m	7.41 m
5	7.41 m	7.41 m	7.41 m
6	7.62 m	7.63 m	7.63 m

Table 8-5-29: Compounds, MFs, and test solvents of normal iridoids **8-5-103**~**8-5-154**.

No.	Compounds	MFs	Test solvents	References
8-5-103	6*α*-dihydrocornic acid	$C_{16}H_{24}O_{10}$	CD_3OD	[101]
8-5-104	6*β*-dihydrocornic acid	$C_{16}H_{24}O_{10}$	CD_3OD	[101]
8-5-105	6′-*O*-acetylloganic acid	$C_{18}H_{26}O_{11}$	D_2O	[102]
8-5-106	aquaticoside A	$C_{23}H_{28}O_{11}$	CD_3OD	[103]
8-5-107	2′-*O*-*p*-hydroxybenzoyl-6′-*O*-*trans*-caffeoyl-8-epiloganic acid	$C_{32}H_{34}O_{15}$	CD_3OD	[104]
8-5-108	2′-*O*-*p*-hydroxybenzoyl-8-epiloganic acid	$C_{23}H_{28}O_{12}$	CD_3OD	[104]
8-5-109	6′-*O*-*E*-*p*-coumaroyl-8-*epi*-loganic acid	$C_{25}H_{30}O_{12}$	CD_3OD	[105]
8-5-110	senburiside IV	$C_{36}H_{42}O_{19}$	CD_3OD	[106]
8-5-111	agnucastoside C	$C_{34}H_{36}O_{15}$	CD_3OD	[107]

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Table 8-5-29 (continued)

No.	Compounds	MFs	Test solvents	References
8-5-112	6′-*O*-*β*-D-apiofuranosyl-mussaenosidic acid	$C_{21}H_{32}O_{14}$	CD_3OD	[108]
8-5-113	8-*O*-acetyl-6-*O*-*trans*-*p*-coumaroylshanzhiside	$C_{27}H_{32}O_{14}$	CD_3OD	[109]
8-5-114	10-*O*-acetylmonotropein	$C_{18}H_{24}O_{12}$	CD_3OD	[110]
8-5-115	10-*O*-*E*-feruloylmonotropein	$C_{26}H_{30}O_{14}$	CD_3OD	[111]
8-5-116	6-*O*-acetylscandoside	$C_{18}H_{24}O_{12}$	CD_3OD	[110]
8-5-117	deacetylalpinoside	$C_{16}H_{22}O_{10}$	CD_3OD	[112]
8-5-118	aquaticoside C	$C_{23}H_{26}O_{11}$	CD_3OD	[103]
8-5-119	2′-*O*-*p*-hydroxybenzoyl gardoside	$C_{23}H_{26}O_{12}$	CD_3OD	[104]
8-5-120	8-*O*-acetylmussaenoside	$C_{19}H_{28}O_{11}$	CD_3OD	[109]
8-5-121	luzonoside C	$C_{26}H_{32}O_{12}$	CD_3OD	[113]
8-5-122	5,9-*epi*-7,8-didehydropenstemoside	$C_{17}H_{24}O_{11}$	D_2O	[114]
8-5-123	myxopyroside	$C_{18}H_{26}O_{13}$	D_2O	[115]
8-5-124	caudatoside B	$C_{26}H_{32}O_{12}$	CD_3COCD_3	[116]
8-5-125	caudatoside D	$C_{26}H_{32}O_{13}$	CD_3COCD_3	[116]
8-5-126	caudatoside A	$C_{26}H_{32}O_{12}$	CD_3COCD_3	[116]
8-5-127	caudatoside C	$C_{26}H_{32}O_{13}$	CD_3COCD_3	[116]
8-5-128	6*β*-acetyl-7*β*(*E*)-*O*-*p*-methoxycinnamoyl myxopyroside	$C_{30}H_{36}O_{16}$	CD_3OD	[115]
8-5-129	saletpangponoside C	$C_{26}H_{34}O_{13}$	CD_3OD	[109]
8-5-130	saletpangponoside B	$C_{34}H_{44}O_{19}$	CD_3OD	[109]
8-5-131	7*β*,8*β*-epoxy-8*α*-dihydrogeniposide	$C_{17}H_{24}O_{11}$	CD_3OD	[117]
8-5-132	6*β*,7*β*-epoxy-8-*epi*-splendoside	$C_{17}H_{24}O_{12}$	CD_3OD	[118]
8-5-133	8-epiapodantheroside	$C_{17}H_{24}O_{10}$	CD_3OD	[117]
8-5-134	5,9-*epi*-penstemoside	$C_{17}H_{26}O_{11}$	D_2O	[114]
8-5-135	jatamanin E	$C_{10}H_{14}O_5$	CD_3COCD_3	[119]
8-5-136	1*β*-methoxyl-mussaenin A	$C_{11}H_{18}O_5$	$CDCl_3$	[120]
8-5-137	luzonoid C	$C_{24}H_{30}O_9$	CD_3OD	[113]
8-5-138	luzonoid A	$C_{24}H_{30}O_9$	CD_3OD	[113]
8-5-139	1*β*-hydroxyl-4-epigardendiol	$C_{10}H_{14}O_5$	$CDCl_3$	[120]
8-5-140	1*β*-methoxyl-4-epigardendiol	$C_{11}H_{16}O_5$	$CDCl_3$	[120]
8-5-141	4′-deoxykanokoside A	$C_{21}H_{32}O_{11}$	CD_3OD	[121]
8-5-142	luzonoside A	$C_{30}H_{40}O_{14}$	CD_3OD	[113]
8-5-143	11-(6-*O*-*trans*-sinapoylglucopyranosyl)gardendiol	$C_{27}H_{34}O_{13}$	CD_3OD	[122]
8-5-144	6′-*O*-*α*-D-glucopyranosylsyringopicroside	$C_{30}H_{40}O_{16}$	CD_3OD	[123]
8-5-145	6-methoxysemperoside	$C_{17}H_{26}O_{10}$	CD_3OD	[124]
8-5-146	3,4-dihydro-3-methoxypaederoside	$C_{19}H_{26}O_{12}S$	CD_3OD	[125]
8-5-147	macrophyllide	$C_{10}H_{10}O_5$	CD_3OD	[126]
8-5-148	cachinol	$C_{10}H_{14}O_4$	CD_3OD	[127]
8-5-149	jatamanin F	$C_{10}H_{16}O_4$	CD_3COCD_3	[119]
8-5-150	kankanoside A	$C_{16}H_{26}O_8$	CD_3OD	[128]
8-5-151	jatamanin A	$C_{10}H_{14}O_4$	CD_3COCD_3	[119]
8-5-152	jatamanin D	$C_{10}H_{14}O_4$	CD_3COCD_3	[119]
8-5-153	jatamanin C	$C_{10}H_{14}O_3$	CD_3COCD_3	[119]
8-5-154	jatamanin B	$C_{10}H_{12}O_4$	CD_3COCD_3	[119]

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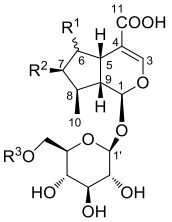
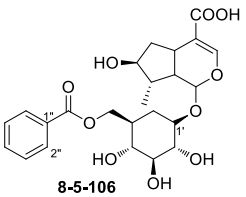
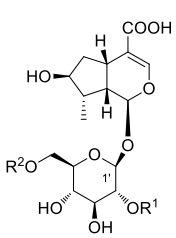


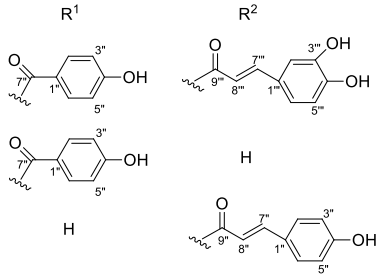
	R^1	R^2	R^3
8-5-103 ①	α-OH	H	H
8-5-104 ①	β-OH	H	H
8-5-105	H	OH	Ac



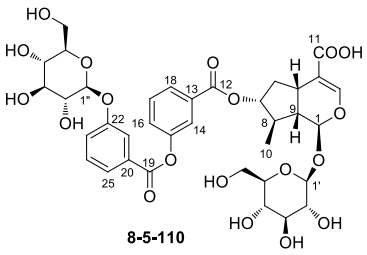
8-5-106

① Misorientation of H-1 of glucose were found in the literature.

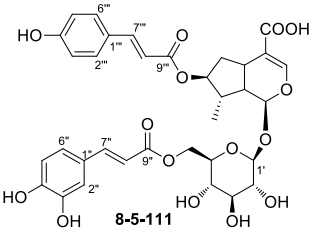




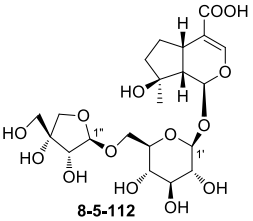
	R^1	R^2
8-5-107		
8-5-108		H
8-5-109	H	



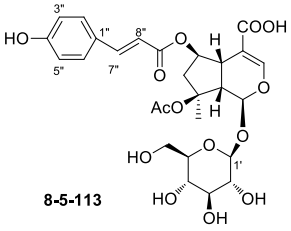
8-5-110



8-5-111



8-5-112



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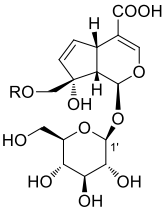
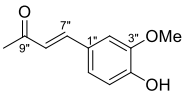
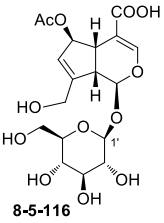


8-5-114 R= Ac

8-5-115 R= 



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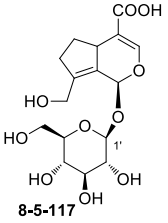
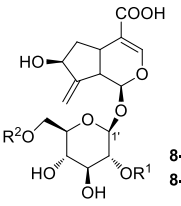


8-5-117



	R^1	R^2
8-5-118	H	Bz
8-5-119	*p*-HydrBz	H

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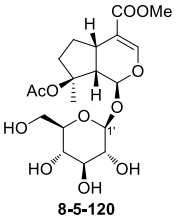
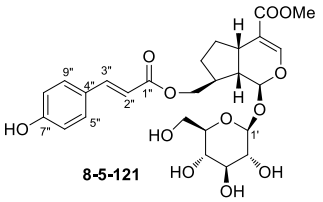
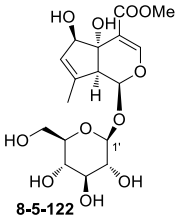


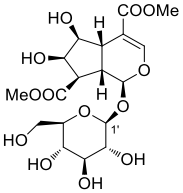
8-5-120



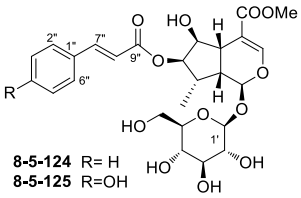
8-5-121



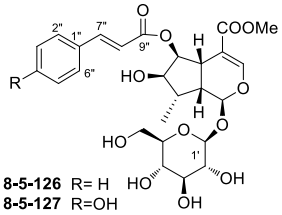
8-5-122



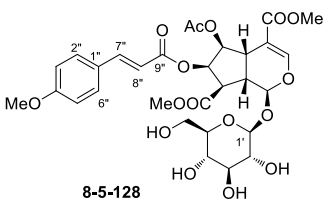
8-5-123



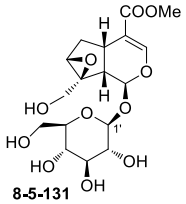
8-5-124 R= H
8-5-125 R=OH



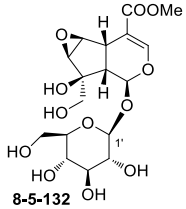
8-5-126 R= H
8-5-127 R=OH



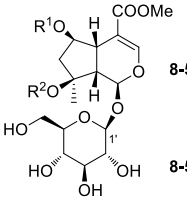
8-5-128



8-5-131

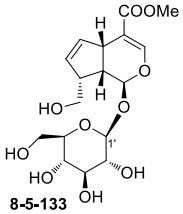


8-5-132

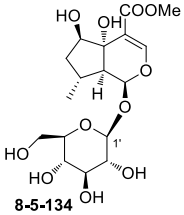


8-5-129 R1 = H, R2 = Ac

8-5-130 R1 = Glc, R2 = Ac



8-5-133



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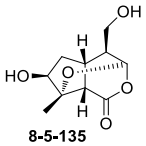
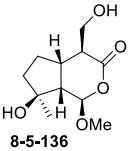


8-5-135



8-5-136

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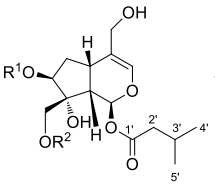
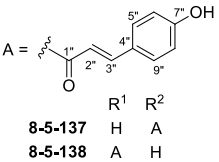
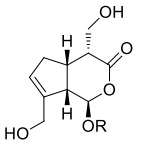
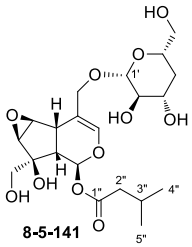




	R^1	R^2
8-5-137	H	A
8-5-138	A	H



8-5-139 R = H
8-5-140 R = Me



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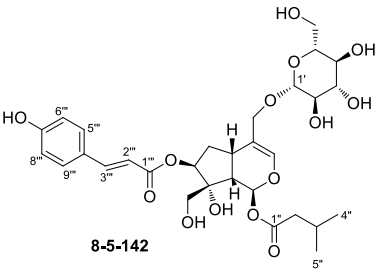

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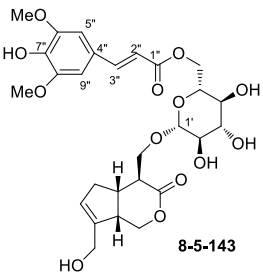

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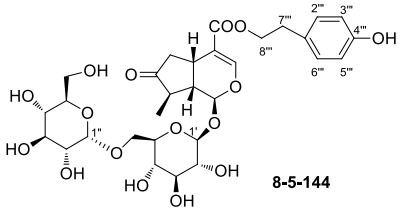

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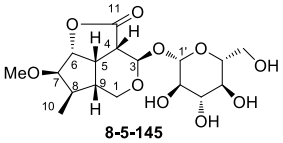

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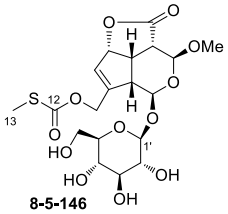
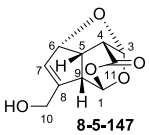


8-5-146



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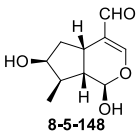

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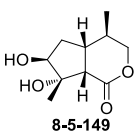

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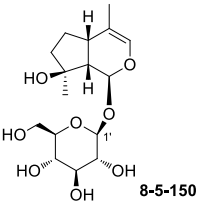

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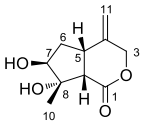
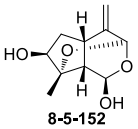


8-5-151



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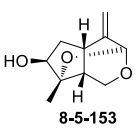
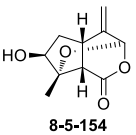


8-5-153



8-5-154

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Table 8-5-30: ^{1}H NMR spectroscopic data of normal iridoids **8-5-103**~**8-5-107**.

H	8-5-103	8-5-104	8-5-105	8-5-106	8-5-107
1	5.21 d(9)	5.25 d(5)	5.33 d(3.6)	5.27 d(5.5)	5.29 d(4.0)
3	7.62 s	7.41 s	7.45 s	7.37 s	7.09 br s
5	2.82 dd(4, 9)	2.79 t(6)	3.06 dd(7.6, 8.0)	3.05 dt(7.6, 8.2)	2.83 m
6	4.47 t(4)	4.05 m	2.19 m	1.72 dt(7.0, 13.7)	1.92 m
			1.76 m	2.02 m	1.74 m
7	1.38 ddd(4, 10, 13)	1.25 m	4.15 m	3.73 m	3.70 m
	1.92 dd(8, 13)	2.17 m			
8	2.30 m	1.96 q(7)	1.90 m	2.07 m	2.02 dd(14.0, 7.0)
9	1.70 dt(4, 8)	2.03 dt(5, 6, 7)①	2.10 m	2.47 dt(5.5, 8.2)	2.45 m
10	1.12 d(8)	1.15 d(7)	1.06 d(7.2)	1.02 d(7.3)	0.96 d(7.5)
1′	4.70 d(8)	4.65 d(8)	4.81 d(8.0)	4.76 d(7.9)	4.99 d(8.0)
2′	3.24 dd(8, 9)	3.20 t(8)	3.29 t(8.0, 9.2)	3.28 dd(7.3, 9.5)	4.94 dd(9.5, 8.0)
3′	3.40 t(9)	3.37 m	3.51 t(9.2)	3.46(ov)	3.69 m
4′	3.31 m	3.37 m	3.47 t(9.2, 9.6)①	3.46(ov)	3.52 dd(9.5, 9.0)
5′	3.29 m	3.30 m	3.68 m	3.67 m	3.67 m
6′	3.67 dd(6, 12)	3.67 dd(6, 12)	4.42 dd(2.4, 12.4)	4.56 dd(6.4, 11.9)	4.54 dd(12.0, 2.0)
	3.86 dd(2, 12)	3.89 dd(2, 12)	4.33 dd(6.0, 12.4)	4.71 dd(2.4, 11.9)	4.42 dd(12.0, 6.0)
OAc			2.12 s		
2″, 6″				8.08 dd(1.2, 8.5)	7.84 d(8.5)
3″, 5″				7.52 t(7.8)	6.81 d(8.5)
4″				7.64 t(8.2)	
2‴					7.05 br s
5‴					6.77 d(8.5)
6‴					6.95 dd(8.5, 1.5)
7‴					7.59 d(15.5)
8‴					6.31 d(15.5)

① Typographic error exists in the literature, giving one more *J* value.

Table 8-5-31: ^{1}H NMR spectroscopic data of normal iridoids **8-5-108**~**8-5-112**.

H	8-5-108	8-5-109	8-5-110	8-5-111	8-5-112
1	5.40 br s	5.28 d(5.0)	5.69 d(3.6)	5.33 d(5.5)	5.34 d(4.9)
3	7.03 br s	7.29 s	7.62 s	7.41 s	7.40 br s
5	2.86 br s	3.03 m	3.12 m	3.06 q(8.0)	3.16 m
6	1.93 br s	1.9 m	2.75 m	1.92 m	1.46 m
	1.82 br s	1.78 m	2.19 m	2.17 m	2.29 m
7	3.72 br s	3.78 m	5.15 m	4.90 m	1.71 br t(7.6)
8	2.04 d(5.5)	2.05 m	2.19 m	2.42 m	
9	2.48 br s	2.46 m	2.19 m	2.48 m	2.18 dd(8.8, 4.9)

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Table 8-5-31 (continued)

H	8-5-108	8-5-109	8-5-110	8-5-111	8-5-112
10	1.00 d(7.0)	1.02 d(7.4)	1.43 d(6.8)	1.08 d(7.0)	1.34 s
14			8.02 s		
16			7.73 d(8.0)		
17			7.76 dd(7.6, 8.0)		
18			8.11 d(7.6)		
21			8.10 s		
23			7.65 d(8.0)		
24			7.69 dd(7.6, 8.0)		
25			8.05 d(7.6)		
1′	4.95 d(8.0)	4.68 d(8.2)	4.87 d(8.0)	4.73 d(8.0)	4.66 d(7.8)
2′	4.88 dd(9.0, 8.0)	3.24 dd(7.9, 8.0)	3.38 t(8.0)	3.30 m	3.19 dd(9.0, 7.8)
3′	3.68 m	3.40~3.34 m	3.50~4.11 m	3.40 t(6.5)	3.36 dd(9.0, 8.8)
4′	3.39 m	–	3.50~4.11 m	3.39 t(6.5)	3.26 dd(9.5, 8.8)
5′	3.67 m	3.55 m	3.50~4.11 m	3.55 m	3.45 m
6′	3.65 m	4.50 dd(12.1, 2.7)	3.50~4.11 m	4.40 dd(12.0, 6.0)	3.61 dd(11.2, 6.3)
	3.93 d(12.0)	4.39 dd(12.0, 6.2)		4.53 dd(12.0, 2.0)	3.98 dd(11.2, 2.2)
1″			5.20 d(7.2)		5.01 d(2.4)
2″	7.83 br d(7.5)	7.46 d(8.6)	3.50~4.11 m	7.04 d(2.0)	3.88 d(2.4)
3″	6.80 br d(7.5)	6.80 d(8.5)	3.50~4.11 m		
4″			3.50~4.11 m		3.75 d(9.8)
					3.95 d(9.8)
5″	6.80 br d(7.5)	6.80 d(8.5)	3.50~4.11 m	6.72 d(8.0)	3.56 s
6″	7.83 br d(7.5)	7.46 d(8.6)	3.50~4.11 m	6.91 dd(8.0, 2.0)	
7″		7.64 d(16.4)		7.57 d(16.0)	
8″		6.36 d(16.4)		6.29 d(16.0)	
2‴,6‴				7.43 d(8.5)	
3‴,5‴				6.78 d(8.5)	
7‴				7.56 d(16.0)	
8‴				6.29 d(16.0)	

Table 8-5-32: ^{1}H NMR spectroscopic data of normal iridoids **8-5-113**~**8-5-117**.

H	8-5-113	8-5-114	8-5-115	8-5-116	8-5-117
1	5.89 d(2.7)	5.64 d(2.2)	5.69 m	5.23 d(6.1)	6.27 s
3	7.49 d(1.5)	7.36 d(1.2)	7.39 s	7.46 s	7.21 d(1.8)
5	3.33	3.28 m	3.58~3.65 m	3.26 m	3.58 m
6	5.40 m	6.22 dd(5.7, 2.2)	6.28 dd(5.5, 2.4)	5.56 m	1.46 m, 2.57 m
7	2.37 br d(15.4) 2.05 dd(15.4, 5.3)	5.60 dd(5.7, 2.0)	5.69 m	5.75 br s	2.47 m

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Table 8-5-32 (continued)

H	8-5-113	8-5-114	8-5-115	8-5-116	8-5-117
9	3.01 dd(8.5, 2.7)	2.61 dd(8.8, 2.2)	2.71 dd(8.6, 2.2)	3.00 dd(7.3, 6.4)	
10	1.51 s	4.16 d(11.2)	4.20 d(11.1)	4.32 d(15.4)	4.17 d(14.6)
		4.06 d(11.2)	4.34 d(11.1)	4.15 d(15.4)	4.26 d(13.9)
1′	4.65 d(7.8)	4.62 d(7.8)	4.68 d(7.9)	4.64 d(7.8)	4.68 d(8.0)
2′	3.18 dd(9.0, 7.8)	3.16 dd(8.8, 7.8)	3.21 t(8.3)	3.17 dd(8.8, 7.8)	3.16 dd(7.9, 8.6)
3′	3.37 dd(9.0, 9.0)	3.31 dd(9.3, 8.8)	3.31~3.37 m	3.34 dd(9.0, 8.8)	3.37 t(8.6)
4′	3.26 dd(9.0, 9.0)	3.23	3.31~3.37 m	3.23	3.30 (ov)
5′	3.31 m	3.23 m	3.31~3.37 m	3.23 m	3.30 (ov)
6′	3.88 dd(12.2, 2.2)	3.83 br d(11.5)	3.58~3.65 m	3.83 dd(12.2, 2.0)	3.68 dd(11.9, 5.1)
	3.66 dd(12.2, 6.1)	3.64 dd(11.5, 4.9)	3.84 d(12.4)	3.60 dd(12.2, 5.4)	3.88 dd(11.9, 1.7)
OAc		2.05 s(10-OAc)		1.98 s(6-OAc)	
OMe			3.89 s(3″-OMe)		
2″	7.40 d(8.6)		7.21 d(1.8)		
3″	6.77 d(8.6)				
5″	6.77 d(8.6)		6.81 d(8.2)		
6″	7.40 d(8.6)		7.09 dd(8.2, 1.8)		
7″	7.56 d(15.9)		7.64 d(15.8)		
8″	6.28 d(15.9)		6.40 d(15.8)		

Table 8-5-33: ^{1}H NMR spectroscopic data of normal iridoids **8-5-118**~**8-5-122**.

H	8-5-118	8-5-119	8-5-120	8-5-121	8-5-122
1	5.18 d(5.2)	5.35 d(3.5)	5.71 d(3.4)	5.20 d(4.9)	5.83 d(3.0)
3	7.36 d(1.2)	7.03 br s	7.43 d(1.0)	7.47 s	7.51 s
5	3.19 dt(7.0, 7.6)	2.97 br s	3.12 m	2.89 ddd (8.2, 8.2, 13.0)	
6	1.83 dt(6.4, 12.8) 1.96 m	1.85 m, 2.03 m	1.75 m	1.45 m, 2.20 m	4.51 m
7	4.31 t(5.8)	4.30 br s	2.05 m	1.45 m, 1.90 m	5.53 m
8				2.41 m	
9	2.92 ddd (1.8, 5.2, 7.3)	2.84 br s	2.68 dd(8.5, 3.4)	2.03 ddd (6.9, 6.9, 13.0)	3.11 m
10	5.19 br s 5.25 t(1.8)	5.29 br s	1.54 s	4.15 dd(6.5, 11.0) 4.21 dd(6.5, 11.0)	1.81 d(1.0)
OMe			3.69 s	3.70 s	3.72 s
1′	4.74 d(7.9)	4.97 d(8.5)	4.59 d(7.8)	4.66 d(8.0)	4.57 d(8.0)
2′	3.30 dd(9.1, 7.9)	4.90 dd(9.5, 8.0)	3.14 dd(9.0, 7.8)	3.20 dd(8.0, 9.3)	3.20 dd(8.0, 9.0)
3′	3.46 (ov)	3.71 m	3.32 dd(9.0, 8.8)	3.35 t(9.3)	3.37 t(9.0)
4′	3.46 (ov)	3.41 m	3.22 dd(9.5, 8.8)	3.30 m	3.28 t(10.0)

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Table 8-5-33 (continued)

H	8-5-118	8-5-119	8-5-120	8-5-121	8-5-122
5′	3.66 m	3.69 m	3.26 m	3.28 m	3.30 (ov)
6′	4.54 dd(6.4, 11.9)	3.66 m	3.85 dd(12.2, 2.2)	3.65 dd(1.8, 11.0)	3.91 dd(2.5, 12.0)
	4.69 dd(2.4, 11.6)	3.93 d(12.0)	3.61 dd(12.2, 6.4)	3.85 dd(11.0, 1.8)	3.65 dd(6.0, 12.0)
2″	8.07 dd(1.2, 8.5)	7.84 br d(7.5)		6.34 d(15.9)	
3″	7.52 t(7.9)	6.80 br d(7.5)		7.61 d(15.9)	
4″	7.65 t(7.6)				
5″	7.52 t(7.9)	6.80 br d(7.5)		7.48 d(8.5)	
6″	8.07 dd(1.2, 8.5)	7.84 br d(7.5)		6.80 d(8.5)	
8″				6.80 d(8.5)	
9″				7.48 d(8.5)	

Table 8-5-34: ^{1}H NMR spectroscopic data of normal iridoids **8-5-123**~**8-5-127**.

H	8-5-123	8-5-124	8-5-125	8-5-126	8-5-127
1	5.37 d(5.2)	5.61 d(2.1)	5.60 d(2.4)	5.58 d(3.3)	5.58 d(3.0)
3	7.58 br d(1)	7.42~7.45	7.44 d(0.6)	7.42~7.45	7.42 d(1.2)
5	3.09 br dd (8.5, 6.5)	2.96 ddd (1.5, 9.0) (ov)	2.94 ddd (0.6, 1.6, 8.7)	3.01 ddd (2.4, 8.9) (ov)	2.99 ddd (1.2, 2.4, 9.3)
6	3.98 dd(4.0, 6.5)	4.34 dd(1.5, 4.0)	4.32 dd(1.6, 3.9)	5.40 dd(2.4, 4.6)	5.38 dd(2.4, 4.3)
7	4.41 dd(4.0, 5.5)	4.72 dd(4.0, 9.2)	4.70 dd(3.9, 9.3)	3.81 dd(4.6, 8.6)	3.79 dd(4.3, 8.6)
8	3.14 dd(5.5, 8.5)	2.67 ddq (9.2, 9.0, 7.2)	2.65 ddq (9.3, 8.7, 7.2)	2.35 ddq (8.6, 8.9, 7.2)	2.34 ddq (8.6, 9.3, 7.5)
9	3.02 dt(5.2, 8.5)	2.88 ddd (2.1, 9.0, 9.0)	2.85 ddd (2.4, 8.7, 8.7)	2.82 ddd (3.3, 8.9, 8.9)	2.81 ddd (3.0, 9.3, 9.3)
10		1.11 d(7.2)	1.10 d(7.2)	1.13 d(7.2)	1.12 d(7.5)
OMe	3.81 s	3.69 s	3.68 s	3.64 s	3.63 s
1′	4.80 d(8.0)	4.66 d(7.8)	4.65 d(8.1)	4.67 d(7.8)	4.66 d(7.8)
2′	3.32 dd(8.2, 9.5)	3.22 dd(7.8, 9.0)	3.20 dd(8.1, 9.0)	3.21 dd(7.8, 9.0)	3.20 dd(7.8, 9.3)
3′	3.54 t(9.5)	3.31~3.46	3.30~3.44	3.31~3.46	3.29~3.45
4′	3.42 t(9.5)	3.31~3.46	3.30~3.44	3.31~3.46	3.29~3.45
5′	3.51 m	3.31~3.46	3.30~3.44	3.31~3.46	3.29~3.45
6′	3.77 dd(2.0, 12.5)	3.88 dd(2.4, 12.3)	3.87 dd(2.4, 12.3)	3.88 dd(2.4, 11.7)	3.88 dd(2.4, 12.0)
	3.95 dd(6.0, 12.5)	3.62~3.67 (ov)	3.61~3.67 (ov)	3.62~3.68 (ov)	3.61~3.67(ov)
2″, 6″		7.66~7.69	7.54 d(8.4)	7.67-7.71	7.55 d(8.4)
3″, 5″		7.42~7.45	6.89 d(8.4)	7.42-7.45	6.89 d(8.4)
4″		7.42~7.45		7.42~7.45	
7″		7.68 d(15.9)	7.60 d(15.9)	7.72 d(16.2)	7.64 d(15.9)
8″		6.56 d(15.9)	6.36 d(15.9)	6.59 d(16.2)	6.37 d(15.9)

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Table 8-5-35: ^{1}H NMR spectroscopic data of normal iridoids **8-5-128**~**8-5-132**.

H	8-5-128	8-5-129	8-5-130	8-5-131	8-5-132
1	5.39 d(6.0)	5.82 d(2.4)	5.85 d(3.2)	5.26 d(9.5)	5.76 s
3	7.53 d(1.0)	7.38 d(1.5)	7.50 d(1.5)	7.48 d(0.7)	7.48 d(1.5)
5	3.3 (ov)	2.94 (ov)	3.25(ov)	2.74 ddd (10.2, 7.8, 7.3)	3.23~3.33(ov)
6	5.23 dd(4.5, 7.0)	4.25 m	5.34 m	α 1.46 ddd (13.9, 10.2, 1.0) β 2.55 dd(13.9, 7.8)	3.80 d(2.5)
7	5.70 dd(4.5, 7.0)	2.11 br d(14.9) 1.97 dd(14.9, 5.4)	2.38 br d(15.6) 2.09 dd(15.6, 5.4)	3.48 br s	3.50 d(2.6)
8	3.3 (ov)				
9	3.09 ddd(6.0, 8.0, 9.0)	2.94 (ov)	2.90 dd(8.6, 3.2)	2.43 dd(9.5, 7.3)	2.32 d(8.8)
10		1.38 s	1.53 s	3.79 d(12.9) 4.22 d(12.9)	3.68 d(11.7) 3.47 d(11.7)
OMe	3.66 s(10-OMe) 3.70 s(11-OMe) 3.84 s(4″-OMe)	3.66 s	3.68 s	3.70 s	3.73 s
OAc	1.98 s		1.89 s		
1′	4.64 d(8.0)	4.59 d(7.8)	4.66 d(7.8)	4.80 d(7.8)	4.56 d(8.0)
2′	3.2~3.4 (ov)	3.14 dd(9.0, 7.8)	3.22 dd(9.0, 7.8)	–	3.13 dd(8.9, 8.1)
3′	3.2~3.4 (ov)	3.32 dd(9.0, 8.8)	3.34(ov)	–	3.23~3.33 (ov)
4′	3.2~3.4 (ov)	3.22 dd(9.5, 8.8)	3.26(ov)	–	3.23~3.33 (ov)
5′	3.2~3.4 (ov)	3.26 m	3.31 m	–	3.23~3.33 (ov)
6′	3.92 dd(2.5, 12.0)	3.85 dd(12.2, 2.2)	3.90 dd(12.0, 2.0)	3.63 dd(12.0, 6.3)	3.87 dd(11.9, 1.8)
	3.67 (ov)	3.61 dd(12.2, 6.4)	3.71 dd(12.0, 5.6)	3.91 dd(12.0, 2.0)	3.65 dd(11.9, 5.8)
2″, 6″	7.58 d(9.0)	6.98 d(8.5)	7.65 d(8.8)		
3″, 5″	6.97 d(9.0)	6.64 d(8.5)	7.07 d(8.8)		
7″	7.63 d(16.0)	2.76 m	6.94 d(12.9)		
8″	6.35 d(16.0)	2.49 m	5.86 d(12.9)		
1‴			4.96 d(7.6)		
2‴			3.48 (ov)		
3‴			3.34 (ov)		
4‴			3.45 (ov)		
5‴			3.28 (ov)		
6‴			3.87 dd(12.0, 1.7) 3.71 dd(12.0, 5.6)		

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Table 8-5-36: ^{1}H NMR spectroscopic data of normal iridoids **8-5-133**~**8-5-137**.

H	8-5-133	8-5-134	8-5-135	8-5-136	8-5-137
1	5.66 d(4.1)	5.81 s		*α* 5.07 d(8.8)	6.31 d(4.4)
3	7.40 d(1.5)	7.55 s	5.57 d(2.4)		6.30 s
4			1.98 m	2.00 ddd	
				(11.4, 8.5, 5.7)	
5	3.53 m		2.23 dd(7.2, 4.8)	3.10 m	3.05 ddd(10.2, 8.4, 8.4)
6	6.01 ddd	4.28 t(4.5)	*α* 2.32 dd	*α* 1.75 m	2.01 ddd
	(5.8, 2.4, 2.2)		(13.8, 7.2)	*β* 1.97 m	(10.3, 8.4, 4.0)
			β 1.79 ddd		2.03 ddd
			(13.8, 6.0, 4.8)		(10.3, 8.4, 4.0)
7	5.78 dt(5.8, 2.2)	1.47 ddd(5.0, 6.5, 11.5)	4.01 m	*α* 1.70 m	4.02 dd(4.0, 4.0)
		1.80 ddd(4.5, 7.0, 11.5)		*β* 1.97 m	
8	3.07 m	2.60			
9	2.72 ddd(8.3, 8.3, 4.1)	2.57 (ov)	2.68 d(4.8)	2.69 dd(8.8, 10.8)	2.44 dd(10.2, 4.4)
10	3.53 m, 3.71 m	0.94 d(7.0)	1.25 s	1.23 s	4.38 s
11			3.40 s	3.24 dd(11.4, 8.5)	4.08 d(12.6)
				3.85 dd(11.4, 5.7)	3.93 d(12.6)
OMe	3.71 s	3.73 s		3.70 s	
1′	4.67 d(7.8)	4.57 d(8.0)			
2′	–	3.18 dd(8.0, 9.0)			2.21 m
3′	–	3.37 t(9.0)			2.07 td(7.4, 6.9)
4′	–	3.25 t(9.0)			0.93 d(6.9)
5′	–	3.30 (ov)			0.93 d(6.9)
6′	3.65 dd(12.2, 5.8)	3.91 dd(2.0, 12.0)			
	3.88 dd(12.2, 2.0)	3.65 dd(6.0, 12.0)			
2″					6.38 d(16.1)
3″					7.68 d(16.1)
5″, 9″					7.48 d(8.5)
6″, 8″					6.80 d(8.5)

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Table 8-5-37: ^{1}H NMR spectroscopic data of normal iridoids **8-5-138**~**8-5-142**.

H	8-5-138	8-5-139	8-5-140	8-5-141	8-5-142
1	6.18 d(4.9)	*α* 4.19 d(8.7)	*α* 4.81 d(8.3)	6.39 br s	6.21 d(4.4)
3	6.34 s			6.40 br s	6.41 s
4		2.37 ddd (5.6, 5.9, 5.2)	2.33 ddd (4.0, 5.2, 5.8)		
5	3.02 ddd (9.8, 8.2, 8.2)	2.80 m	2.59 m	3.07 dd(8.5, 1.5)	3.09 ddd (9.9, 7.4, 7.4)
6	2.12 ddd (11.0, 8.2, 4.1) 2.15 ddd (11.0, 8.2, 4.1)	*α* 2.18 m *β* 2.22 m	*α* 2.01 m *β* 2.70 m	4.03 d(2.5)	2.24 ddd (11.8, 4.4, 7.4) 2.17 ddd (11.8, 4.4, 7.4)
7	5.09 dd(4.1, 4.1)	*α* 5.73 s	*α* 5.70 s	3.35 d(2.5)	5.10 dd(4.4, 4.4)
9	2.43 dd(9.8, 4.9)	2.38 dd(8.3, 8.7)	2.36 t(8.3)	2.01 d(8.5)	2.45 dd(9.9, 4.4)
10	3.68 d(11.3) 3.76 d(11.3)	4.25 s	4.20 s	3.68 d(4.0)	3.67 d(11.5) 3.73 d(11.5)
11	3.94 d(12.4)	3.46 dd(12.0, 5.9)	3.49 dd(12.0, 5.2)	4.22 d(11.5)	4.13 d(11.5)
	4.09 d(12.4)	4.00 dd(12.0, 5.2)	3.95 dd(12.0, 5.8)	4.33 d(11.5)	4.29 d(11.5)
OMe			3.71 s		
1′				4.32 d(8.0)	4.30 d(8.0)
2′	2.22 d(7.1)			3.10 dd(8.0, 9.0)	3.19 dd(8.0, 9.3)
3′	2.09 tq(7.1, 6.9)			3.60 m	3.34 t(9.3)
4′	0.97 d(6.9)			1.35 dt(12.5, 11.0) 1.91 ddd(12.5, 5.5, 2.0)	3.26 m
5′	0.97 d(6.9)			3.53 m	3.26 m
6′				3.56 br s(2H)	3.75 dd(1.4, 11.5) 3.86 dd(1.4, 11.5)
1″					
2″	6.34 d(15.8)			2.16 d(1.5), 2.18 d(2.0)	2.22 d(6.6)
3″	7.61 d(15.8)			2.03 m	2.09 tq(6.6, 6.6)
4″				0.93 d(7.0)	0.97 d(6.6)
5″	7.46 d(8.5)			0.93 d(7.0)	0.97 d(6.6)
6″	6.80 d(8.5)				
8″	6.80 d(8.5)				
9″	7.46 d(8.5)				
2‴					6.34 d(15.9)
3‴					7.61 d(15.9)
5‴,9‴					7.47 d(8.8)
6‴,8‴					6.80 d(8.8)

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Table 8-5-38: ^{1}H NMR spectroscopic data of normal iridoids **8-5-143**~**8-5-147**.

H	8-5-143	8-5-144	8-5-145	8-5-146	8-5-147
1	4.47 dd(11.1, 5.4)	5.55 d(3.7)	*α* 3.44 d(12.5)	5.10 d(6.0)	5.72 s
	4.09 t(11.4)		*β* 4.39 dd(12.5, 3.5)		
3		7.44 d(1.5)	5.30 s	5.01 d(3.6)	5.40 d(3.5)
4	2.85 m		2.97 d(11.0)	3.25 dd(3.6, 10.4)	3.10 dd(3.5, 5.5)
5	2.71 m	3.29 m	3.25 dd(11.0, 6.5)	3.40 ddd(6.6, 9.1, 10.4)	3.25 ddd(4.5, 5.5, 8.0)
6	2.76 br d(16.3)	*α* 2.43 dd(19.4, 1.5)	4.68 d(6.5)	5.37 br d(6.6)	4.88 dd(1.5, 4.5)
	2.37 br d(16.4)	*β* 2.56 dd(19.4, 8.4)			
7	5.64 br s		3.93 d(3.0)	5.98 br s	5.96 d(1.5)
8		2.12 dq(9.5, 7.3)	1.82 m		
9	3.13 m	2.31 ddd (9.5, 7.3, 3.7)	1.75 ddd (13.0, 12.0, 4.5)	3.02 ddd (0.8, 6.0, 9.1)	3.14 d(8.0)
10	4.00 (ov)	1.15 d(7.3)	0.98 d(6.5)	4.89 br d(15.7) 5.08 br d(15.7)	4.11 s
11	3.98 (ov)				
13				2.35 s	
OMe	3.88 s(6″, 8″-OMe)		3.29 s	3.51 s	
1′	4.39 d(7.9)	4.70 d(8.1)	4.46 d(8.0)	4.69 d(8.0)	
2′	3.22 m	3.29 dd(8.8, 8.1)	3.18 dd(9.0, 8.0)	3.21 dd(8.0, 9.3)	
3′	3.39 m	3.27~3.38 m	3.34 t(9.0)	3.38 dd(9.3, 9.1)	
4′	3.38 m	3.27~3.38 m	3.28 t(9.0)	3.27 dd(9.1, 9.1)	
5′	3.52 m	3.53 ddd (9.5, 5.5, 2.0)	3.30 ddd (9.0, 5.0, 2.0)	3.31 m	
6′	4.52 dd(12.0, 2.2)	3.80 dd(11.4, 2.0)	3.65 dd(12.0, 5.0)	3.68 ddd(1.6, 4.1, 11.8)	
	4.35 dd(11.8, 5.8)	3.90 dd(11.4, 5.5)	3.80 dd(12.0, 2.0)	3.88 dd(1.4, 11.8)	
1″		4.83 d(3.7)			
2″	6.43 d(15.9)	3.27~3.38 m			
3″	7.63 d(15.9)	3.65 t(9.5)			
4″		3.27~3.38 m			
5″	6.92 s	3.63 m			
6″		3.64 dd(10.0, 5.5) 3.79 dd(10.0, 2.0)			
9″	6.92 s				
2‴, 6‴		7.04 d(8.8)			

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Table 8-5-38 (continued)

H	8-5-143	8-5-144	8-5-145	8-5-146	8-5-147
3‴, 5‴		6.71 d(8.8)			
8‴		2.84 t(7.0)			
9‴		4.26 t(7.0), 4.25 t(7.0)			

Table 8-5-39: ^{1}H NMR spectroscopic data of normal iridoids **8-5-148**~**8-5-152**.

H	8-5-148	8-5-149	8-5-150	8-5-151	8-5-152
1	4.89 d(3.9)		5.33 d(2.7)		5.43 dd(4.8, 3.6)
3	7.33 d(1.2)	4.20 dd(10.8, 11.4) 3.82 br d(10.8)	5.95 br s	5.04 d(11.4) 4.38 dd(11.4, 1.2)	4.92 s
4		2.18 m			
5	2.99 br q(8.1)	2.81 m	2.71 m	3.35 dd(10.8, 9.6)	3.13 dd(6.6, 4.8)
6	*α* 1.60 ddd (14.1, 6.9, 5.1) *β* 2.21 ddd (14.1, 8.1, 1.5)	*α* 2.06 ddd (12.6, 7.8, 3.6) *β* 1.63 dd (12.6, 7.2)	*α* 1.49 m *β* 2.02 m	*α* 2.18 ddd (13.2, 9.6, 2.4) *β* 2.01 dd (13.2, 4.8)	*α* 2.02 dd (13.2, 6.6) *β* 1.83 ddd (13.2, 7.8, 4.8)
7	4.01 dt(5.1, 1.5)	3.82 br s	*α* 1.67 m, *β* 1.64 m	3.85 br s	3.79 m
8	1.74 m				
9	2.02 dt(9.6, 3.9)	2.87 d(10.8)	2.21 dd(9.5, 2.7)	2.99 d(10.8)	2.22 dd(4.8, 3.6)
10	1.08 d(6.9)	1.49 s	1.31 s	1.51 s	1.32 s
11	9.17 s	0.87 d(6.6)	1.51 br s	5.08 s, 5.02 s	4.77 s, 4.68 s
1′			4.62 d(7.9)		
2′			3.18 dd(7.9, 8.5)		
3′			3.36 dd(8.5, 8.9)		
4′			3.26 dd(8.9, 9.5)		
5′			3.28 m		
6′			3.65 dd(5.8, 11.9) 3.89 dd(1.9, 11.9)		

Table 8-5-40: ^{1}H NMR spectroscopic data of normal iridoids **8-5-153** and **8-5-154**.

H	8-5-153	8-5-154	H	8-5-153	8-5-154
1	4.08 dd(9.6, 2.4), 3.90 d(9.6)		7	3.74 dd(7.2, 2.8)	3.97 dd(7.2, 4.8)
3	4.84 s	5.73 s	9	2.05 d(5.4)	2.85 d(4.8)
5	2.97 dd(6.6, 5.4)	3.19 dd(6.0, 4.8)	10	1.41 s	1.31 s
6	*α* 2.03 dd(13.2, 6.6) *β* 1.86 ddd(13.2, 7.2, 3.6)	*α* 2.27 dd(13.8, 7.2) *β* 1.99 ddd(13.8, 6.0, 4.8)	11	4.79 s, 4.77 s	5.17 s, 5.05 s

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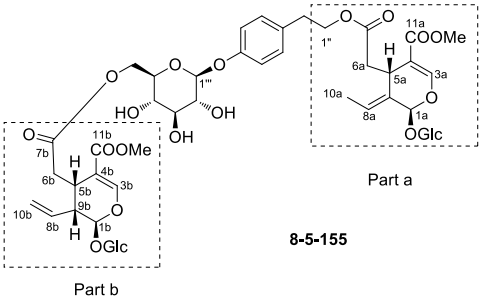
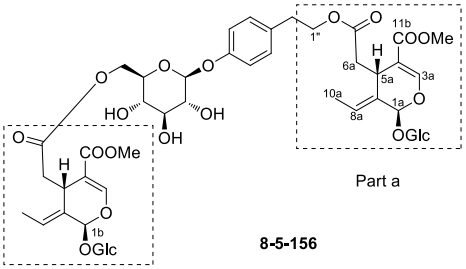
8.5.2 Dimeric iridoids

Table 8-5-41: Compounds, MFs, and test solvents of dimeric iridoids **8-5-155**~**8-5-165**.

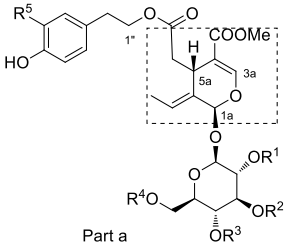
No.	Compounds	MFs	Test solvents	References
8-5-155	neopolyanoside	$C_{48}H_{64}O_{27}$	CD_3OD	[129]
8-5-156	polyanoside	$C_{48}H_{64}O_{27}$	CD_3OD	[130]
8-5-157	jaspolyanoside	$C_{42}H_{54}O_{22}$	CD_3OD	[130]
8-5-158	isojaspolyoside A	$C_{42}H_{54}O_{23}$	CD_3OD	[130]
8-5-159	isojaspolyoside B	$C_{42}H_{54}O_{23}$	CD_3OD	[130]
8-5-160	isojaspolyoside C	$C_{42}H_{54}O_{23}$	CD_3OD	[130]
8-5-161	jaspolyoside	$C_{42}H_{54}O_{23}$	CD_3OD	[131]
8-5-162	jaspolyanthoside	$C_{35}H_{48}O_{22}$	CD_3OD	[131]
8-5-163	jasamplexoside A	$C_{42}H_{54}O_{24}$	CD_3OD	[132]
8-5-164	jasamplexoside C	$C_{42}H_{54}O_{25}$	CD_3OD	[132]
8-5-165	3″-glucosyl depresteroside	$C_{46}H_{62}O_{27}$	CD_3OD	[133]



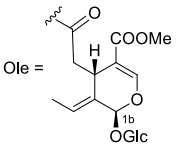
8-5-155



8-5-156



	R^1	R^2	R^3	R^4	R^5
8-5-157	H	H	H	Ole	H
8-5-158	Ole	H	H	H	OH
8-5-159	H	Ole	H	H	OH
8-5-160	H	H	Ole	H	OH
8-5-161	H	H	H	Ole	OH



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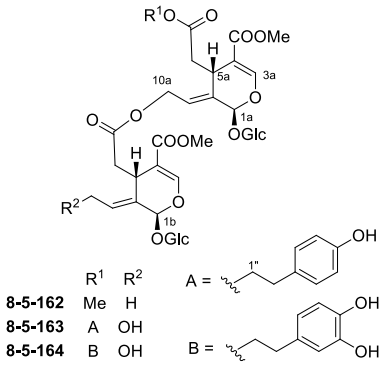
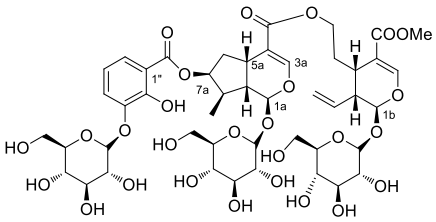


	R^1	R^2
8-5-162	Me	H
8-5-163	A	OH
8-5-164	B	OH



8-5-165

Table 8-5-42: ^{1}H NMR spectroscopic data of dimeric iridoids **8-5-155**~**8-5-157**.

H	8-5-155	8-5-156	8-5-157
1a	5.90 br s	5.895 br s	5.85 br s
3a	7.51 s	7.51 s	7.52 s
5a	3.95 dd(9.0, 4.5)	4.01 dd(9.0, 4.5)	3.95 dd(9.0, 4.0)
6a	2.44 dd(14.0, 9.0)	2.44 dd(14.0, 9.0)	2.40 dd(14.0, 9.0)
	2.69 dd(14.0, 4.5)	2.78 dd(14.0, 4.5)	2.70 dd(14.0, 4.0)
8a	6.06 qd(7.5, 1.0)	6.05 qd(7.0, 1.0)	6.06 qd(7.0, 1.0)
10a	1.64 dd(7.0, 1.5)	1.63 dd(7.0, 1.5)	1.62 dd(7.0, 1.5)
11a-OMe	3.71 s	3.69 s	3.67 s
1′a	4.80 d(7.5)	4.80 d(8.0)	4.82 d(8.0)
2′a	–	3.32~3.48 m	3.36 m
3′a	–	3.32~3.48 m	3.41 t(9.0)
4′a	–	3.32~3.48 m	3.39 t(9.0)
5′a	3.28 m	3.32~3.48 m	3.54 ddd(9.0, 5.0, 2.0)
6′a	3.72 dd(12.0, 4.5)	3.66 dd(12.0, 6.0)	4.20 dd(12.0, 5.0)
	3.88 dd(12.0, 1.5)①	3.89 dd(12.0, 1.5)	4.33 dd(12.0, 2.0)
1″	4.14 dt(11.0, 7.0)	4.14 dt(11.0, 7.0)	4.08 dt(10.5, 7.0)
	4.25 dt(11.0, 7.0)	4.25 dt(11.0, 7.0)	4.19 dt(10.5, 7.0)
2″	2.87 t(7.0)	2.87 t(7.0)	2.77 t(7.0)
4″,8″	7.17 AA′BB′(8.5)	7.18 d(8.5)	7.01 d(8.5)
5″,7″	7.02 AA′BB′(8.5)	7.02 d(8.5)	6.70 d(8.5)
1‴	4.87 d(7.5)	4.87 d(8.0)	
2‴	–	3.32~3.48 m	
3‴	–	3.32~3.48 m	
4‴	–	3.32~3.48 m	
5‴	3.63 ddd(9.0, 5.5, 2.0)	3.65 m	
6‴	4.14 dd(12.0, 5.5)	4.22 dd(1l.5, 6.0)	
	4.57 dd(12.0, 2.0)	4.36 dd(11.5, 2.0)	
1b	5.45 d(4.0)	5.898 br s	5.88 br s
3b	7.48 d(1.5)	7.53 s	7.49 s
5b	3.32 m	3.94 dd(9.0, 4.5)	3.98 dd(9.0, 4.0)

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Table 8-5-42 (continued)

H	8-5-155	8-5-156	8-5-157
6b	2.29 dd(16.5, 9.0)	2.42 dd(14.0, 9.0)	2.37 dd(14.0, 9.0)
	3.03 dd(16.5, 5.5)	2.68 dd(14.0, 4.5)	2.69 dd(14.0, 4.0)
8b	5.55 dt(17.0, 10.0)	6.08 qd(7.0, 1.0)	6.09 qd(7.5, 1.0)
9b	2.86 ddd(10.0, 5.5, 4.0)		
10b	5.07 dd(10.0, 1.0)	1.69 dd(7.0, 1.5)	1.71 dd(7.5, 1.5)
	5.14 dd(17.0, 1.0)		
11b-OMe	3.64 s	3.70 s	3.71 s
1′b	4.67 d(7.5)	4.78 d(8.0)	4.80 d(8.0)
2′b	–	3.32-3.48 m	3.32 m
3′b	–	3.32-3.48 m	3.43 t(9.0)
4′b	–	3.32-3.48 m	3.31 t(9.0)
5′b	3.34 m	3.32-3.48 m	3.34 m
6′b	3.67 dd(12.0, 4.5)	3.67 dd(11.0, 5.0)	3.67 dd(12.0, 5.0)
	3.90 dd(12.0, 2.0)①	3.87 br d(11.0)	3.88 dd(12.0, 2.0)

① The assignment of data in the literature is uncertain.

Table 8-5-43: ^{1}H NMR spectroscopic data of dimeric iridoids **8-5-158**~**8-5-161**.

H	8-5-158	8-5-159	8-5-160	8-5-161
1a	5.82 br s	5.96 br s	5.91 br s	5.88 br s
3a	7.49 s	7.54 s	7.53 s	7.49 s
5a	3.95 dd(9.0, 4.5)	3.96 dd(9.5, 4.5)	3.97 dd(9.0, 4.5)	3.98 dd(9.0, 4.5)
6a	2.41 dd(14.0, 9.0)	2.44 dd(14.0, 9.5)	2.44 dd(14.5, 9.0)	2.41 dd(15.0, 9.0)
	2.69 dd(14.0, 4.5)	2.70 dd(14.0, 4.5)	2.70 dd(14.5, 4.5)	2.70 dd(15.0, 4.5)
8a	5.98 qd(7.0, 0.5)	6.11 qd(7.5, 1.0)	6.08 qd(7.0, 1.0)	6.08 qd(7.0, 0.9)
10a	1.66 dd(7.0, 1.5)	1.78 dd(7.5, 1.5)	1.66 dd(7.0, 1.5)	1.71 dd(7.0, 1.0)
11a-OMe	3.69 s	3.71 s	3.71 s	3.67 s
1′a	4.94 d(8.0)	4.88 d(8.0)	4.80 d(7.5)	4.81 d(7.5)
2′a	4.78 dd(9.5, 8.0)	3.46 dd(9.5, 8.0)	3.40 dd(10.0, 7.5)	3.27~3.57 m
3′a	3.60 t(9.5)	4.95 t(9.5)	3.58 t(10.0)	3.27~3.57 m
4′a	3.39 m	3.49 t(9.5)	4.73 t(10.0)	3.27~3.57 m
5′a	3.38 m	3.42 ddd(9.5, 6.0, 2.0)	3.52 ddd(10.0, 6.0, 2.5)	3.27~3.57 m
6′a	3.69 dd(12.0, 6.0)	3.68 dd(11.5, 6.0)	3.89 br d(11.5)	4.22 dd(12.0, 6.0)
	3.89 br d(12.0)	3.87 dd(1l.5, 2.0)	3.69 dd(11.5, 6.0)	4.33 dd(12.0, 1.5)
1″	4.10 dt(11.0, 7.0)	4.10 dt(11.0, 7.0)	4.11 dt(11.0, 7.0)	4.08 dt(11.0, 7.0)
	4.20 dt(11.0, 7.0)	4.20 dt(11.0, 7.0)	4.21 dt(11.0, 7.0)	4.17 dt(11.0, 7.0)
2″	2.76 t(7.0)	2.76 t(7.0)	2.76 t(7.0)	2.72 t(7.0)
4″	6.66 d(2.0)	6.66 d(2.0)	6.66 d(2.0)	6.63 d(2.0)
7″	6.69 d(8.5)	6.69 d(8.0)	6.69 d(8.0)	6.68 d(8.0)
8″	6.54 dd(8.5, 2.0)	6.55 dd(8.0, 2.0)	6.55 dd(8.0, 2.0)	6.52 dd(8.0, 2.0)
1b	5.96 br s	5.90 br s	5.98 br s	5.84 br s
3b	7.51 s	7.52 s	7.51 s	7.52 s

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Table 8-5-43 (continued)

H	8-5-158	8-5-159	8-5-160	8-5-161
5b	3.99 dd(9.0, 4.0)	4.01 dd(7.0, 5.0)	4.03 dd(9.0, 4.0)	3.96 dd(9.0, 4.5)
6b	2.60 dd(15.0, 9.0)	2.73 m	2.59 dd(14.5, 9.0)	2.38 dd(15.0, 9.0)
	2.72 dd(15.0, 4.0)		2.87 dd(14.5, 4.0)	2.69 dd(15.0, 4.5)
8b	6.09 qd(7.0, 0.5)	6.08 qd(7.0, 1.0)	6.15 qd(7.0, 1.0)	6.07 dq(7.0, 0.9)
10b	1.73 dd(7.0, 1.5)	1.66 dd(7.0, 1.5)	1.76 dd(7.0, 1.5)	1.65 dd(7.0, 1.0)
11b-OMe	3.70 s	3.73 s	3.72 s	3.71 s
1′b	4.81 d(8.0)	4.80 d(8.0)	4.80 d(7.5)	4.83 d(7.5)
2′b	3.33 m	3.31 dd(9.5, 8.0)	3.31 m	3.27~3.57 m
3′b	3.41 t(9.5)	3.41 t(9.5)	3.41 t(10.0)	3.27~3.57 m
4′b	3.28 m	3.27 t(9.5)	3.32 m	3.27~3.57 m
5′b	3.34 m	3.36 ddd(9.5, 6.0, 2.5)	3.34 m	3.27~3.57 m
6′b	3.67 dd(12.0, 6.5)	3.66 dd(12.0, 6.0)	3.69 dd(11.5, 6.0)	3.68 dd(12.0, 5.5)
	3.91 dd(12.0, 2.0)	3.91 dd(12.0, 2.5)	3.89 br d(11.5)	3.89 dd(12.0, 1.5)

Table 8-5-44: ^{1}H NMR spectroscopic data of dimeric iridoids **8-5-162**~**8-5-165**.

H	8-5-162	8-5-163	8-5-164	8-5-165
1a	5.99 br s	5.97 br s	5.97 br s	5.33 d(4.5)
3a	7.54 s	7.53 s	7.53 s	7.47 d(1)
5a	4.01 dd(9.0, 4.5)	3.99 dd(10, 4)	4.00 dd(10, 4)	3.21 m(9, 8.5, 8, 1)
6a	2.54 dd(15.0, 9.0)	2.52 dd(15, 10)	2.52 dd(15, 10)	2.48 br dd(14, 8.5, 0.5)
	2.80 dd(15.0, 4.5)	2.76 dd(15, 4)	2.77 dd(15, 4)	1.88 m(14, 8, 5.5)
7a				5.48 m(5.5, 4.5, 0.5)
8a	6.10 ddd(7.0, 6.0, 1.0)	6.05 br t(7)	6.06 br t(7)	2.24 m(8.7, 6.7, 4.7)
9a				2.18 ddd(9, 8.7, 4.5)
10a	4.73 ddd(13.5, 6.0, 2.0)	4.61 ddd(13, 6, 1.5)	4.63 ddd(13, 6, 1.5)	1.16 d(6.7)
	4.82 br dd(13.5, 7.0)	4.76 dd(13, 7.5)	4.77 dd(13, 7.5)	
11a-OMe	3.71 s, 3.66 s	3.72 s	3.72 s	
1′a	4.81 d(8.0)	4.81 d(8)	4.81 d(8)	4.68 d(8)
2′a~5′a	3.25~3.44 m	3.32~3.44 m	3.32~3.43 m	3.21~3.40 m
6′a	3.66~3.72 m	3.32~3.44 (ov)	3.32~3.43 (ov)	3.92~3.62 m
	3.90 dd(12.0, 2.0)	3.87 dd(12, 1.5)	3.87 dd(12, 1.5)	
1″		4.l6 dt(11, 7)	4.l6 dt(11, 7)	
		4.26 dt(11, 7)	4.24 dt(11, 7)	
2″		2.84 t(7)	2.78 t(7)	
4″		7.06 AA′BB′(8.5)	6.67 d(2)	7.43 dd(8, 1)
5″		6.71 AA′BB′(8.5)		6.90 t(8)
6″				7.56 dd(8, 1)
7″		6.71 AA′BB′(8.5)	6.69 d(8)	
8″		7.06 AA′BB′(8.5)	6.56 dd(8, 2)	

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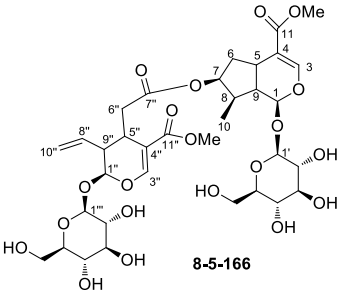
Table 8-5-44 (continued)

H	8-5-162	8-5-163	8-5-164	8-5-165
1‴				4.92 d(7)
2‴~5‴				3.20~3.40 m
6‴				3.92~3.62 m
1b	5.93 br s	5.96 br s	5.95 br s	5.53 d(6.5)
3b	7.52 s	7.53 s	7.53 s	7.44 d(0.5)
5b	4.00 dd(9.0, 4.5)	3.96 dd(10, 4)	3.96 dd(10, 4)	2.89 br td(7, 7, 5.5)
6b	2.46 dd(14.5, 9.0)	2.47 dd(15, 10)	2.47 dd(15, 10)	2.00 m(13.5, 7, 6.5, 6)
	2.76 dd(14.5, 4.5)	2.77 dd(15, 4)	2.78 dd(15, 4)	1.68 m(13.5, 7, 7, 5.5)
7b				4.18 m(12, 6, 5.5)
				4.13 m(12, 7, 6.5)
8b	6.12 qd(7.0, 1.0)	6.l7 ddd(8, 5.5, 1.5)	6.l7 ddd(8, 5.5, 1.5)	5.74 ddd(17, 11, 8.5)
10b	1.73 dd(7.0, 1.5)	4.l3 ddd(13.5, 5.5, 1.5)	4.l4 ddd(13.5, 5.5, 1.5)	5.26 dd(17, 1)
		4.29 dd(13.5, 8)	4.29 dd(13.5, 8)	5.20 dd(11, 1)
11b-OMe	3.72 s	3.70 s	3.70 s	3.65 s
1′b	4.82 d(7.5)	4.82 d(7.5)	4.82 d(8)	4.71 d(8)
2′b~5′b	3.25~3.44 m	3.32~3.44 m	3.32~3.43 m	3.20~3.40 m
6′b	3.67 dd(12.0, 5.0)	3.32~3.44 (ov)	3.32~3.43 (ov)	3.92~3.62 m
	3.88 br d(12.0)	3.89 dd(12, 1.5)	3.89 dd(12, 1.5)	

Table 8-5-45: Compounds, MFs, and test solvents of dimeric iridoids **8-5-166**~**8-5-170**.

No.	Compounds	MFs	Test solvents	References
8-5-166	tricoloroside methyl ester	$C_{34}H_{48}O_{20}$	CD_3OD	[134]
8-5-167	depresteroside	$C_{40}H_{52}O_{22}$	CD_3OD	[133]
8-5-168	asaolaside	$C_{28}H_{38}O_{15}$	CD_3OD	[135]
8-5-169	inerminoside A	$C_{31}H_{48}O_{16}$	CD_3OD	[136]
8-5-170	inerminoside B	$C_{31}H_{46}O_{16}$	CD_3OD	[136]



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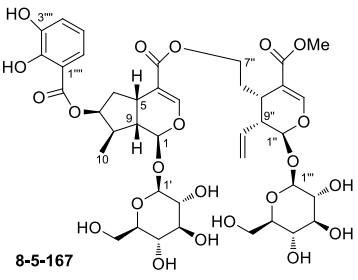

8-5-167

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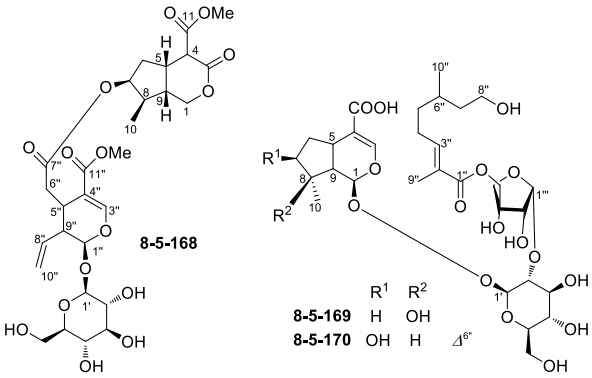

Table 8-5-46: ^{1}H NMR spectroscopic data of dimeric iridoids **8-5-166**~**8-5-170**.

H	8-5-166	8-5-167	8-5-168	8-5-169	8-5-170
1	5.27 d(4.7)	5.34 d(4.5)	4.16 dd(9.2, 11.6) 4.43 dd(5.9, 11.6)	5.39 d(5.6)	5.43 (ov)
3	7.42 d(1.28)	7.47 d(1)		7.37 s	7.38 s
4			3.65~3.75 (ov)		
5	3.09 m	3.20 m	3.05 m	3.16 q(8.5)	3.02 q-like(7.4)
6	1.71 m, 2.35 m	2.46 m, 1.89 m	1.58 m, 2.21 m	1.51 m, 2.34 m	1.90 m, 2.10 m
7	5.13 m	5.45 br ddd(5, 4.5, 0.7)	5.14 m	1.76 m	3.93 (ov)
8	2.12 m	2.23 m	2.02 m		2.14 m
9	2.07 m	2.18 ddd(9, 8.5, 4.5)	2.35 m	2.14 dd(8.5, 5.6)	2.43 m
10	1.06 d(6.41)	1.14 d(6.5)	1.02 d(6.8)	1.39 s	1.13 d(7.2)
1′	4.65 d(7.7)	4.69 d(8)	4.66 d(7.8)	4.77 d(7.7)	4.76 d(7.6)
2′	3.21 m	*ca*.3.21~3.40 m	3.21 m	3.46 dd(9.1, 7.7)	3.47 dd(9.0, 7.6)
3′	3.29-3.38 m	*ca*.3.21~3.40 m	3.26~3.40 (ov)	3.55 t(8.8)	3.55 t(9.0)
4′	3.29-3.38 m	*ca*.3.21~3.40 m	3.26~3.40 (ov)	3.27 dd(9.7, 8.3)	3.28~3.43(ov)
5′	3.29-3.38 m	*ca*.3.21~3.40 m	3.26~3.40 (ov)	3.55 m	3.28~3.43(ov)
6′	3.67 m	3.92 dd(12, 2)	3.89 m	3.66(ov)	3.66 dd(12.9, 2.0)
	3.89 dd(12.0, 1.7)	3.68 dd(12, 6.5)	3.65~3.75 (ov)	3.94 br d(12.9)	3.90 (ov)
1″	5.49 d(3.9)	5.54 d(6)	5.48 d(4.0)		
3″	7.48 d(2.1)	7.44 d(0.5)	7.49 d(1.7)	6.86 br t(7.5)	6.85 br t(7.0)
4″				2.27 m	2.39 m
5″	3.38 m	2.89 m	3.35 m	1.36 m, 1.48 m	2.24 m

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Table 8-5-46 (continued)

H	8-5-166	8-5-167	8-5-168	8-5-169	8-5-170
6″	2.37 m 2.98 dd(4.7, 16.7)	2.01 m, 1.79 m	2.37 dd(9.0, 16.6) 2.89 dd(5.3, 16.6)	1.67 m	
7″		4.11 ddd(12, 7, 6.5) 4.18 ddd(12, 6.2, 5.5)		1.50, 1.62 m	5.44 (ov)
8″	5.64 m	5.75 ddd(17.5, 11.5, 8.5)	5.64 m	3.66 (ov)	4.14 d(6.6)
9″	2.78 m	2.63 ddd(8.5, 6, 5.5)	2.75 m	1.87 s	1.87 br s
10″	5.26 m	5.27 dd(17.5, 1.5) 5.21 dd(11.5, 1.5)	5.25 m	0.99 d	1.74 s
1‴	4.66 d(7.7)	4.72 d(8)		5.41 br s	*ca*.5.42
2‴	3.22 m	3.21~3.40 m		3.92 br s	3.93 s
3‴	3.29~3.38 m	3.21~3.40 m			
4‴	3.29~3.38 m	3.21~3.40 m		3.79 d(9.6) 4.23 d(9.6)	3.80 d(9.8) 4.24 d(9.8)
5‴	3.29~3.38 m	3.21~3.40 m		4.27 d(11.3) 4.22 d(11.3)	4.26 br s
6‴	3.68 m 3.90 dd(12.0, 1.7)	3.89 dd(12, 1.5) 3.66 dd(12, 6)			
4⁗		7.03 dd(8, 1.5)			
5⁗		6.77 t(8)			
6⁗		7.34 dd(8, 1.5)			
11-OMe	3.68 s		3.65~3.75 (ov)		
11″-OMe	3.69 s	3.65 s	3.78 s		

Table 8-5-47: Compounds, MFs, and test solvents of dimeric iridoids **8-5-171**~**8-5-183**.

No.	Compounds	MFs	Test solvents	References
8-5-171	saprosmoside G	$C_{32}H_{42}O_{21}$	CD_3OD	[137]
8-5-172	saprosmoside A	$C_{34}H_{44}O_{22}S$	CD_3OD	[138]
8-5-173	–	$C_{37}H_{48}O_{23}S_2$	CD_3OD	[125]
8-5-174	globuloside A	$C_{42}H_{50}O_{21}$	CD_3OD	[112]
8-5-175	saprosmoside H	$C_{32}H_{42}O_{21}S$	CD_3OD	[137]
8-5-176	saprosmoside C	$C_{34}H_{42}O_{21}S$	CD_3OD	[138]
8-5-177	globuloside B	$C_{38}H_{46}O_{19}$	CD_3OD	[112]

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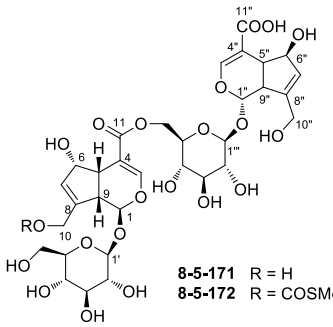
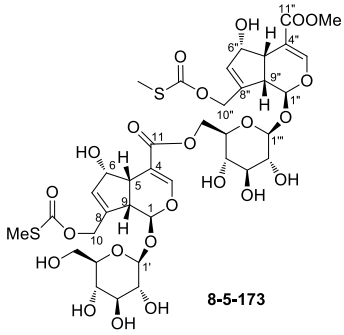
Table 8-5-47 (continued)

No.	Compounds	MFs	Test solvents	References
8-5-178	asperuloide A	$C_{27}H_{38}O_{13}$	CD_3OD	[139]
8-5-179	coelobillardin	$C_{52}H_{64}O_{26}$	CD_3OD	[140]
8-5-180	randinoside	$C_{33}H_{46}O_{20}$	CD_3OD	[141]
8-5-181	adinoside D	$C_{33}H_{44}O_{20}$	CD_3OD	[142]
8-5-182	rapulaside A	$C_{33}H_{46}O_{19}$	C_5D_5N	[143]
8-5-183	2″-*epi*-frameroside	$C_{27}H_{38}O_{15}$	CD_3OD	[144]



8-5-171 R = H
8-5-172 R = COSMe



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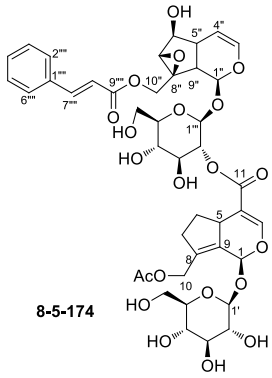

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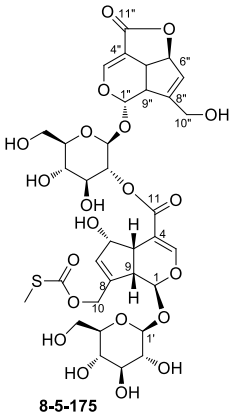
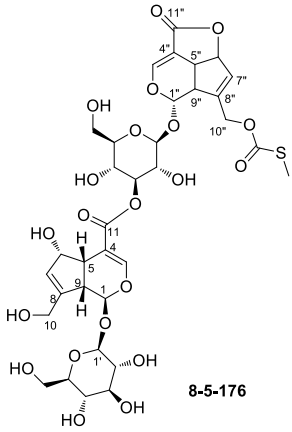


8-5-175



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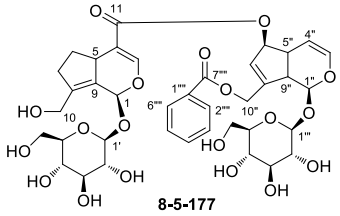
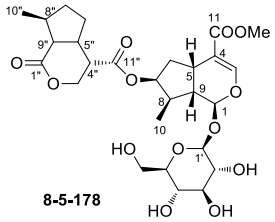


8-5-177



8-5-178

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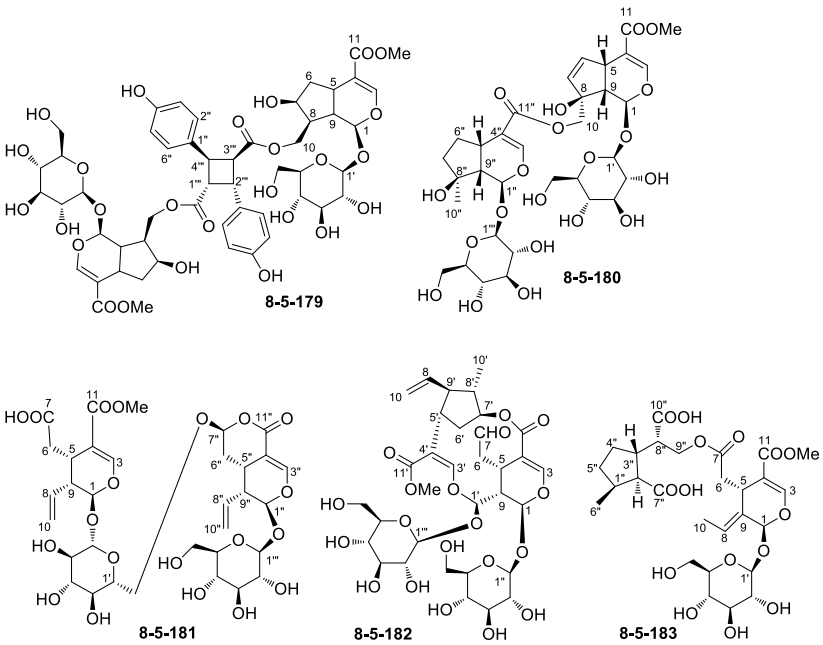

Table 8-5-48: ^{1}H NMR spectroscopic data of dimeric iridoids **8-5-171**~**8-5-175**.

H	8-5-171	8-5-172	8-5-173	8-5-174	8-5-175
1	5.04 d(8.5)	5.05 d(8.5)	5.06 d(9.1)	6.26 s	5.06 d(9.0)
3	7.66 d(1.0)	7.67 d(1.5)	7.69 d(1.4)	7.30 d(1.8)	7.70 d(1.5)
5	3.03 ddt (6.5, 6.5, 1.5)	3.06 ddd (7.5, 6.0, 1.5)	3.07 ddd (7.4, 6.0, 1.4)	3.57 m	2.90 ddt (8.0, 6.0, 1.5)
6	4.80 (ov)	4.82 (ov)	4.81 dd(1.9, 6.0)	2.51 m, 1.49 m	4.80 (ov)
7	6.04 d(2.0)	6.06 d(2.0)	6.06 d(1.9)	2.42 m	6.01 d(2.0)
9	2.58 (ov)	2.64 dd(7.5, 8.5)	2.64 dd(7.4, 9.1)		2.71 dd(9.0, 8.0)
10	4.21 (ov) 4.44 dd(12.5, 1.5)	4.96 d(14.0) 5.10 dd(1.0, 14.0)	4.99 br d(14.8) 5.09 dd(1.4, 14.8)	4.80 d(12.9) 4.68 d(12.9)	4.91 d(15.0) 5.14 dd(15.0, 2.0)
Me		2.35 s(10-Me)	2.35 s(10-Me) 2.34 s(10″-Me) 3.74 s(11″-OMe)	2.07 s(10-Me)	2.35 s(10-Me)
1′	4.72 d(7.5)	4.76 d(8.0)	4.73 d(8.0)	4.67 d(7.9)	4.72 d(7.5)
2′	3.24 dd(9.0, 7.5)	3.23 (ov)	3.26 dd(8.0, 9.3)	3.16 dd(7.9, 9.0)	3.25 dd(9.0, 7.5)
3′	3.40 (ov)	3.38 (ov)	3.84 dd(8.8, 9.3)	3.36 (ov)	3.28 (ov)
4′	3.28 (ov)	3.25 (ov)	2.26 t(9.3)	3.29 t(9.5)	3.28 (ov)
5′	3.28 (ov)	3.28 m	3.28 m	3.37 (ov)	3.38 (ov)

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Table 8-5-48 (continued)

H	8-5-171	8-5-172	8-5-173	8-5-174	8-5-175
6′	3.63 dd(12.0, 5.5)	3.64 dd(12.0, 6.0)	3.64 dd(12.1, 6.0)	3.90 dd(12.0, 2.0)	3.64 dd(11.0, 5.5)
	3.84 dd(12.0, 1.5)	3.86 dd(12.0, 2.0)	3.86 dd(12.1, 1.9)	3.69 dd(12.0, 5.5)	3.85 dd(11.0, 1.5)
1″	5.02 d(9.0)	4.99 d(9.0)	5.00 d(8.5)	5.05 d(9.7)	5.86 d(2.0)
3″	7.65 d(1.5)	7.57 d(1.0)	7.65 d(1.1)	6.35 dd(6.0, 1.8)	7.15 d(2.0)
4″				5.07 dd(6.0, 4.7)	
5″	2.98 ddt (6.0, 6.0, 1.5)	3.00 ddd (7.5, 6.0, 1.0)	3.02 ddd (7.4, 6.0, 1.1)	2.28 m	3.45 m
6″	4.80 (ov)	4.82 (ov)	4.79 dd(1.7, 6.0)	3.90 br s	5.51 m
7″	6.00 d(2.0)	5.98 d(2.0)	6.02 d(1.7)	3.49 br s	5.60 dd(2.0, 1.0)
9″	2.58 m	2.57 dd(7.5, 9.0)	2.62 dd(7.4, 8.5)	2.57 dd(7.6, 9.7)	3.20 (ov)
10″	4.21 (ov)	4.23 d(15.0)	4.96 dd(1.7, 14.6)	4.97 d(12.5)	4.16 s
	4.41 dd(12.5, 1.5)	4.42 dd(15.0, 1.5)	5.03 br d(14.6)	4.21 d(12.5)	
1‴	4.77 d(7.5)	4.73 d(8.0)	4.72 d(8.0)	4.99 d(8.1)	4.92 d(8.0)
2‴	3.24 dd(9.0, 7.5)	3.23 (ov)	3.27 dd(8.0, 9.6)	4.77 dd(8.1, 9.5)	4.79 dd(9.0, 8.0)
3‴	3.40 (ov)	3.42 (ov)	3.40 dd(8.8, 9.6)	3.53 t(9.5)	3.67 dd(10.0, 9.0)
4‴	3.38 (ov)	3.40 (ov)	3.93 dd(8.8, 9.3)	3.36 (ov)	3.38 (ov)
5‴	3.53 (ov)	3.52 m	3.51 m	3.37 (ov)	3.40 (ov)
6‴	4.24 dd(12.0, 5.5)	4.29 dd(12.0, 2.0)	4.30 dd(11.8, 4.8)	3.94 br d(12.0)	3.70 dd(12.0, 6.0)
	4.47 dd(12.0, 2.0)	4.46 dd(12.0, 5.0)	4.46 dd(11.8, 1.9)	3.69 dd(12.0, 5.5)	3.94 dd(12.0, 2.0)
2⁗, 6⁗				7.65 m	
3⁗, 5⁗				7.40 m	
4⁗				7.40 m	
7⁗				7.70 d(16.0)	
8⁗				6.58 d(16.0)	

Table 8-5-49: ^{1}H NMR spectroscopic data of dimeric iridoids **8-5-176**~**8-5-180**.

H	8-5-176	8-5-177	8-5-178	8-5-179	8-5-180
1	5.06 d(9.0)	6.37 s	5.24 d(5.4)	5.21 d(5.5)	5.78 d(2.5)
3	7.74 d(1.5)	7.39 d(1.8)	7.43 d(1.3)	7.43 s	7.37 d(1.4)
5	3.08 ddd(8.0, 6.0, 1.5)	3.60 m	3.08 dd(7.9, 7.7)	3.05 m	3.69 m

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Table 8-5-49 (continued)

H	8-5-176	8-5-177	8-5-178	8-5-179	8-5-180
6	4.85 (ov)	2.55 m 1.45 m	*α* 1.71 ddd (14.0, 8.5, 4.8) *β* 2.29 ddd (14.5, 7.5, 1.2)	*α* 1.62 m *β* 2.22 (ov)	6.14 dd(2.7, 5.7)
7	6.02 d(2.5)	2.50 m	5.16 t(4.7)	4.13 (ov)	5.72 dd(5.7, 1.7)
8			2.15 td(13.6, 6.9)	2.00 m	
9	2.60 dd(9.0, 8.0)		2.03 td(8.7, 5.5)	2.22 (ov)	2.60 dd(2.5, 8.5)
10	4.21 d(16.0)	4.19 dd(12.5, 1.0)	1.08 d(6.9)	*α* 4.35 (ov)	3.62 d(11.3)
	4.46 d(16.0)	4.27 br d(12.5)		*β* 4.14 (ov)	3.51 d(11.3)
Me	2.35 s(10″-Me)			3.72 s(11-OMe)	3.69 s(11-OMe)
1′	4.72 d(8.0)	4.68 d(7.9)	4.66 d(7.9)	4.69 d(7.7)	4.65 d(7.9)
2′	3.24 dd(8.0, 9.0)	3.15 dd(7.9, 9.0)	3.20 dd(9.1, 7.9)	3.20~3.45(ov)	3.18 dd(9.0, 7.9)
3′	3.25 (ov)	3.38 (ov)	3.37 dd(9.0, 8.7)	3.20~3.45(ov)	3.28 m
4′	3.26 (ov)	3.29 (ov)	3.26 dd(9.6, 8.6)	3.20~3.45(ov)	3.24 t(8.8)
5′	3.38 m	3.30 (ov)	3.31 m	3.20~3.45(ov)	3.35 dd(2.1, 9.0)
6′	3.73 dd(12.0, 5.5)	3.86 (ov)	*α* 3.64 dd(11.9, 6.1)	*α* 3.95 dd(11.3, 2.3)	3.88 dd(5.2, 10.0)
	3.92 dd(12.0, 2.0)	3.68 (ov)	*β* 3.90 dd(11.9, 2.1)	*β* 3.70 dd(11.3, 4.4)	3.65 dd(5.2, 10.0)
1″	5.95 d(1.5)	5.18 d(6.4)			5.43 d(4.0)
2″				7.21 d(8.5)	
3″	7.30 d(2.0)	6.35 dd(6.2, 2.0)	*α* 4.42 m *β* 3.23 m	6.77 d(8.5)	7.33 br s
4″		5.08 dd(6.2, 3.6)	2.96 m		
5″	3.67 m	2.98 m	1.53 m	6.77 d(8.5)	3.17 m
6″	5.56 br d(6.0)	5.32 br s	1.93 m 1.28 m(12.1, 6.4)	7.21 d(8.5)	2.27 m 1.47 m
7″	5.74 br s	5.91 t-like(1.7)	*α* 1.98 m *β* 2.09 m		1.70 t(7.2)
8″			2.52 t(10.6)		
9″	3.35(ov)	3.15(ov)	1.18 d(6.4)		2.21 dd(4.0, 9.1)
10″	4.85(ov) 4.91 dd(1.5, 14.5)	5.03 br d(13.5) 5.15 br d(13.5)	3.69 s		1.31 s
1‴	4.81 d(8.0)	4.70 d(7.9)		4.35 (ov)	4.64 d(7.9)
2‴	3.40 dd(8.0, 9.5)	3.24 dd(7.9, 8.0)		3.95 (ov)	3.17 dd(7.9, 9.0)
3‴	5.06 t(9.5)	3.38 (ov)		4.35 (ov)	3.29 m
4‴	3.57 dd(9.5, 10.0)	3.29 (ov)		3.95 (ov)	3.25 t(8.8)

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Table 8-5-49 (continued)

H	8-5-176	8-5-177	8-5-178	8-5-179	8-5-180
5‴	3.47 m	3.30 (ov)			3.33 dd(2.1, 9.0)
6‴	3.62 dd(6.0, 12.0)	3.86 (ov)			3.86 dd(5.1, 10.0)
	3.84 dd(1.5, 12.0)	3.68 (ov)			3.63 dd(5.1, 10.0)
2⁗,6⁗		8.06 m			
3⁗,5⁗		7.50 t-like(8.0)			
4⁗		7.62 m			

Table 8-5-50: ^{1}H NMR spectroscopic data of dimeric iridoids **8-5-181**~**8-5-183**.

H	8-5-181	8-5-182	8-5-183
1	5.39 d(4.0)	5.82 d(4.6)	5.92 br s
3	7.45 d(2.0)	7.73 s	7.52 s
5	3.27~3.40 m	3.64~3.72 m	3.99 dd(9.0, 4.5)
6	2.23 dd(16.5, 9.0)	2.40~2.49 m	2.48 dd(14.0, 9.0)
	2.86 dd(16.5, 5.0)	2.81~2.90 m	2.71 dd(14.0, 4.5)
7		9.79 t(4.4)	
8	5.64 ddd(17.0, 10.5, 9.0)	5.67~5.71 m	6.11 qd(7.0, 1.0)
9	2.81 ddd(9.0, 5.5, 4.0)	2.86~2.89 m	
10	5.23 dd(10.5, 1.5)	5.08 (ov)	1.74 dd(7.0, 1.0)
	5.28 dd(17.0, 1.5)		
OMe	3.68 s	3.53 s	3.71 s
1′	4.65 d(8.0)	5.66 d(4.0)	4.81 d(8.0)
2′	3.19 dd(8.0, 9.0)		–
3′	3.27~3.40 m	7.64 s	3.41 t(8.5)
4′	3.27~3.40 m		–
5′	3.43 m	3.17~3.25 m	–
6′	3.97 dd(12.0, 2.0)	α 1.74~1.82 m	3.71 dd(12.0, 6.0)
	4.03 dd(12.0, 4.0)	β 2.31~2.39 m	3.90 dd(12.0, 2.0)
7′		5.18~5.24 m	
8′		2.04~2.12 m	
9′		2.23~2.31 m	
10′		0.89 d(6.8)	
1″	5.56 d(1.5)	5.40 d(7.8)	2.29 m
2″		4.13~4.19 m	2.45 m
3″	7.61 d(2.5)	4.22~4.29 m	2.59 br dd(8.0, 4.5)
4″		4.28 (ov)	1.53 tt(12.0, 8.0)
			1.83 br dt(12.0, 6.0)
5″	3.43 m	4.03 (ov)	2.03 dt(12.0, 7.0), 1.23 m
6″	1.71 td(13.5, 2.5)	4.40 (ov)	1.09 d(7.0)
	1.92 ddd(13.5, 5.0, 1.5)	4.56 d(11.0)	
7″	5.55 dd(2.5, 1.5)		
8″	5.53 ddd(17.0, 10.5, 9.5)		2.90 m
9″	2.66 ddd(9.5, 5.5, 1.5)		4.27 m

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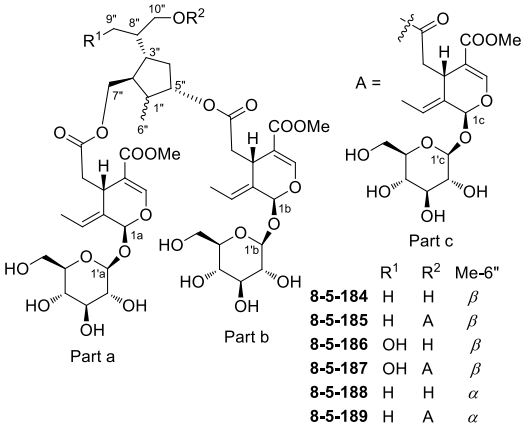
Table 8-5-50 (continued)

H	8-5-181	8-5-182	8-5-183
10″	5.27 dd(10.5, 1.5) 5.31 dd(17.0, 1.5)		
1‴	4.70 d(8.0)	5.36 d(7.9)	
2‴	3.23 dd(8.0, 9.0)	4.11~4.17 m	
3‴	3.27~3.40 m	4.20~4.26 m	
4‴	3.27~3.40 m	4.28 (ov)	
5‴	3.27~3.40 m	4.03 (ov)	
6‴	3.67 dd(5.5, 12.0)	4.40 (ov)	
	3.89 dd(2.0, 12.0)	4.56 d(11.0)	

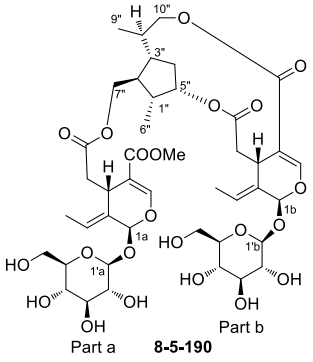
8.5.3 Trimeric and tetrameric iridoids

Table 8-5-51: Compounds, MFs, and test solvents of iridoid oligomers **8-5-184**~**8-5-195**.

No.	Compounds	MFs	Test solvents	References
8-5-184	jasuroside A	$C_{44}H_{64}O_{23}$	CD_3OD	[145]
8-5-185	jasuroside B	$C_{61}H_{86}O_{33}$	CD_3OD	[145]
8-5-186	jasuroside C	$C_{44}H_{64}O_{24}$	CD_3OD	[145]
8-5-187	jasuroside D	$C_{61}H_{86}O_{34}$	CD_3OD	[145]
8-5-188	jasnudifloside A	$C_{44}H_{64}O_{23}$	CD_3OD	[146]
8-5-189	jasnudifloside B	$C_{61}H_{86}O_{33}$	CD_3OD	[146]
8-5-190	jasnudifloside C	$C_{43}H_{60}O_{22}$	CD_3OD	[147]
8-5-191	oleopolyanthoside A	$C_{52}H_{70}O_{32}$	CD_3OD	[147]
8-5-192	oleopolyanthoside B	$C_{52}H_{70}O_{32}$	CD_3OD	[147]
8-5-193	jaspolyoleoside A	$C_{59}H_{76}O_{33}$	CD_3OD	[147]
8-5-194	jaspolyoleoside B	$C_{59}H_{76}O_{32}$	CD_3OD	[147]
8-5-195	jaspolyoleoside C	$C_{59}H_{76}O_{32}$	CD_3OD	[147]



	R^1	R^2	Me-6"
8-5-184	H	H	*β*
8-5-185	H	A	*β*
8-5-186	OH	H	*β*
8-5-187	OH	A	*β*
8-5-188	H	H	*α*
8-5-189	H	A	*α*



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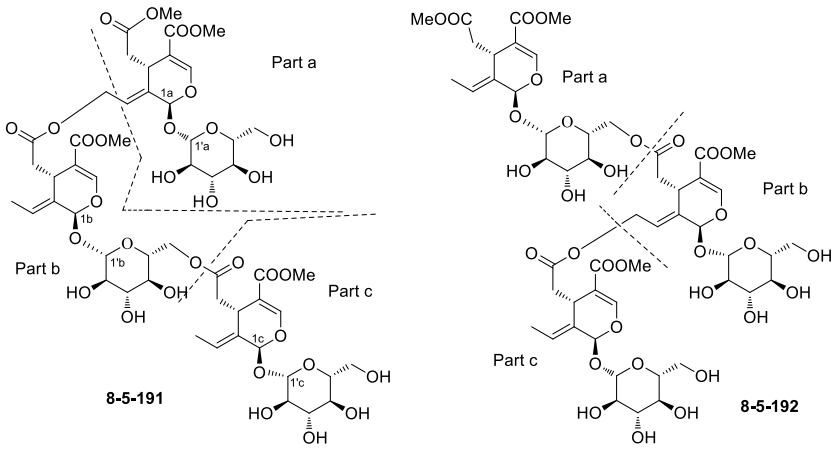

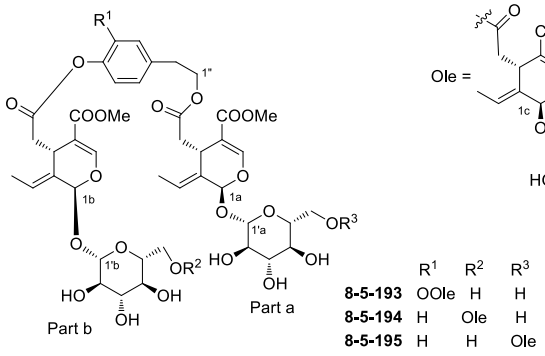

	R^1	R^2	R^3
8-5-193	OOle	H	H
8-5-194	H	Ole	H
8-5-195	H	H	Ole

Table 8-5-52: ^{1}H NMR spectroscopic data of iridoid oligomers **8-5-184**~**8-5-187**.

H	8-5-184	8-5-185	8-5-186	8-5-187
1a	5.94 s	5.93 s	5.94 s	5.93 s
3a	7.52 s	7.53 s	7.53 s	7.53 s
5a	4.00 dd(3.3, 6.6)	4.00 dd(3.9, 8.9)	4.01 m	4.01 m
6a	2.52 dd(10.5, 6.6) 2.72 dd(10.5, 3.6)	2.52 m, 2.72 m	2.52 dd(9.3, 13.8) 2.72 dd(4.2, 11.8)	2.56 m, 2.75 m
8a	6.11 q(5.4)	6.10 q(5.4)	6.13 q(5.7)	6.10 q(5.4)
10a	1.74 d(5.4)	1.74 d(5.4)	1.75 d(5.4)	1.75 d(5.4)
11a-OMe	3.72 s	3.72 s	3.72 s	3.72 s
1′a	4.80①	4.79①		4.79①
2′a~6′a	3.30~4.00①	3.30~4.00①		3.30~4.00①
1″	1.95 m	1.90 m	1.94 m	1.90 m
2″	1.82 m	1.86 m	1.90 m	1.90 m
3″	1.84 m	1.84 m	1.85 m	1.85 m

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Table 8-5-52 (continued)

H	8-5-184	8-5-185	8-5-186	8-5-187
4″	1.64 m, 2.08 m	1.64 m, 2.10 m	1.65 m, 2.06 m	1.65 m, 2.10 m
5″	5.04 dd(3.9, 6.6)	5.10 m	5.02 m	5.05 m
6″	0.94 d(5.1)	0.94 d(6.6)	0.94 d(6.6)	0.95 d(5.4)
7″	3.96 dd(3.9, 8.6)	4.00 dd(3.9, 8.9)	3.90 m, 4.21 m	3.95 m, 4.21 m
	4.21 m	4.20 m		
8″	1.65 m	1.65 m	1.65 m	1.65 m
9″	0.99 d(5.1)	1.00 d(6.3)	3.67 m, 3.90 m	3.67 m, 3.90 m
10″	3.31 m, 3.59 m	3.41 m, 3.63 m	3.40 m, 3.57 m	3.40 m, 3.59 m
1b	5.95 s	5.95 s	5.97 s	5.95 s
3b	7.52 s	7.53 s	7.53 s	7.54 s
5b	4.00 dd(3.5, 6.6)	4.00 dd(3.9, 8.9)	4.01 m	4.01 m
6b	2.52 dd(10.5, 6.6)	2.52 m, 2.72 m	2.52 dd(11.8, 7.0)	2.56 m, 2.75 m
	2.72 dd(10.5, 3.5)		2.72 dd(11.8, 4.2)	
8b	6.11 q(5.4)	6.10 q(5.4)	6.13 q(5.7)	6.10 q(5.4)
10b	1.74 d(5.4)	1.74 d(5.4)	1.75 d(5.7)	1.75 d(5.4)
11b-OMe	3.72 s	3.72 s	3.72 s	3.72 s
1′b	4.80①	4.79①		4.79①
2′b~6′b	3.30~4.00①	3.30~4.00①		3.30~4.00①
1c		5.96 s		5.97 s
3c		7.52 s		7.55 s
5c		4.00 dd(3.9, 8.9)		4.01 m
6c		2.52 m, 2.72 m		2.56 m, 2.75 m
8c		6.12 q(5.4)		6.14 q(5.4)
10c		1.75 d(5.4)		1.76 d(5.4)
11c-OMe		3.71 s		3.71 s
1′c				4.82①
2′c~6′c				3.30~4.00①

① Splitting informations are not given in the literature.

Table 8-5-53: ^{1}H NMR spectroscopic data of iridoid oligomers **8-5-188**~**8-5-190**.

H	8-5-188	8-5-189	8-5-190
1a	5.96 br s	5.93 br s	5.95 br s
3a	7.53 s	7.52 s	7.54 s
5a	4.00 dd(9.0, 4.5)	3.97~4.03 m	4.01 dd(9.5, 4.5)
6a	2.52 dd(14.0, 9.0)	2.49 dd(14.0, 9.0)	2.54 dd(14.0, 9.0)
	2.73 dd(14.0, 4.5)	2.70 dd(14.0, 4.5)	2.73 dd(14.0, 4.5)
8a	6.11 qd(7.0, 1.0)	6.10 qd(7.0, 1.0)	6.13 qd(7.0, 1.0)
10a	1.75 dd(7.0, 1.0)	1.74 dd(7.0, 1.0)	1.75 dd(7.0, 1.0)
11a-OMe	3.72 s	3.71 s	3.72 s
1′a	4.80 d(8.5)	4.80 d(7.5)	4.81 d(8.0)

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Table 8-5-53 (continued)

H	8-5-188	8-5-189	8-5-190
2′a~5′a	3.27~3.41 m	3.28~3.41 m	3.27~3.41 m
6′a	3.65 dd(12.0, 6.0)	3.65 dd(12.0, 6.0)	3.64 dd(11.5, 6.0)
	3.89 dd(12.0, 2.0)	3.91 dd(12.0, 2.0)	3.88 dd(11.5, 1.5)
1″	1.96 m	1.94 m	1.81 m
2″	1.84 m	1.85 m	1.91 m
3″	1.81 m	1.85 m	1.81 m
4″	1.62 ddd(14.0, 5.5, 4.0)	1.64 ddd(14.0, 4.0, 3.0)	2.01 br dd(11.0, 4.5)
	2.08 ddd(14.0, 9.0, 5.5)	2.09 ddd(14.0, 9.0, 5.0)	2.01 br dd(11.0, 4.5)
5″	5.04 td(5.5, 4.0)	5.05 td(4.5, 2.0)	4.91 br t(3.5)
6″	0.93 d(7.0)	0.94 d(7.0)	1.00 d(6.5)
7″	3.96 dd(11.5, 5.0)	3.99 m	4.08 dd(11.5, 4.5)
	4.21 dd(11.5, 4.0)	4.19 dd(11.0, 3.5)	4.19 dd(11.5, 4.5)
8″	1.66 ddd(14.0, 7.0, 4.0)	1.90 m	2.08 m
9″	0.99 d(7.0)	1.00 d(6.5)	0.97 d(7.0)
10″	3.34 m	3.75 dd(11.0, 7.0)	4.12 m(11.5, 3.5)
	3.59 dd(10.0, 4.5)	4.16 dd(11.0, 4.5)	4.34 dd(11.4, 9.0)
1b	5.95 br s	5.95 br s	5.87 br s
3b	7.53 s	7.53 s	7.43 s
5b	4.00 dd(9.0, 4.5)	3.97~4.03 m	3.99 dd(9.5, 4.5)
6b	2.52 dd(14.0, 9.0)	2.51 dd(14.0, 9.0)	2.37 dd(14.0, 4.5)
	2.70 dd(14.0, 4.5)	2.72 dd(14.0, 4.5)	2.45 dd(14.0, 9.5)
8b	6.12 qd(7.0, 1.0)	6.12 qd(7.0, 1.0)	6.07 qd(7.0, 1.0)
10b	1.76 dd(7.0, 1.5)	1.75 dd(7.0, 1.0)	1.82 dd(7.0, 1.0)
11b-OMe	3.72 s	3.72 s	
1′b	4.81 d(7.5)	4.80 d(8.0)	4.81 d(8.0)
2′b~5′b	3.27~3.41 m	3.28~3.41 m	3.27~3.41 m
6′b	3.66 dd(12.0, 6.0)	3.66 dd(12.0, 6.0)	3.67 dd(12.0, 6.5)
	3.90 dd(12.0, 2.0)	3.87 dd(12.0, 2.0)	3.90 dd(12.0, 2.0)
1c		5.96 br s	
3c		7.53 s	
5c		3.97~4.03 m	
6c		2.52 dd(14.0, 9.0)	
		2.73 dd(14.0, 4.5)	
8c		6.13 qd(7.0, 1.0)	
10c		1.76 dd(7.0, 1.0)	
11c-OMe		3.72 s	
1′c		4.81 d(7.5)	
2′c~5′c		3.28~3.41 m	
6′c		3.66 dd(12.0, 6.0)	
		3.87 dd(12.0, 2.0)	

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Table 8-5-54: ^{1}H NMR spectroscopic data of iridoid oligomers **8-5-191**~**8-5-195**.

H	8-5-191	8-5-192	8-5-193	8-5-194	8-5-195
1a	5.97 br s	5.91 br s	5.91 br s	5.92 br s	5.84 br s
3a	7.51 s	7.51 s	7.52 s	7.51 s	7.52 s
5a	4.00 dd(9.5, 4.5)	3.98 dd(9.5, 4.5)	3.95 dd(9.0, 4.5)	3.94 dd(9.5, 5.0)	3.93 dd(9.5, 4.5)
6a	2.54 dd(15.0, 9.5) 2.79 dd(15.0, 4.5)	2.46 dd(14.0, 9.5) 2.78 dd(14.0, 4.5)	2.44 dd(14.0, 9.0) 2.71 dd(14.0, 4.5)	2.44 dd(14.0, 9.5) 2.71 dd(14.0, 5.0)	2.40 dd(14.0, 9.5) 2.70 dd(14.0, 4.5)
8a	6.05 ddd(7.0, 5.5, 1.0)	6.09 qd(7.0, 1.5)	6.06 qd(7.0, 1.0)	6.06 qd(7.0, 1.5)	6.03 qd(7.0, 1.0)
10a	4.71 ddd(13.5, 5.5, 1.0) 4.78 dd(13.5, 7.0)	1.73 dd(7.0, 1.5)	1.61 dd(7.0, 1.5)	1.59 dd(7.0, 1.5)	1.57 dd(7.0, 1.5)
7a-OMe	3.69 or 3.67 s	3.69 or 3.64 s			
11a-OMe	3.67 or 3.69 s	3.64 or 3.69 s	3.70 s	3.71 s	3.71 s
1′a	4.811 d(7.5)	4.80 d(8.0)	4.82 d(8.0)	4.81 d(7.5)	4.82 d(7.5)
2′a~4′a	3.30~3.44 m	3.30~3.44 m	3.30~3.43 m	3.30~3.45 m	3.30~3.45 m
5′a	3.30~3.44 m	3.55 ddd(9.0, 5.5, 1.5)	3.30~3.43 m	3.30~3.45 m	3.55 ddd(9.0, 5.5, 2.0)
6′a	3.68 dd(11.5, 6.0) 3.89 dd(11.5, 1.5)	4.24 dd(12.0, 5.5) 4.32 dd(12.0, 1.5)	3.68 dd(12.0, 6.0) 3.88 dd(12.0, 1.5)	3.66 dd(12.0, 6.0) 3.88 dd(12.0, 2.0)	4.20 dd(12.0, 5.5) 4.35 dd(12.0, 2.0)
1b	5.92 br s	5.88 br s	6.04 br s	5.98 br s	6.04 br s
3b	7.53 s	7.55 s	7.57 s	7.58 s	7.50 s
5b	3.99 dd(9.5, 4.5)	4.02 dd(9.5, 4.5)	4.10 dd(9.5, 4.5)	4.10 dd(9.5, 4.5)	4.12 dd(9.5, 4.5)
6b	2.43 dd(14.5, 9.5) 2.73 dd(14.5, 4.5)	2.49 dd(14.5, 9.5) 2.80 dd(14.5, 4.5)	2.78 dd(15.0, 9.5) 2.97 dd(15.0, 4.5)	2.70 dd(14.0, 9.5) 2.97 dd(14.0, 4.5)	2.74 dd(15.0, 9.5) 2.97 dd(15.0, 4.5)
8b	6.10 qd(7.0, 1.5)	6.08 ddd(7.0, 6.0, 1.0)	6.18 qd(7.0, 1.0)	6.18 qd(7.0, 1.0)	6.19 qd(7.0, 1.0)
10b	1.73 br d(7.0)	4.74 ddd(13.5, 6.0, 1.0) 4.81 dd(13.5, 7.0)	1.78 dd(7.0, 1.5)	1.73 dd(7.0, 1.5)	1.77 dd(7.0, 1.5)
11b-OMe	3.71 s	3.71 s	3.74 s	3.68 s	3.66 s
1′b	4.81 d(7.5)	4.84 d(8.0)	4.80 d(8.0)	4.83 d(7.5)	4.83 d(7.0)
2′b~4′b	3.30~3.44 m	3.30~3.44 m	3.30~3.43 m	3.30~3.45 m	3.30~3.45 m
5′b	3.55 ddd(9.0, 6.0, 1.5)	3.30~3.44 m	3.30~3.43 m	3.53 ddd(9.5, 6.0, 2.0)	3.30~3.45 m

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Table 8-5-54 (continued)

H	8-5-191	8-5-192	8-5-193	8-5-194	8-5-195
6′b	4.20 dd(11.5, 6.0) 4.34 dd(11.5, 1.5)	3.66 dd(11.5, 6.0) 3.89 dd(11.5, 1.5)	3.64 dd(12.0, 6.0) 3.86 dd(12.0, 2.0)	4.13 dd(12.0, 6.0) 4.26 dd(12.0, 2.0)	3.68 dd(12.0, 6.0) 3.84 dd(12.0, 1.5)
1c	5.86 br s	5.93 br s	6.04 br s	5.86 br s	5.89 br s
3c	7.54 s	7.51 s	7.57 s	7.49 s	7.58 s
5c	3.99 dd(9.5, 4.5)	4.04 dd(9.5, 4.5)	4.10 dd(9.5, 4.5)	3.96 dd(9.0, 5.0)	3.98 dd(8.5, 4.5)
6c	2.48 dd(14.0, 9.5) 2.76 dd(14.0, 4.5)	2.44 dd(14.0, 9.5) 2.75 dd(14.0, 4.5)	2.77 dd(15.0, 9.5) 2.96 dd(15.0, 4.5)	2.32 dd(14.0, 9.0) 2.67 dd(14.0, 5.0)	2.41 dd(14.0, 8.5) 2.70 dd(14.0, 4.5)
8c	6.12 qd(7.0, 1.5)	6.12 qd(7.0, 1.5)	6.18 qd(7.0, 1.0)	6.06 qd(7.0, 1.5)	6.09 qd(7.5, 1.5)
10c	1.73 br d(7.0)	1.71 dd(7.0, 1.5)	1.77 dd(7.0, 1.5)	1.69 dd(7.0, 1.5)	1.71 dd(7.5, 1.5)
11c-OMe	3.72 s	3.72 s	3.74 s	3.74 s	3.74 s
1′c	4.82 d(7.5)	4.81 d(8.0)	4.80 d(8.0)	4.78 d(8.0)	4.80 d(7.5)
2′c~5′c	3.30~3.44 m	3.30~3.44 m	3.30~3.43 m	3.30~3.45 m	3.30~3.45 m
6′c	3.65 dd(11.5, 6.0) 3.90 dd(11.5, 1.5)	3.68 dd(11.5, 6.0) 3.88 dd(11.5, 1.5)	3.64 dd(12.0, 6.0) 3.85 dd(12.0, 1.5)	3.65 dd(12.0, 5.5) 3.89 dd(12.0, 2.0)	3.68 dd(12.0, 6.0) 3.88 dd(12.0, 2.0)
1″			4.18 dt(10.5, 6.5) 4.30 dt(10.5, 6.5)	4.16 dt(11.0, 6.5) 4.29 dt(11.0, 6.5)	4.14 dt(11.0, 6.5) 4.27 dt(11.0, 6.5)
2″			2.96 t(6.5)	2.93 t(6.5)	2.89 t(6.5)
4″			7.11 d(2.0)	7.26 d(8.5)	7.25 d(8.5)
5″				6.98 d(8.5)	7.03 d(8.5)
7″			7.12 d(8.5)	6.98 d(8.5)	7.03 d(8.5)
8″			7.20 dd(8.5, 2.0)	7.26 d(8.5)	7.25 d(8.5)

8.5.4 Secoiridoids

Table 8-5-55: Compounds, MFs, and test solvents of secoiridoids **8-5-196**~**8-5-222**.

No.	Compounds	MFs	Test solvents	References
8-5-196	7-dioxolanyl secologanin	$C_{19}H_{28}O_{11}$	CD_3OD	[148]
8-5-197	loniceracetalide A	$C_{21}H_{32}O_{11}$	CD_3OD	[149]
8-5-198	loniceracetalide B	$C_{21}H_{32}O_{11}$	CD_3OD	[149]
8-5-199	10-acetoxyoleoside dimethyl ester	$C_{20}H_{28}O_{13}$	$CDCl_3$	[150]

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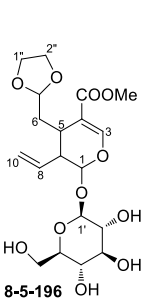
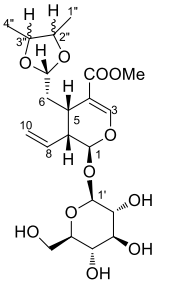
Table 8-5-55 (continued)

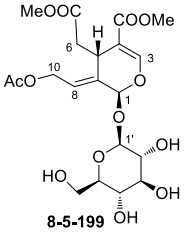
No.	Compounds	MFs	Test solvents	References
8-5-200	gonocaryoside E	$C_{22}H_{32}O_{13}$	C_5D_5N	[151]
8-5-201	jaspofoliamoside A	$C_{33}H_{50}O_{18}$	CD_3OD	[129]
8-5-202	jaspofoliamoside B	$C_{33}H_{48}O_{18}$	CD_3OD	[129]
8-5-203	jaspolinaloside	$C_{27}H_{40}O_{12}$	CD_3OD	[129]
8-5-204	hydroxyframoside A	$C_{32}H_{38}O_{14}$	CD_3OD	[152]
8-5-205	hydroxyframoside B	$C_{32}H_{38}O_{14}$	CD_3OD	[152]
8-5-206	framoside	$C_{32}H_{38}O_{13}$	CD_3OD	[152]
8-5-207	angustifolioside C	$C_{38}H_{48}O_{20}$	CD_3OD	[153]
8-5-208	insularoside-3′-*O*-*β*-D-glucoside	$C_{38}H_{46}O_{18}$	CD_3OD	[154]
8-5-209	insularoside-3′,6‴-di-*O*-*β*-D-glucoside	$C_{44}H_{56}O_{23}$	CD_3OD	[154]
8-5-210	insuloside	$C_{40}H_{46}O_{16}$	CD_3OD	[154]
8-5-211	desrhamnosyloleoacteoside	$C_{40}H_{48}O_{21}$	CD_3OD	[154]
8-5-212	fraxicarboside A	$C_{34}H_{38}O_{16}$	CD_3OD	[155]
8-5-213	fraxicarboside B	$C_{34}H_{38}O_{17}$	CD_3OD	[155]
8-5-214	fraxicarboside C	$C_{36}H_{40}O_{18}$	CD_3OD	[155]
8-5-215	multifloroside	$C_{32}H_{38}O_{16}$	CD_3OD	[156]
8-5-216	multiroside	$C_{31}H_{42}O_{19}$	CD_3OD	[156]
8-5-217	10-hydroxyoleoside-11-methyl ester	$C_{17}H_{24}O_{12}$	D_2O	[156]
8-5-218	jaslanceoside C	$C_{27}H_{32}O_{15}$	CD_3OD	[157]
8-5-219	jaslanceoside D	$C_{26}H_{30}O_{14}$	CD_3OD	[157]
8-5-220	jaslanceoside E	$C_{26}H_{30}O_{15}$	CD_3OD	[157]
8-5-221	jaslanceoside A	$C_{27}H_{32}O_{15}$	CD_3OD	[158]
8-5-222	jaslanceoside B	$C_{26}H_{30}O_{14}$	CD_3OD	[158]



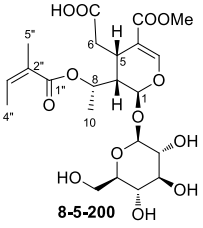
8-5-196



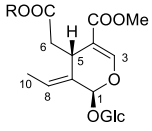
8-5-197 2"α-H, 3"α-H
8-5-198 2"β-H, 3"β-H

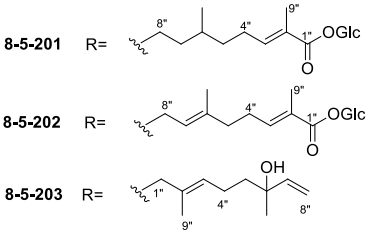


8-5-199



8-5-200





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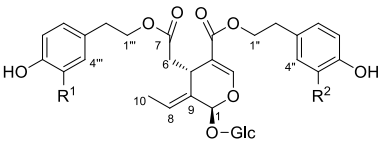
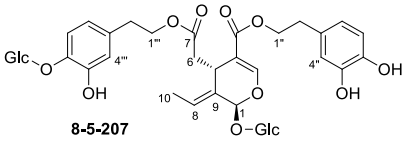
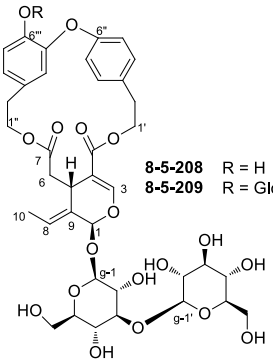


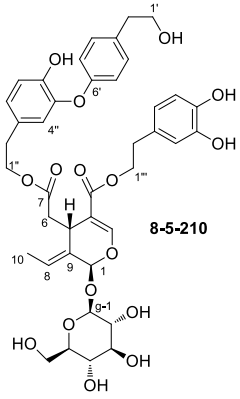
	R^1	R^2
8-5-204	OH	H
8-5-205	H	OH
8-5-206	H	H



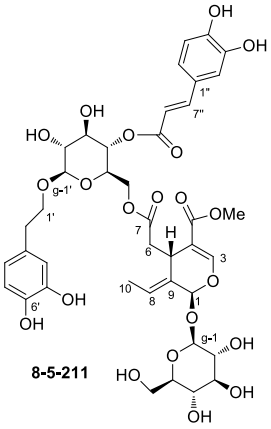
8-5-207



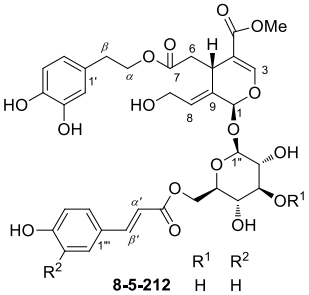
8-5-208 R = H
8-5-209 R = Glc



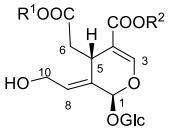
8-5-210



8-5-211

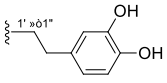


	R^1	R^2
8-5-212	H	H
8-5-213	H	OH
8-5-214	Ac	OH

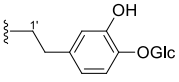


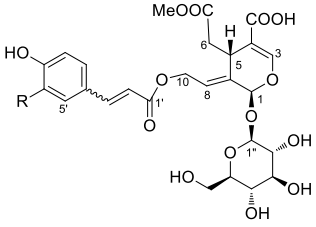
	R^1	R^2
8-5-215	A	A
8-5-216	B	Me
8-5-217	H	Me

A =



B =





	R	H-2', 3'
8-5-218	OMe	*cis*
8-5-219	H	*cis*
8-5-220	OH	*trans*
8-5-221	OMe	*trans*
8-5-222	H	*trans*

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Table 8-5-56: ^{1}H NMR spectroscopic data of secoiridoids **8-5-196**~**8-5-200**.

H	8-5-196	8-5-197	8-5-198	8-5-199	8-5-200
1	5.52 d(5.5)	5.51 d(5.1)	5.51 d(5.1)	5.81 s	6.28 d(6.6)
3	7.42 d(1)	7.41 d(1.5)	7.41 d(1.1)	7.49 s	7.73 s
5	3.01 m	2.97 m	3.00 m	3.98 dd(9.4, 4.0)	3.80 m
6	2.04 m, 1.77 m	1.67 ddd(13.6, 8.1, 4.8)	1.77 ddd(13.6, 8.4, 4.4)	2.43 dd(14.6, 9.4)	3.10 dd(16.2, 4.7)
		1.96 ddd(13.6, 6.2, 6.2)	2.06 ddd(13.6, 8.1, 5.9)	2.83 dd(14.6, 4.0)	2.86 dd(16.2, 7.8)
7	4.96 dd(7, 4.5)	5.25 dd(6.2, 4.8)	4.92 dd(5.9, 4.4)		
8	5.73 ddd (17, 10, 8)	5.72 ddd (17.2, 10.3, 7.0)	5.72 ddd (17.2, 10.3, 7.0)	6.11 t(6.5)	5.68 m
9	2.73 m	2.74 m	2.72 m		2.56 m
10	5.29 dd(17, 1.5)	5.25 dd(10.3, 1.1)	5.25 dd(10.3, 1.1)	4.68 m	1.47 d(6.4)
	5.25 dd(10, 1.5)	5.28 dd(17.2, 1.1)	5.28 br d(17.2)	4.78 dd(13.2, 6.5)	
7-OMe				3.65 s①	
11-OMe	3.68 s	3.68 s	3.68 s	3.72 s①	3.57 s
10-OAc				2.05 s	
1′	4.67 d(8)	4.66 d(8.1)	4.67 d(8.1)	4.85 d(7.5)	5.41 d(7.8)
2′	3.20 dd(8.5, 8)	3.19 dd(9.2, 8.1)	3.19 dd(9.2, 8.1)	3.40~3.70 m	4.03 t(8.9)
3′	3.20~3.40	3.28~3.37 m	3.24~3.37 m	–	4.24 t(8.9)
4′	3.20~3.40	3.28~3.37 m	3.24~3.37 m	–	4.20 t(8.9)
5′	3.20~3.40	3.28~3.37 m	3.24~3.37 m	3.40~3.70 m	3.96 m
6′	3.60~4.00	3.66 dd(11.7, 6.2)	3.67 dd(11.7, 6.2)	3.80 m	4.50 dd(11.8, 2.2)
		3.89 dd(11.7, 1.8)	3.89 dd(11.7, 1.8)		4.34 dd(11.8, 5.2)
1″	3.60~4.00	1.097 d(6.2)	1.10 or 1.11 d(5.9)		
2″	3.60~4.00	4.17 or 4.21 q(6.2)	4.06 or 4.08 q(5.9)		
3″		4.17 or 4.21 q(6.2)	4.06 or 4.08 q(5.9)		7.06 q(7.0)
4″		1.099 d(6.2)	1.10 or 1.11 d(5.9)		1.62 d(7.0)
5″					1.88 s

① The data were not assigned in the literature and here it is only listed.

Table 8-5-57: ^{1}H NMR spectroscopic data of secoiridoids **8-5-201**~**8-5-203**.

H	8-5-201	8-5-202	8-5-203
1	5.94 br s	5.94 br s	5.94 br s
3	7.53 s	7.52 s	7.52 s
5	3.99 dd(9.0, 4.5)	4.00 dd(9.5, 4.5)	4.00 dd(9.0, 4.5)
6	2.48 dd(14.5, 9.0)	2.46 dd(14.0, 9.5)	2.49 dd(14.5, 9.0)
	2.71 dd(14.5, 4.5)	2.72 dd(14.0, 4.5)	2.73 dd(14.5, 4.5)

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Table 8-5-57 (continued)

H	8-5-201	8-5-202	8-5-203
8	6.11 br q(7.0)	6.10 qd(7.0, 2.0)	6.11 qd(7.0, 1.0)
10	1.74 dd(7.0, 1.0)	1.73 dd(7.0, 1.5)	1.73 dd(7.0, 1.5)
11-OMe	3.72 s	3.72 s	3.71 s
1′	4.81 d(7.5)	4.80 d(8.0)	4.80 d(8.0)
6′	3.66 dd(12.0, 4.5)①	3.66 dd(12.0, 6.0)①	3.66 dd(12.0, 6.0)
	3.84 dd(12.0, 1.5)①	3.83 dd(12.0, 2.0)①	3.88 dd(12.0, 2.0)
1″			4.36 br d(12.0)
			4.48 br d(12.0)
3″	6.91 tq(7.0, 1.5)	6.89 tq(7.0, 1.5)	5.47 tq(7.0, 1.0)
4″	2.26 m	2.38 br q(7.0)	2.01 m
5″	1.48 m, 1.70 m	2.19 br t(7.0)	1.54 m
6″	1.59 m		
7″	1.48 m, 1.70 m	5.38 tq(7.5, 1.5)	5.91 dd(17.5, 11.0)
8″	4.06 dt(11, 6.0)	4.54 dd(12.0, 7.0)	5.03 dd(11.0, 1.5)
	4.13 dt(11, 7.0)	4.61 dd(12.0, 7.0)	5.20 dd(17.5, 1.5)
9″	1.87 br s	1.86 d(1.5)	1.65 br t(0.5)
10″	0.96 d(6.5)	1.74 d(1.0)	1.26 s
1‴	5.53 d(8.0)	5.52 d(8.0)	
6‴	3.68 dd(12.0, 4.5)①	3.68 dd(12.0, 6.0)②	
	3.89 dd(12.0, 2.0)①	3.89 dd(12.0, 2.5)②	

① The data were not assigned in the literature and here they are only listed.

Table 8-5-58: ^{1}H NMR spectroscopic data of secoiridoids **8-5-204**~**8-5-207**.

H	8-5-204	8-5-205	8-5-206	8-5-207
1	5.90 br s	5.90 br s	5.90 br s	5.89 br s
3	7.47 s	7.48 s	7.46 s	7.48 s
5	3.94 dd(9.4, 4.5)	3.94 dd(9.4, 4.6)	3.94 dd(9.5, 4.2)	3.98 dd(9.5, 4.5)
6	2.39 dd(14.2, 9.4)	2.39 dd(14.2, 9.4)	2.38 dd(14.2, 9.5)	2.44 dd(14.2, 9.5)
	2.64 dd(14.2, 4.5)	2.65 dd(14.2, 4.6)	2.63 dd(14.2, 4.2)	2.72 dd(14.5, 4.5)
8	6.08 qd(7.1, 1.0)	6.07 qd(7.1, 1.0)	6.07 qd(7.0, 1.0)	6.19 br t(7.0)
10	1.66 dd(7.1, 1.5)	1.64 dd(7.1, 1.5)	1.65 dd(7.0, 1.4)	1.72 dd(7.0, 1.5)
1′	4.80 d(7.8)	4.80 d(7.8)	4.80 d(7.8)	4.81 d(7.9)
2′	3.2~3.4(ov)	3.2~3.4(ov)	3.2~3.4(ov)	5.18 dd(7.8, 9.2)
3′	3.41 t(8.8)	3.41 t(8.8)	3.42 t(8.9)	3.25~3.52 m(ov)
4′	3.2~3.4(ov)	3.2~3.4(ov)	3.2~3.4(ov)	
5′	3.2~3.4(ov)	3.2~3.4(ov)	3.2~3.4(ov)	
6′	3.68 dd(11.9, 5.5)	3.68 dd(11.9, 5.5)	3.68 dd(12.1, 5.7)	3.68 dd(12.0, 1.5)
	3.89 dd(11.9, 1.7)	3.89 dd(11.9, 1.7)	3.89 dd(12.1, 1.8)	3.86 dd(12.0, 5.0)
1″	4.27 dt(10.8, 6.7)	4.27 dt(10.8, 6.7)	4.27 dt(10.8, 6.7)	4.29 t(7.0)
	4.31 dt(10.8, 6.7)	4.31 dt(10.8, 6.7)	4.30 dt(10.8, 6.7)	4.41 t(7.0)
2″	2.87 t(6.7)	2.81 t(6.7)	2.87 t(6.7)	2.87 t(7.0)

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Table 8-5-58 (continued)

H	8-5-204	8-5-205	8-5-206	8-5-207
4″	7.07 d(8.6)	6.68 d(2.0)	7.07 d(8.5)	6.86 d(1.7)
5″	6.71 d(8.6)		6.71 d(8.5)	
7″	6.71 d(8.6)	6.69 d(8.0)	6.71 d(8.5)	6.78 d(8.0)
8″	7.07 d(8.6)	6.56 dd(8.0, 2.0)	7.07 d(8.5)	6.56 dd(8.0, 1.7)
1‴	4.10 dt(10.7, 7.1)	4.09 dt(10.7, 7.2)	4.10 dt(10.8, 7.1)	4.15 dt(11.0, 6.7)
	4.21 dt(10.7, 7.1)	4.22 dt(10.7, 7.2)	4.23 dt(10.8, 7.1)	4.26 dt(11.0, 6.7)
2‴	2.77 t(7.1)	2.82 t(7.2)	2.82 t(7.1)	2.78 t(6.7)
4‴	6.67 d(2.1)	7.05 d(8.6)	7.05 d(8.6)	7.09 d(1.7)
5‴		6.72 d(8.6)	6.72 d(8.6)	
7‴	6.70 d(8.0)	6.72 d(8.6)	6.72 d(8.6)	7.13 d(8.0)
8‴	6.55 dd(8.0, 2.1)	7.05 d(8.6)	7.05 d(8.6)	6.77 dd(8.0, 1.7)
1⁗				4.74 d(7.6)
3⁗				3.25~3.52 m(ov)
6⁗				3.68 dd(12.0, 1.5)
				3.89 dd(12.0, 5.5)

Table 8-5-59: ^{1}H NMR spectroscopic data of secoiridoids **8-5-208**~**8-5-211**.

H	8-5-208	8-5-209	8-5-210	8-5-211
1	5.86 br s	5.86 br s	5.85 br s	5.89 s
3	7.54 s	7.54 s	7.45 s	7.48 s
5	3.79 dd(10.5, 3.5)	3.79 dd(10.5, 3.5)	3.87 dd(9.0, 4.5)	3.73 dd(9.0, 4.5)
6	2.16 dd(15.0, 10.5)	2.15 dd(15.0, 10.5)	2.30 dd(14.0, 9.0)	2.45 dd(14.5, 9.0)
	2.31 dd(15.0, 3.5)	2.32 dd(15.0, 3.5)	2.59 dd(14.0, 4.5)	2.71 dd(14.5, 4.5)
8	6.03 qd(7.0, 1.0)	6.03 qd(7.0, 1.0)	6.05 qd(7.5, 1.0)	6.05 qd(7.0, 1.0)
10	1.61 dd(7.0, 1.0)	1.62 dd(7.0, 1.5)	1.58 dd(7.5, 1.5)	1.69 dd(7.0, 1.5)
11-OMe				3.66 s
1′	4.47 ddd(10.5, 9.0, 3.5)	4.46 ddd(12.0, 9.0, 3.0)	3.71 t(7.5)	3.72 dt(11.0, 8.0)
	4.52 ddd(10.5, 5.0, 4.0)	4.54 ddd(12.0, 5.5, 4.0)	2.75 br t(7.0)	3.97 dt(11.0, 7.0)
2′	2.91 ddd(15.0, 5.0, 3.5)	2.92 ddd(14.0, 5.5, 3.0)	–	2.80 m
	3.01 ddd(15.0, 9.0, 4.0)	3.02 ddd(14.0, 9.0, 4.0)	–	
4′	7.20 d(8.0)	7.21 d(8.0)	7.12 d(8.5)	6.68 d(2.0)
5′	6.92 d(8.0)	6.96 d(8.0)	6.83 d(8.5)	
7′	6.92 d(8.0)	6.96 d(8.0)	6.83 d(8.5)	6.67 d(8.0)
8′	7.20 d(8.0)	7.21 d(8.0)	7.12 d(8.5)	6.56 dd(8.0, 2.0)
1″	4.01 ddd(11.0, 6.0, 5.0)	4.03 dt(11.0, 5.5)	4.20 dt(10.5, 6.5)	
	4.27 ddd(11.0, 6.0, 4.5)	4.27 dt(11.0, 5.5)	4.26 dt(10.5, 6.5)	
2″	2.75 br t(5.5)	2.79 br t(4.5)	2.79 br t(6.5)	7.05 d(2.0)

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Table 8-5-59 (continued)

H	8-5-208	8-5-209	8-5-210	8-5-211
4″	6.52 d(2.0)	6.56 d(2.5)	6.79 d(2.0)	
5″				6.78 d(8.0)
6″				6.96 dd(8.0, 2.0)
7″	6.84 d(8.0)	7.20 d(8.5)	6.87 d(8.0)	7.59 d(16.0)
8″	6.76 dd(8.0, 2.0)	6.88 dd(8.5, 2.5)	6.89 dd(8.0, 2.0)	6.28 d(16.0)
1‴			4.07 dt(10.5, 6.5)	
			4.19 dt(10.5, 6.5)	
2‴			2.77 br t(6.5)	
4‴			6.67 d(2.0)	
7‴			6.67 d(8.0)	
8‴			6.53 dd(8.0, 2.0)	
g-1	4.82 d(8.0)	4.84 d(7.5)	4.77 d(7.5)	4.80 d(8.0)
g-2	3.49 dd(8.5, 8.0)	3.49 dd(9.0, 7.5)	3.29 dd(9.0, 7.5)	–
g-3	3.60 t(8.5)	3.60 t(9.0)	–	–
g-4	3.42 dd(9.5, 8.5)	3.42 t(90)	–	–
g-5	3.30~3.38 m	3.28~3.42 m	3.30~3.40 m	–
g-6	3.63 dd(12.0, 5.5)	3.64 dd(12.0, 6.0)	3.64 dd(12.0, 6.0)	3.65 dd(12.0, 6.0)
	3.88 dd(12.0, 2.5)	3.89 dd(12.0, 2.0)	3.86 dd(12.0, 1.5)	3.87 dd(12.0, 2.0)
g-1′	4.58 d(8.0)	4.58 d(7.5)		4.39 d(8.0)
g-2′	3.27 dd(9.0, 8.0)	3.27 dd(9.0, 7.5)		3.32 dd(9.0, 8.0)
g-3′	3.38 t(9.0)	–		–
g-4′	3.28 t(9.0)	–		–
g-5′	3.30~3.38 m	3.28~3.42 m		–
g-6′	3.66 dd(12.0, 5.5)	3.66 dd(12.0, 6.0)		4.07 dd(12.0, 3.0)
	3.87 dd(12.0, 2.5)	3.87 dd(12.0, 2.0)		4.18 dd(12.0, 5.0)
g-1″		4.99 d(7.5)		
g-2″		3.50 dd(9.0, 7.5)		
g-5″		3.28~3.42 m		
g-6″		3.69 dd(12.0, 5.5)		
		3.87 dd(12.0, 2.0)		

Table 8-5-60: ^{1}H NMR spectroscopic data of secoiridoids **8-5-212**~**8-5-214**.

H	8-5-212	8-5-213	8-5-214
1	5.92 br s	5.83 br s	5.90 br s
3	7.63 s	7.75 s	7.54 s
5	3.78 dd(9.5, 4.5)	3.76 dd(9.2, 4.5)	3.85 dd(9.0, 4.5)
6	2.47 dd(14.5, 8.5)	2.36 dd(14.2, 9.0)	2.39 dd(14.5, 9.0)
	2.59 dd(14.5, 4.3)	2.63 dd(14.2, 4.5)	2.48 dd(14.5, 4.5)
8	6.21 t(7.3)	6.32 br t(7.0)	6.28 t(7.5)
10	3.96 dd(9.2, 7.5)	3.88 dd(9.2, 7.5)	3.83 dd(9.2, 7.5)
	4.38 dd(12.5, 7.5)	4.25 dd(12.5, 7.5)①	4.19 dd(12.5, 7.5)
11-OMe	3.71 s	3.68 s	3.72 s

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Table 8-5-60 (continued)

H	8-5-212	8-5-213	8-5-214
α	4.13 t(7.3)	4.10 t(7.5)	4.10 t(7.5)
β	2.80 t(7.3)	2.79 t(7.5)	2.89 t(7.5)
2′	6.67 d(2.0)	6.71 d(2.3)	6.65 d(1.9)
5′	6.63 d(8.0)	6.67 d(8.0)	6.70 d(8.0)
6′	6.51 dd(8.0, 2.0)	6.58 dd(8.0, 2.5)	6.53 dd(8.0, 2.0)
1″	4.76 d(8.0)	4.86 d(7.8)	5.02 d(7.9)
2″	3.13 dd(8.5, 8.0)	3.41 dd(8.2, 7.8)	3.47 t(9.5)
3″	3.29 dd(9.2, 8.5)	3.48 dd(9.0, 8.2)	5.13 dd(9.5, 9.0)
4″	3.26 dd(9.8, 8.2)	3.33 dd(10.0, 8.5)	3.43 dd(10.0, 8.5)
5″	3.34 ddd(9.8, 5.3, 2.1)	3.39 ddd(9.8, 5.3, 2.1)	3.89 ddd(9.8, 5.3, 2.1)
6″	4.48 dd(11.5, 5.3)	4.53 dd(12.2, 5.5)	4.41 dd(12.5, 5.7)
	4.69 dd(11.5, 2.1)	4.76 dd(12.2, 2.0)	4.64 dd(12.5, 2.5)
α′	6.44 d(16.0)	6.29 d(15.7)	6.33 d(16.1)
β″	7.68 d(16.0)	7.58 d(15.7)	7.62 d(16.1)
2‴	7.36 d(8.6)	7.11 d(2.2)	7.07 d(2.0)
3‴	6.87 d(8.6)		
5‴	6.87 d(8.6)	6.79 d(8.2)	6.83 d(8.5)
6‴	7.36 d(8.6)	7.05 d(8.2, 2.2)	6.98 d(8.5, 2.0)
3″-OAc			1.99 s

① Typographic error exists in the literature, giving one less d.

Table 8-5-61: ^{1}H NMR spectroscopic data of secoiridoids **8-5-215**~**8-5-217**.

H	8-5-215	8-5-216	8-5-217
1	5.93 br s	5.89 br s	5.87 br s
3	7.49 s	7.50 s	7.44 br s
5		3.90	3.60 dd(9.1, 6.0)
6	2.43 dd(14.8, 9.6)	2.49 dd(14.8, 9.1)	2.14 dd(14.0, 9.1)
	2.66 dd(14.8, 3.2)	2.70 dd(14.8, 4.4)	2.60 dd(14.0, 6.0)
8	6.15 br t(6.3)	6.13 t(6.5)	6.01 br t(6.4)
10	4.20	4.10 dd(14.2, 6.2)	4.18 (12.9)
		4.27 dd	4.16
11-OMe		3.70 s	3.63 s
1′	4.20	4.17~4.23	
2′	2.76 t(7.4)	2.81 t(6.0)	
4′	6.65~6.72	6.75 d(2.1)	
7′	6.65~6.72	7.11 d(8.4)	
8′	6.55 dd(8.0, 1.9)	6.66 dd(8.4, 2.1)	
1″	4.24		
2″	2.78 t(6.9)		
4″	6.65~6.72		
7″	6.65~6.72		
8″	6.55 dd(8.0, 1.9)		
1‴	4.83 d(7.7)	4.81 d(7.6)	4.84 d(7.7)
1⁗		4.74 d(7.5)	

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Table 8-5-62: ^{1}H NMR spectroscopic data of secoiridoids **8-5-218**~**8-5-222**.

H	8-5-218	8-5-219	8-5-220	8-5-221	8-5-222
1	5.93 br s	5.95 br s	5.94 br s	5.95 br s	5.95 br s
3	7.46 s	7.48 s	7.42 s	7.46 s	7.48 s
5	4.08 m	4.07 m	4.10 m	4.09 dd(9.8, 3.3)	4.08 dd(9.7, 3.5)
6*α*	2.90	2.90	2.92 dd(15.1, 3.6)	2.90 dd(15.3, 3.3)	2.82 dd(15.3, 3.5)
6*β*	2.50	2.52	2.50 dd(15.1, 10.5)	2.50 dd(15.3, 9.8)	2.51 dd(15.3, 9.7)
8	6.15 t(7.0)	6.17 t(7.0)	6.14 t(6.6)	6.17 t(6.5)	6.17 t(6.5)
10	5.95, 4.85	4.95, 4.87	4.92	4.95, 4.85	4.95, 4.87
2′	5.77 d(13)	5.76 d(12.6)	6.25 d(15.9)	6.34 d(16)	6.31 d(16)
3′	6.84 d(13)	6.86 d(12.6)	7.55 d(15.9)	7.62 d(16)	7.61 d(16)
5′	7.78 d(1.8)	7.61 d(8.5)	7.04 d(2.0)	7.17 d(1.5)	7.45 d(8.8)
6′		6.76 d(8.5)			6.80 d(8.8)
8′	6.77 d(8.4)	6.76 d(8.5)	6.77 d(8.1)	6.81 d(8.1)	6.80 d(8.8)
9′	7.09 dd(8.4, 1.8)	7.61 d(8.5)	6.94 dd(8.1, 2.0)	7.06 dd(8.1, 1.5)	7.45 d(8.8)
1″	4.81 d(7.8)	4.82 d(7.8)	4.82 (ov)	4.81 (ov)	4.82 (ov)
2″-6″	3.30~3.90 m	3.30~3.90 m	3.30~3.90 m	3.30~3.90 m	3.30~3.90 m
7-OMe	3.65 s	3.65 s	3.65 s	3.65 s	3.65 s
6′-OMe	3.85 s			3.88 s	

Table 8-5-63: Compounds, MFs, and test solvents of secoiridoids **8-5-223**~**8-5-237**.

No.	Compounds	MFs	Test solvents	References
8-5-223	7-methoxydiderroside	$C_{20}H_{30}O_{13}$	DMSO-d_6	[159]
8-5-224	8-*O*-tigloyldiderroside	$C_{22}H_{32}O_{13}$	DMSO-d_6	[159]
8-5-225	(8*Z*)-ligstroside	$C_{25}H_{32}O_{12}$	CD_3OD	[123]
8-5-226	safghanoside A	$C_{32}H_{40}O_{17}$	CD_3OD	[144]
8-5-227	safghanoside C	$C_{30}H_{40}O_{17}$	CD_3OD	[144]
8-5-228	safghanoside E	$C_{38}H_{48}O_{19}$	CD_3OD	[144]
8-5-229	secologanoside 7-methyl ester	$C_{17}H_{24}O_{11}$	CD_3OD	[160]
8-5-230	adinoside C	$C_{21}H_{32}O_{11}$	CD_3OD	[142]
8-5-231	grandifloroside 11-methyl ester	$C_{26}H_{32}O_{13}$	CD_3OD	[142]
8-5-232	7-*O*-(4-*β*-D-glucopyranosyloxy-3-methoxybenzoyl)-secologanolic acid	$C_{30}H_{40}O_{18}$	CD_3OD	[161]
8-5-233	adinoside A	$C_{20}H_{28}O_{11}$	C_5D_5N	[142]
8-5-234	gentiotrifloroside	$C_{29}H_{36}O_{17}$	CD_3OD	[162]
8-5-235	6*β*-hydroxyswertiajaposide A	$C_{17}H_{24}O_{11}$	CD_3OD	[163]
8-5-236	gentiascabraside A	$C_{17}H_{24}O_{11}$	DMSO-d_6	[163]
8-5-237	4′-*O*-*β*-D-glucopyranosylgentiopicroside	$C_{22}H_{30}O_{14}$	CD_3OD	[164]

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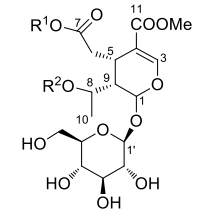
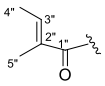
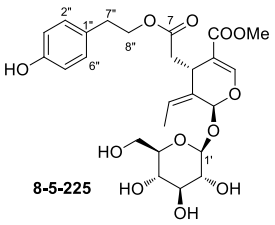
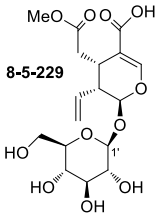


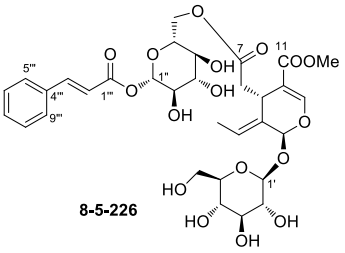
	R^1	R^2
8-5-223	Me	Ac
8-5-224	H	



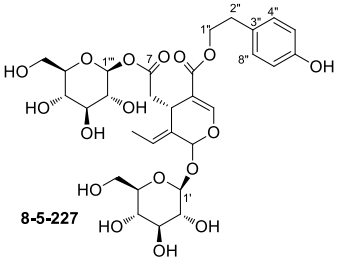
8-5-225



8-5-229



8-5-226



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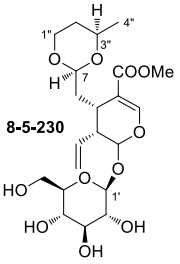

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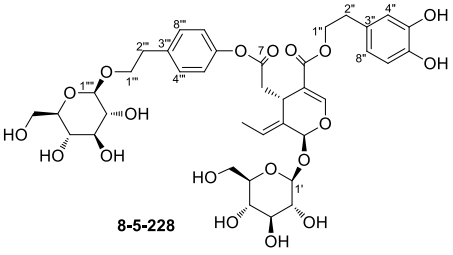

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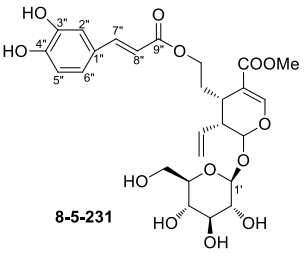

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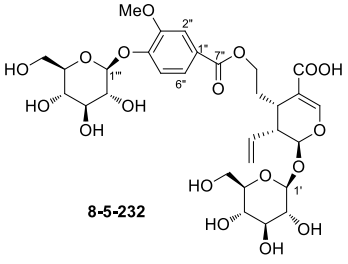
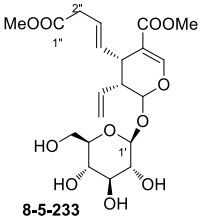


8-5-232



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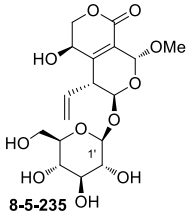

8-5-235

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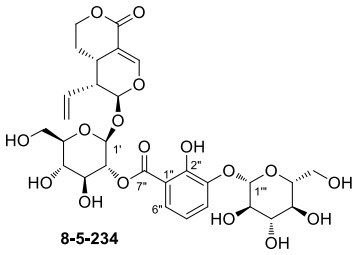
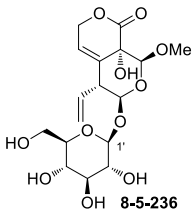

8-5-234


8-5-236

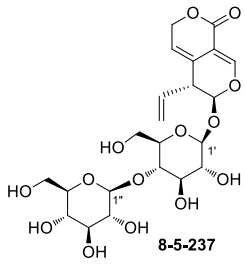

8-5-237

Table 8-5-64: ^{1}H NMR spectroscopic data of secoiridoids **8-5-223**~**8-5-227**.

H	8-5-223	8-5-224	8-5-225	8-5-226	8-5-227
1	5.66 d(4.5)	5.76 d(6.5)	6.23 br s	5.91 br s	5.93 br s
3	7.44 s	7.42 s	7.45 d(1.2)	7.51 s	7.45 s
5	3.10 m	3.20 m	3.66 m	4.00 dd(9.0, 5.0)	3.98 dd(9.0, 3.0)
6	2.48 dd(8.9, 16.0)	2.34 dd(8.0, 16.0)	2.62 dd(15.6, 8.1)	2.75 dd(14.0, 5.0)	2.73 dd(15.0, 3.0)
	2.85 dd(7.5, 16.0)	2.78 dd(7.2, 16.0)	2.89 dd(15.6, 3.8)	2.50 dd(14.0, 9.0)	2.54 dd(15.0, 9.0)
8	4.97 dq(4.0, 6.5)	5.09 dq(3.5, 6.5)	5.48 dq(7.1, 1.0)	6.09 qd(7.0, 1.0)	6.10 br q(7.0)
9	2.08 ddd(4.0, 4.5, 9.5)	2.16 ddd(3.5, 6.5, 8.5)			
10	1.26 d(6.5)	1.30 d(6.5)	1.71 dd(7.1, 1.7)	1.73 dd(7.0, 2.0)	1.76 dd(7.0, 1.0)
1′	4.54 d(7.5)	4.59 d(8.0)	4.64 d(7.8)	4.81 d(8.0)	4.80 d(8.0)
2′	3.18 dd(7.5, 11.2)	2.99 m	3.19 dd(8.8, 7.8)	–	–
3′	3.16 m	3.18 m	3.27~3.38 m	3.46 t(8.0)	3.41 t(9.0)
4′	3.12 m	3.01 m	3.27~3.38 m	–	–
5′	3.06 m	3.20 m	3.27~3.38 m	–	–
6′	3.68 dd(5.0, 12.4)	3.70 dd(5.6, 11.5)	3.66 m	3.68 dd(12.0, 5.5)	3.66 dd(12.0, 5.5)
	3.72 dd(5.7, 12.4)	3.98 dd(6.8, 11.5)	3.91 dd(12.0, 2.0)	3.87 dd(12.0, 1.5)	3.81 dd(12.0, 1.0)
OMe	3.58 s(7-OMe) 3.54 s(11-OMe)	3.59 s(7-OMe)	3.68 s(11-OMe)	3.71 s(11-OMe)	
OAc	1.92 s(8-OAc)				
1″				5.60 d(8.0)	4.25 dt(10.0, 7.0) 4.28 dt(10.0, 7.0)
2″			7.04 d(8.5)	–	2.86 t(7.0)
3″		6.79 dq(1.5, 7.2)①	6.72 d(8.5)	–	
4″		1.76 d(1.5)		–	7.07 d(8.0)
5″		1.74 br s	6.72 d(8.5)	–	6.71 d(8.0)

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Table 8-5-64 (continued)

H	8-5-223	8-5-224	8-5-225	8-5-226	8-5-227
6″			7.04 d(8.5)	4.25 dd(12.0, 5.0) 4.32 dd(12.0, 2.0)	
7″			2.81 t(6.8)		6.71 d(8.0)
8″			4.19 m		7.07 d(8.0)
1‴					5.44 d(8.0)
2‴				6.58 d(16.0)	–
3‴				7.81 d(16.0)	–
5‴				7.41~7.63 m	–
6‴				7.41~7.63 m	3.66 dd(12.0, 5.5) 3.89 dd(12.0, 2.0)
7‴				7.41~7.63 m	
8‴				7.41~7.63 m	
9‴				7.41~7.63 m	

① The peaktype should be qq.

Table 8-5-65: ^{1}H NMR spectroscopic data of secoiridoids **8-5-228**~**8-5-232**.

H	8-5-228	8-5-229	8-5-230	8-5-231	8-5-232
1	6.01 br s	5.47 d(4.1)	5.51 d(5.5)	5.57 d(6.5)	5.56 d(6.3)
3	7.52 s	7.48 d(1.7)	7.41 d(1.0)	7.49 d(0.5)	7.46 s
5	4.07 dd(9.0, 5.0)	3.30 m	2.98 br q(6.5)	2.93 br q(6.5)	2.98 m
6	2.66 dd(14.0, 9.0)	2.32 dd(16.1, 8.8)	1.69 ddd(13.5, 7.5, 4.5)	1.87 td(13.5, 7.0)	1.94 m
	2.87 dd(14.0, 5.0)	2.94 dd(16.1, 5.4)	1.97 dt(13.5, 6.5)	2.06 td(13.5, 7.0)	2.19 m
7			4.63 dd(6.5, 4.5)	4.17 dt(11.0, 7.0) 4.23 dt(11.0, 7.0)	4.35 m
8	6.17 qd(7.0, 1.0)	5.64 ddd (17.0, 10.5, 9.5)	5.74 ddd (17.5, 10.5, 8.5)	5.80 ddd (17.0, 10.5, 8.5)	5.83 ddd (17.6, 10.2, 8.8)
9		2.76 m	2.66 dt(5.5, 8.5)	2.67 dt(6.5, 8.5)	2.70 m
10	1.75 dd(7.0, 2.0)	5.22 m	5.25 br d(10.5)	5.27 dd(10.5, 1.5)	5.26 br d(10.2)
			5.29 br d(17.5)	5.32 dd(17.0, 1.5)	5.31 br d(17.6)
OMe		3.63 s(7-OMe)	3.69 s(11-OMe)	3.68 s(11-OMe)	3.91 s(3″-OMe)
1′	4.81 d(8.0)	4.66 d(7.8)	4.67 d(8.0)	4.70 d(8.0)	4.70 d(7.8)
2′	–	3.21 dd(9.1, 7.8)	3.19 dd(9.0, 8.0)	3.19 dd(9.0, 8.0)	–
3′	3.41 t(8.0)	3.33 m	3.36 t(9.0)	3.36 t(9.0)	–

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Table 8-5-65 (continued)

H	8-5-228	8-5-229	8-5-230	8-5-231	8-5-232
4′	–	3.33 m	3.27 t(9.0)	3.26 t(9.0)	–
5′	–	3.33 m	3.31 ddd(9.0, 5.5, 2.0)	3.32 ddd(9.0, 6.0, 2.0)	–
6′	3.63 dd(12.0, 5.0)	3.65 m	3.66 dd(5.5, 11.5)	3.66 dd(12.0, 6.0)	3.87 m
	3.82 dd(12.0, 2.0)	3.89 dd(12.0, 2.0)	3.89 dd(2.0, 11.5)	3.90 dd(2.0, 12.0)	3.67 m
1″	4.28 m		3.69 ddd(13.0, 11.0, 2.5) 3.99 ddd(11.0, 5.0, 1.5)		
2″	2.81 t(7.0)		1.45 dtd(13.0, 2.5, 1.5) 1.55 tdd(13.0, 11.0, 5.0)	7.03 d(2.0)	7.61 d(2.0)
3″			3.73 dqd(11.0, 6.0, 2.5)		
4″	6.67 d(2.0)		1.17 d(6.0)		
5″				6.78 d(8.0)	7.21 d(8.4)
6″				6.94 dd(8.0, 2.0)	7.64 dd(8.4, 2.0)
7″	6.68 d(8.0)			7.53 d(16.0)	
8″	6.56 dd(8.0, 2.0)			6.22 d(16.0)	
1‴	3.76 dt(10.0, 7.0) 4.09 dt(10.0, 7.0)				5.02 d(7.3)
2‴	2.94 t(7.0)				–
4‴	7.29 d(8.0)				–
5‴	6.98 d(8.0)				–
6‴					3.67 m, 3.87 m
7‴	6.98 d(8.0)				
8‴	7.29 d(8.0)				
1⁗	4.30 d(8.0)				
6⁗	3.66 dd(12.0, 5.0) 3.86 dd(12.0, 2.0)				

Table 8-5-66: ^{1}H NMR spectroscopic data of secoiridoids **8-5-233**~**8-5-237**.

H	8-5-233	8-5-234	8-5-235	8-5-236	8-5-237
1	5.91 d(8.0)	5.458 d(1.5)	5.43 d(4.1)	5.25 d(7.0)	5.62 d(2.9)
3	7.77 s	7.133 d(2.5)	5.54 d(1.2)	4.88 s	7.44 br s
5	3.62 dd(7.0, 5.5)	2.676 m			
6	5.62 dd, (15.5, 7.0)	α 1.512 m, β 1.666 m	4.14 dd(2.7, 1.7)	5.99 dd(2.2, 2.2)	5.62 m

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Table 8-5-66 (continued)

H	8-5-233	8-5-234	8-5-235	8-5-236	8-5-237
7	5.76 dt(15.5, 7.0)	*α* 4.093 m	4.40 dd(12.7, 2.7)	4.79 dd(12.5, 2.2)	4.99 dd(17.6, 3.3)
		β 4.304 m	4.44 dd(12.7, 1.7)	4.95 dd(12.5, 2.2)	5.07 dddd(17.6, 2.6, 1.5, 1.1)
8	5.86 ddd (17.0, 10.5, 8.0)	5.401 dt (9.8, 17.1)	5.78 ddd (16.9, 10.3, 8.8)	5.76 ddd (16.9, 9.9, 7.0)	5.75 ddd (17.2, 10.3, 7.0)
9	2.72 td(8.0, 5.5)	2.620 ddd (1.5, 5.5, 9.8)		3.27 m	3.30~3.34 m
10	5.13 dd(10.5, 1.5)	5.219 dd(1.9, 9.8)	5.33 ddd(16.9, 1.5, 0.7)	5.15 dd(16.9, 1.2)	5.20 dd(10.3, 1.1)
	5.23 br d(17.0)	5.261 dd(1.9, 17.1)	5.35 dd(10.3, 1.5)	5.20 dd(9.9, 1.2)	5.23 ddd(17.2, 1.5, 1.5)
OH				6.58 s(4-OH)	
OMe	3.58 s 3.63 s		3.51 s(3-OMe)	3.51 s(3-OMe)	
1′	5.44 d(8.0)	4.996 d(8.0)	4.69 d(7.8)	4.56 d(8.1)	4.68 d(8.1)
2′	4.07 br t(8.0)	5.028 dd(8.2, 8.9)	3.18 dd(9.3, 8.1)	–	3.221 dd(8.8, 8.1)
3′	4.29 t(8.5)	3.523 t(9.0)	–	–	3.51 dd(8.8, 8.8)
4′	4.26 t(8.5)	3.430 t(8.2)	–	–	3.55 dd(9.2, 8.8)
5′	3.99 ddd(8.5, 5.5, 2.0)	3.470 m	–	–	3.45 ddd(9.2, 4.4, 2.2)
6′	4.38 dd(11.5, 5.5)	*α* 3.717 dd(5.6, 10.2)	3.66 dd(12.0, 5.6)	–	3.84 dd(12.1, 4.4)
	4.54 dd(11.5, 2.0)	*β* 3.939 dd(1.8, 11.9)	3.87 dd(12.0, 2.0)		3.93 dd(12.1, 2.2)
1″					4.39 d(8.1)
2″	3.08 dd(16.5, 7.0) 3.04 dd(16.5, 7.0)				3.216 dd(8.8, 8.1)
3″					3.30~3.34 m
4″		7.420 dd(1.5, 8.0)			3.30~3.34 m
5″		6.835 t(8.0)			3.30~3.34 m
6″		7.537 dd(1.5, 8.0)			3.65 dd(11.7, 5.9) 3.87 dd(11.7, 2.2)
1‴		4.949 d(7.4)			
2‴		3.789 dd(8.5, 8.7)			
3‴		3.496 t(7.7)			

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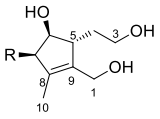
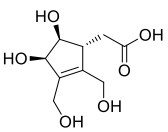
Table 8-5-66 (continued)

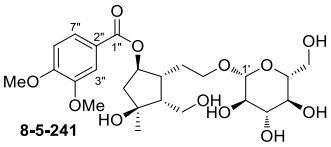
H	8-5-233	8-5-234	8-5-235	8-5-236	8-5-237
4‴		3.398 t(9.2)			
5‴		3.451 m			
6‴		*α* 3.694 dd(5.6, 10.3) *β* 3.896 dd(2.1, 12.1)			

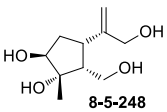
Table 8-5-67: Compounds, MFs, and test solvents of secoiridoids **8-5-238**~**8-5-252**.

No.	Compounds	MFs	Test solvents	References
8-5-238	10-deoxyeucommiol	$C_9H_{16}O_3$	CD_3OD	[165]
8-5-239	7-hydroxy-10-deoxyeucommiol	$C_9H_{16}O_4$	CD_3OD	[165]
8-5-240	7-hydroxy eucommic acid	$C_9H_{14}O_6$	CD_3OD	[165]
8-5-241	6-*O*-(3,4-dimethoxybenzoyl)-crescentin IV 3-*O*-*β*-D-glucopyranoside	$C_{24}H_{36}O_{12}$	CD_3OD	[166]
8-5-242	ovatic acid methyl ester 7-*O*-(6′-*O*-*p*-hydroxybenzoyl)-*β*-D-glucopyranoside	$C_{23}H_{32}O_{11}$	CD_3OD	[167]
8-5-243	kankanoside D	$C_{15}H_{26}O_7$	CD_3OD	[128]
8-5-244	3-*O*-(4-hydroxybenzoyl)-10-deoxyeucommiol 6-*O*-*β*-D-glucopyranoside	$C_{22}H_{30}O_{10}$	C_5D_5N	[166]
8-5-245	7-*O*-*p*-hydroxybenzoylovatol 1-*O*-(6′-*O*-*p*-hydroxybenzoyl)-*β*-D-glucopyranoside	$C_{29}H_{34}O_{12}$	CD_3OD	[167]
8-5-246	pagoside	$C_{24}H_{28}O_{11}$	CD_3OD	[168]
8-5-247	syringafghanoside	$C_{25}H_{32}O_{11}$	CD_3OD	[144]
8-5-248	jatamanin J	$C_{10}H_{18}O_4$	CD_3OD	[119]
8-5-249	jatamanin L	$C_{11}H_{16}O_5$	CD_3COCD_3	[119]
8-5-250	jatamanin M	$C_{12}H_{14}O_6$	CD_3COCD_3	[119]
8-5-251	7a-hydroxygelsemiol	$C_{10}H_{16}O_5$	CD_3OD	[124]
8-5-252	gelsemiol 6′-*trans*-caffeoyl-1-glucoside	$C_{25}H_{32}O_{12}$	CD_3OD	[169]









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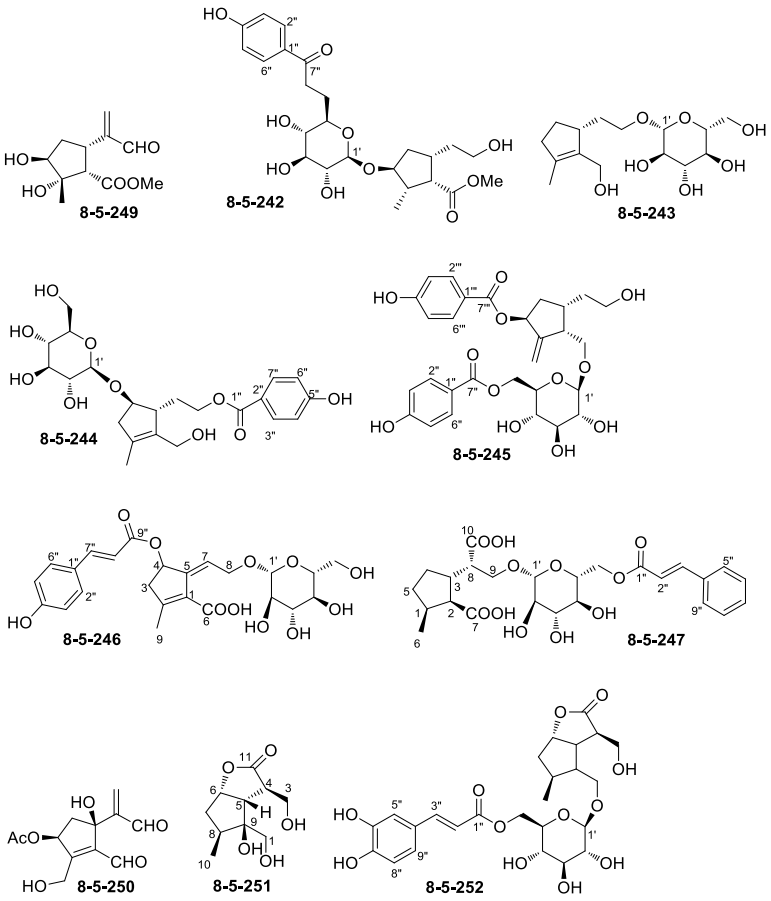

Table 8-5-68: ^{1}H NMR spectroscopic data of secoiridoids **8-5-238**~**8-5-242**.

H	8-5-238	8-5-239	8-5-240	8-5-241	8-5-242
1	4.19 d(12.2) 4.03(ov)	4.11 d(12.5) 3.94 d(12.5)	4.16 d(13.2) 4.01 d(13.2)	3.73 (ov)	
3	3.66 t(6.8)	3.60 t(6.8)		3.66 m 3.97 dt(10.0, 6.5)	3.43 m
4	1.89 m 1.41 m	1.86 m 1.34 m	2.59 dd(15.6, 5.6) 2.30 dd(15.6, 8.3)	1.96 m 1.84 m	1.31 m 1.46 m
5	2.63 m	2.59 m	3.00 m	3.00 quint(7.5)	2.36 br dd(10.0, 6.8)
6	4.03 m	3.73 dd(5.6, 4.2)	3.76 t(5.4)	5.21 ddd (8.5, 7.5, 3.5)	α 1.88 ddd (13.7, 10.0, 9.0) β 1.97 ddd (13.7, 10.0, 3.4)

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Table 8-5-68 (continued)

H	8-5-238	8-5-239	8-5-240	8-5-241	8-5-242
7	2.17 br d(16.6) 2.63 m	4.16 br d(5.6)	4.45 br d(5.4)	2.46 dd(14.5, 8.5) 1.75 ddd (14.5, 3.5, 1.5)	4.06 m
8					2.22 br q(6.8)
9				2.10 m	2.85 br t(6.8)
10	1.70 s	1.64 s	4.19 d(12.4) 4.06 d(12.4)	1.36 s	1.05 d(6.8)
1′				4.23 d(8.0)	4.32 d(7.8)
2′				3.16 t(8.0)	3.19 dd(8.8, 7.8)
3′				3.32 t(8.0)	3.35 m
4′				3.24 t(8.0)	3.35 m
5′				3.16 m	3.59 m
6′				3.78 dd(12.0, 2.0)	4.38 dd(11.7, 7.4)
				3.59 dd(12.0, 5.5)	4.60 dd(11.7, 2.4)
2″					7.91 d(9.0)
3″				7.58 d(2.0)	6.83 d(9.0)
5″					6.83 d(9.0)
6″				7.02 dd(8.5)①	7.91 d(9.0)
7″				7.72 dd(8.5, 2.0)	
OMe				3.88 s(4″-OMe) 3.89 s(5″-OMe)	3.60 s(1-OMe)

① Typographic error exists in the literature.

Table 8-5-69: ^{1}H NMR spectroscopic data of secoiridoids **8-5-243**~**8-5-247**.

H	8-5-243	8-5-244	8-5-245	8-5-246	8-5-247
1	4.04 d(12.2) 4.18 d(12.2)	4.40 br d(12.5) 4.50 br d(12.5)	3.59 m 3.91 dd(9.8, 5.1)		2.25 m
2					2.51 m
3	3.56 ddd (2.8, 7.4, 13.2) 3.97 ddd (4.9, 8.0, 13.2)	4.60 ddd (11.0, 8.5, 7.0) 4.80 ddd (11.0, 8.5, 5.5)	3.59 m(2H)	2.42 ddd (19.7, 1.7, 1.3) 3.05 ddd (19.7, 7.1, 1.5)	2.51 m
4	1.41 m 2.06 m	1.95 m 2.44 m	1.45 m 1.80 m	5.92 ddd (7.1, 1.7, 1.7)	1.53 m 1.85 m
5	2.90 m	3.58 br s	2.50 br dt (7.3, 6.8)		1.14 m 1.93 m

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Table 8-5-69 (continued)

H	8-5-243	8-5-244	8-5-245	8-5-246	8-5-247
6	*α* 1.51 m *β* 2.01 m	4.71 qunit(3.5)	*α* 2.02 ddd (13.9, 8.5, 6.8) *β* 1.83 m		1.02 d(7.0)
7	*α* 2.23 br dd(*ca*.8, 15) *β* 2.37 br dd(*ca*.8, 15)	2.62 br d(17.0) 2.73 dd(17.0, 6.5)	5.68 m	6.41 ddd (7.7, 6.0, 1.5)	
8				4.54 dd(12.9, 7.7) 4.25 dd(12.9, 6.0)	2.84 m
9			3.00 m	2.15 s	3.70 dd(10.0, 7.0) 4.12 dd(10.0, 4.0)
10	1.69 s	1.57 br s	5.19 s 5.30 s		
1′	4.25 d(7.7)	4.93 d(8.0)	4.30 d(7.8)	4.29 d(8.0)	4.25 d(8.0)
2′	3.16 dd(7.7, 9.2)	3.97(ov)	3.22 dd(9.3, 7.8)	3.17 dd(9.0, 7.9)	–
3′	3.34 dd(8.9, 9.2)	4.24 t(8.0)	3.31 m	3.28 dd(9.3)	3.35 t(8.0)
4′	3.26 m	4.20 t(8.0)	3.31 m	3.32 dd(8.9)	–
5′	3.27 m	3.97 o(ov)	3.59 m	3.32 ddd(9.4, 5.5, 2.3)	–
6′	3.66 dd(5.2, 12.2)	4.55 dd(12.0, 2.0)	4.43 dd(11.7, 6.6)	3.79 dd(12.0, 2.2)	4.36 dd(12.0, 6.0)
	3.86 dd(1.8, 12.2)	4.35 dd(12.0, 5.5)	4.61 dd(11.7, 2.2)	3.62 dd(12.0, 5.3)	4.50 dd(12.0, 2.0)
2″			7.83 d(8.8)	7.46 d(8.5)	6.57 d(16.0)
3″		8.20 d(8.5)	6.80 d(8.8)	6.79 d(8.5)	7.72 d(16.0)
4″		7.15 d(8.5)			
5″			6.80 d(8.8)	6.79 d(8.5)	7.55~7.62 m
6″		7.15 d(8.5)	7.83 d(8.8)	7.46 d(8.5)	7.35~7.44 m
7″		8.20 d(8.5)		7.62 d(16.1)	7.35~7.44 m
8″				6.32 d(16.1)	7.35~7.44 m
9″					7.55~7.62 m
2‴			7.90 d(8.8)		
3‴			6.81 d(8.8)		
5‴			6.81 d(8.8)		
6‴			7.90 d(8.8)		

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Table 8-5-70: ^{1}H NMR spectroscopic data of secoiridoids **8-5-248**~**8-5-252**.

H	8-5-248	8-5-249	8-5-250	8-5-251	8-5-252
1	3.66 dd(10.8, 6.0) 3.58 dd(10.8, 7.2)		10.09 s	3.64 d(12.0) 3.61 d(12.0)	3.52 dd(10.0, 4.0) 4.05 dd(10.0, 4.0)
3	4.02 s	9.50 s	9.57 s	3.88 dd(10.8, 4.2) 3.86 dd(10.8, 4.8)	3.81 dd(10.5, 4.0) 3.86 dd(10.5, 4.0)
4				2.85 ddd (6.0, 4.8, 4.2)	2.87 dt(8.0, 4.0)
5	3.06 dd(10.2, 9.6)	3.69 dd(10.2, 9.6)		2.96 dd(7.2, 6.0)	3.14 m
6	*α* 2.19 ddd (13.2, 9.6, 4.8) *β* 1.72 ddd (13.2, 4.8, 1.8)	*α* 2.30 ddd (13.2, 9.6, 4.5) *β* 1.87 dd (13.2, 8.4)	*α* 2.69 dd(14.4, 7.8) *β* 1.88 dd(14.4, 4.8)	4.99 ddd (7.2, 5.4, 1.2)	4.91 dd(7.0, 6.0)
7	3.80 dd(4.8, 4.8)	3.98 br s	5.97 dd(7.8, 4.8)	*α* 1.92 dd(14.4, 5.4) *β* 1.95 ddd (14.4, 5.4, 1.2)	*α* 2.04 dd(14.0, 6.0) *β* 1.44 ddd (14.0, 12.0, 6.0)
8				1.98 m	1.76 m
9	2.19 ddd (10.2, 7.2, 6.0)	3.22 d(10.2)			1.91 m
10	1.34 s	1.38 s	4.79 dt(13.2, 4.8) 4.52 dt(13.2, 4.8)	0.94 d(6.6)	0.96 d(6.5)
11	5.22 s, 5.03 s	6.46 s, 6.18 s	6.84 s, 6.31 s		
OMe		3.50 s(1-OMe)			
1′					4.27 d(8.0)
2′					3.19 t(8.0)
3′					3.51 dd(9.5, 8.0)
4′					3.34 t(9.5)
5′					3.52 ddd(9.5, 6.0, 2.5)
6′					4.38 dd(12.0, 6.0) 4.47 dd(12.0, 2.5)
2″					6.28 d(16.0)
3″					7.57 d(16.0)
5″					7.04 d(2.0)
8″					6.77 d(8.0)
9″					6.94 dd(8.0, 2.0)

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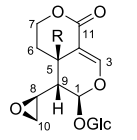
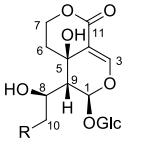
8.5.5 Secoiridoids containing lactone ring in molecular structure

Table 8-5-71: Compounds, MFs, and test solvents of secoiridoids **8-5-253**~**8-5-277**.

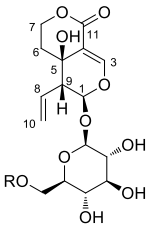
No.	Compounds	MFs	Test solvents	References
8-5-253	5-desoxyeustomoside	$C_{16}H_{22}O_{10}$	CD_3OD	[170]
8-5-254	eustomoside	$C_{16}H_{22}O_{11}$	CD_3OD	[170]
8-5-255	eustoside	$C_{16}H_{23}ClO_{11}$	CD_3OD	[170]
8-5-256	eustomorusside	$C_{16}H_{24}O_{12}$	CD_3OD	[170]
8-5-257	swertiamarine	$C_{16}H_{22}O_{10}$	CD_3OD	[171]
8-5-258	6′-*O*-*β*-D-glucosyl swertiamarine	$C_{22}H_{32}O_{15}$	CD_3OD	[171]
8-5-259	8-hydroxy-10-hydrosweroside	$C_{16}H_{24}O_{10}$	CD_3OD	[172]
8-5-260	exaltoside	$C_{26}H_{36}O_{12}$	C_5D_5N	[173]
8-5-261	7-epiexaltoside	$C_{26}H_{36}O_{12}$	CD_3OD	[173]
8-5-262	6′-(2,3-dihydroxybenzoyl)-sweroside	$C_{23}H_{26}O_{12}$	CD_3OD	[174]
8-5-263	6′-(2,3-dihydroxybenzoyl)-swertiamarin	$C_{23}H_{26}O_{13}$	CD_3OD	[174]
8-5-264	isomacrophylloside	$C_{40}H_{44}O_{22}$	CD_3OD	[172]
8-5-265	macrophylloside A	$C_{40}H_{44}O_{22}$	CD_3OD	[175]
8-5-266	macrophylloside B	$C_{40}H_{44}O_{23}$	CD_3OD	[175]
8-5-267	2′-gentisoyl gelidoside	$C_{40}H_{44}O_{23}$	CD_3OD	[176]
8-5-268	6′-gentisoyl 8-epikingiside	$C_{24}H_{28}O_{14}$	CD_3OD	[176]
8-5-269	gelidoside	$C_{35}H_{42}O_{21}$	CD_3OD	[177]
8-5-270	gentomoside	$C_{35}H_{42}O_{22}$	CD_3OD	[177]
8-5-271	2′-*O*-acetyl-4′-*O*-*trans*-feruloylswertiamarin	$C_{28}H_{32}O_{14}$	CD_3OD	[178]
8-5-272	2′-*O*-acetyl-4′-*O*-*cis*-feruloylswertiamarin	$C_{28}H_{32}O_{14}$	CD_3OD	[178]
8-5-273	2′-*O*-acetyl-4′-*O*-*trans*-*p*-coumaroylswertiamarin	$C_{27}H_{30}O_{13}$	CD_3OD	[178]
8-5-274	2′-*O*-acetyl-4′-*O*-*cis*-*p*-coumaroylswertiamarin	$C_{27}H_{30}O_{13}$	CD_3OD	[178]
8-5-275	4′-*O*-*trans*-*p*-coumaroylswertiamarin	$C_{25}H_{28}O_{12}$	CD_3OD	[178]
8-5-276	3′-*O*-caffeoylsweroside	$C_{25}H_{28}O_{12}$	CD_3OD	[179]
8-5-277	corniculoside	$C_{31}H_{38}O_{18}$	CD_3OD	[180]



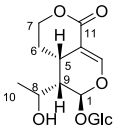
8-5-253 R = H
8-5-254 R = OH



8-5-255 R = Cl
8-5-256 R = OH



8-5-257 R = H
8-5-258 R = Glc



8-5-259

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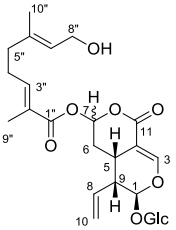
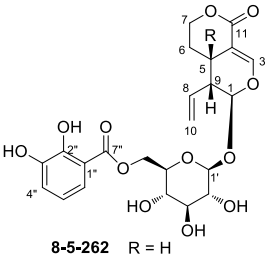
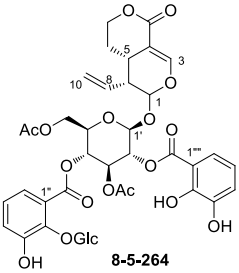


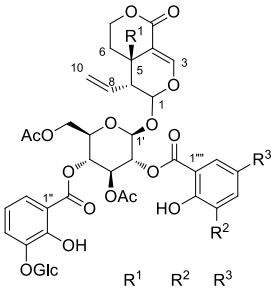
8-5-260 7β-H
8-5-261 7α-H



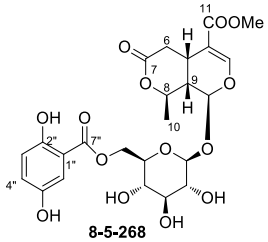
8-5-262 R = H
8-5-263 R = OH



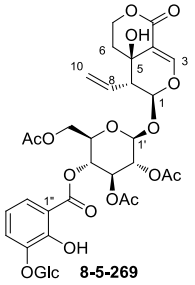
8-5-264



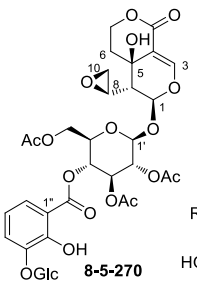
	R^1	R^2	R^3
8-5-265	H	OH	H
8-5-266	OH	OH	H
8-5-267	OH	H	OH



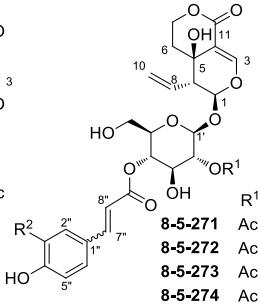
8-5-268



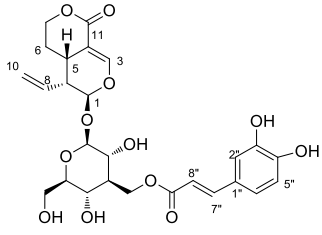
8-5-269



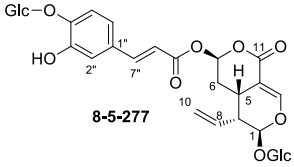
8-5-270



	R^1	R^2	H-7": 8"
8-5-271	Ac	OMe	*trans*
8-5-272	Ac	OMe	*cis*
8-5-273	Ac	H	*trans*
8-5-274	Ac	H	*cis*
8-5-275	H	H	*trans*



8-5-276



8-5-277

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Table 8-5-72: ^{1}H NMR spectroscopic data of secoiridoids **8-5-253**~**8-5-256**.

H	8-5-253	8-5-254	8-5-255	8-5-256
1	5.71 d(1.5)	5.74 d(1)	6.03 d(1.5)	6.01 br s
3	7.61 d(2.5)	7.63 s	7.59 s	7.60 s
5	3.20 m			
6	2.06 m, 1.97 m	2.27 ddd(13, 11, 5)	2.14 ddd(14, 12, 5)	2.16 br dd(13, 5)
		1.99 ddd(13, 2.5, 1.5)	2.01 ddd(14, 2.5, 1.5)	2.00 br d(13)
7	4.52 ddd(12, 11.5, 3)	4.80 ddd(12, 11, 2.5)	4.80 ddd(12, 11, 2.5)	4.80 br dd(12, 11)
	4.38 ddd(12, 4, 2.5)	4.41 ddd(12, 5, 1.5)	4.38 ddd(11, 5, 1.5)	4.37 br dd(12, 5)
8	2.71 m	2.67 m	3.83 m	3.30~3.60 m
9	1.66 ddd(9, 5, 1.5)	1.88 dd(9, 1)	2.54 dd(7.5, 1.5)	2.48 d(7)
10	2.74 dd(5, 4)	2.81 dd(5, 4)	3.50~3.65 m	3.30~3.60 m
	2.64 dd(5, 4)	2.72 dd(5, 4)		
1′	4.67 d(8)	4.63 d(8)	4.63 d(8)	4.62 d(8)
6′	3.90 dd(11.5, 2)	3.90 dd(12, 2)	3.89 dd(12, 1.5)	3.89 dd(12, 1)
	3.64 dd(11.5, 6)	3.65 dd(12, 6)	3.69 dd(12, 5)	3.60 dd(12, 5)

Table 8-5-73: ^{1}H NMR spectroscopic data of secoiridoids **8-5-257**~**8-5-259**.

H	8-5-257	8-5-258	8-5-259
1	5.75 d(1.5)	5.69 d(1)	5.92 d(1.7)
3	7.63 d(2.5)	7.63 s	7.59 d(2.7)
5			3.05 m
6	1.91 ddd(12.5, 11, 5)	1.91 ddd(13, 11, 5)	2.01 m, 1.90 m
	1.74 ddd(12.5, 3, 1.5)	1.74 ddd(13, 3, 1)	
7	4.76 ddd(13, 11, 3)	4.75 ddd(12.5, 11, 3)	4.35 m
	4.34 ddd(13, 5, 1.5)	4.34 ddd(12.5, 5, 1.0)	4.21 br dd(11.3, 11.5)
8	5.44 dt(16.5, 9)	5.44 dt(17, 9)	3.21 dq(6.5, 6.8)
9	2.93 dd(9, 1.5)	2.91 dd(9, 1.0)	1.98 m
10	5.35 dd(16.5, 3.5),	5.38 dd(17, 3),	1.30 d(6.8)
	5.29 dd(9, 3.5)	5.30 dd(9, 3)	
1′	4.64 d(8)	4.64 d(8)	4.67 d(7.8)
2′	3.20~3.40 m	3.30~3.40 m	3.45 dd(7.8, 9.0)
3′	3.20~3.40 m	3.30~3.40 m	3.41 t(9.0)
4′	3.20~3.40 m	3.30~3.40 m	3.35 t(9.0)
5′	3.20~3.40 m	3.52 m	3.12 m
6′	3.89 dd(12, 2),	4.17 dd(12, 1.5),	3.89 dd(12.1, 2.1),
	3.67 dd(12, 5.5)	3.78 dd(12, 5.5)	3.63 dd(12.1, 4.4)
1″		4.36 d(8)	
2″~5″		3.30~3.40 m	
6″		3.86 dd(12, 1.5),	
		3.65 dd(12, 5.5)	

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Table 8-5-74: ^{1}H NMR spectroscopic data of secoiridoids **8-5-260**~**8-5-263**.

H	8-5-260	8-5-261	8-5-262	8-5-263
1	5.81 d(1.7)	5.59 br s	5.43 d(1.7)	5.51 d(1.3)
3	7.93 d(2.4)	7.67 d(2.3)	7.67 d(2.4)	7.60 s
5	3.09 m	3.35~3.48 m(ov)	3.08 m	
6	*α* 1.70 td(10.3, 13.2, 13.3)①	1.88~1.98 m	*α* 1.62 dddd	*α* 1.86 ddd
	β 1.89 dddd(13, 4.3, 3)②		(13.4, 13.2, 13.0, 4.2)	(13.4, 13.7, 5.1)
			β 1.70 m	*β* 1.69 br d(13.7)
7	6.48 dd(2.9, 10.3)	6.63 t(1.9)	*α* 4.41 m	*α* 4.30 ddd
			β 4.32 ddd	(10.9, 5.1, 1.4)
			(13.4, 13.2, 4.2)	*β* 4.71 ddd
				(13.4, 10.9, 2.7)
8	5.37 dt(10.1, 17)	5.56 dt(9.6, 17.5)	5.47 ddd	5.36 ddd
			(10.2, 9.7, 17.1)	(10.0, 9.6, 17.0)
9	2.68 dddd(1.4, 5.6, 9.7)	2.76 m	2.64 m	2.84 dd(9.6, 1.3)
10	4.99, 5.08 dd(1.7, 10.3, 17)	5.29~5.38 dd	5.20 dd(1.6, 17.1)	5.25 dd(2.0, 17.0)
		(1.9, 9.9, 17)	5.18 dd(1.6, 10.2)	5.18 dd(2.0, 10.2)
1′	5.32 d(7.8)	4.72 d(7.7)	4.71 d(7.9)	4.66 d(7.9)
2′	4.11 t(8.1, 8.5)	–	3.21 dd(7.9, 9.0)	3.21 dd(7.9, 9.0)
3′	4.33 t(8.8, 8.9)	–	3.42 dd(9.0, 9.0)	3.43 dd(9.0, 9.0)
4′	4.27 t(8.8, 8.7)	–	3.40 dd(9.0, 9.0)	3.40 dd(9.0, 9.0)
5′	4.01 m	–	3.63 m	3.66 m
6′	4.55 dd(12, 2.1)	3.89 dd(11.8, 1.8)	4.68 dd(12.0, 2.2)	4.69 dd(11.9, 2.3)
	4.41 dd(12, 5.3)	3.67 dd(11.7, 5.5)	4.51 dd(12.0, 5.7)	4.52 dd(11.9, 6.0)
3″	7.00 td(1.4, 7.3)	6.86 td(1.5, 7.4)		
4″	2.25 q-like(7.4)	2.38 q-like(7.3)	6.99 dd(8.0, 1.7)	6.99 dd(8.0, 2.0)
5″	2.06 t(7.2)	2.18 t(7.3)	6.72 dd(8.0, 8.0)	6.72 dd(8.0, 8.0)
6″			7.33 dd(8.0, 1.7)	7.33 dd(8.0, 1.7)
7″	5.73 tq(1.2, 6.5)	5.40 br t(ov)		
8″	4.42 d(6.1)	4.08 d(6.6)		
9″	1.85 d(1.1)	1.85 br s		
10″	1.62 d(0.3)	1.69 br s		

① Typographic error exists in the literature, giving one less coupling constant.

Table 8-5-75: ^{1}H NMR spectroscopic data of secoiridoids **8-5-264**~**8-5-266**.

H	8-5-264	8-5-265	8-5-266
1	5.36 d(1.0)	5.40 br s	5.60 br s
3	7.24 d(1.9)	7.27 d(1.7)	7.14 d(1.7)
5	2.66 m	2.68 m	
6	1.65 m	1.53 m, 1.67 br m	1.78 m
	1.52 dddd(12.9, 12.0, 11.8, 3.4)		1.73 br d(12.5)
7	4.27 m	4.27 m	4.70 br t(11.0)
	4.00 ddd(11.8, 12, 1.7)	4.02 br t(11.1)	4.26 m
8	5.42 ddd(17.2, 10.1, 9.3)	5.42 m	5.40 m

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Table 8-5-75 (continued)

H	8-5-264	8-5-265	8-5-266
9	2.66 m	2.68 m	2.97 m
10	5.23 dd(10.1, 2.0)	5.26 dd(10.0, 1.9)	5.28 dd(10.2, 1.9)
	5.29 dd(17.2, 2.1)	5.31 dd(17.1, 1.9)	5.32 dd(17.0, 1.9)
1′	5.40 m	5.37 d(8.1)	5.33 d(8.1)
2′	5.40 m	5.38 dd(8.1, 9.5)	5.38 dd(8.1, 9.5)
3′	5.76 t(9.5)	5.80 t(9.5)	5.82 t(9.5)
4′	5.38 t(9.5)	5.48 t(9.5)	5.49 t(9.5)
5′	4.23 m	4.27 m	4.24 m
6′	4.34 dd(12.5, 1.7)	4.36 dd(12.6, 4.7)	4.37 dd(12.6, 4.6)
	4.25 dd(12.5, 4.4)	4.29 dd(12.6, 2.3)	4.29 dd(12.6, 1.8)
4″	7.15 dd(7.2, 2.2)	7.46 dd(8.1, 1.4)	7.45 dd(8.1, 1.5)
5″	7.07 dd(7.2, 8.2)	6.88 t(8.1)	6.88 t(8.1)
6″	7.11 dd(8.2, 2.2)	7.52 dd(8.1, 1.4)	7.51 dd(8.1, 1.5)
1‴	4.86 d(7.7)	4.93 d(7.4)	4.90 d(7.4)
2‴	3.49 dd(7.7, 9.3)	3.56 m	3.54 m
3‴	3.43 dd(9.3, 9.0)	3.52 m	3.49 m
4‴	3.40 t(9.0)	3.44 t(9.0)	3.43 t(9.0)
5‴	3.30 m	3.45 m	3.44 m
6‴	3.84 dd(12.1, 2.3)	4.06 br d(10.9)	3.91 br d(11.1)
	3.71 dd(12.1, 5.3)	3.72 dd(10.9, 4.4)	3.70 dd(11.1, 4.6)
4⁗	7.00 dd(8.0, 1.5)	7.03 dd(8.0, 1.4)	7.05 dd(8.1, 1.5)
5⁗	6.70 t(8.0)	6.72 t(8.0)	6.72 t(8.1)
6⁗	7.21 dd(8.0, 1.5)	7.22 dd(8.0, 1.4)	7.26 dd(8.1, 1.5)
OAc	2.07 s, 1.93 s	2.09 s, 1.88 s	2.02 s, 1.86 s

Table 8-5-76: ^{1}H NMR spectroscopic data of secoiridoids **8-5-267**~**8-5-270**.

H	8-5-267	8-5-268	8-5-269	8-5-270
1	5.56 d(1.2)	5.28 d(7.4)	5.57 d(1.6)	5.79 d(1.5)
3	7.08 s	7.52 d(1.4)	7.56 s	7.56 s
5		2.99 m		
6	*α* 1.78 ddd(13.0, 12.5, 5.1)	*α* 2.18 dd(16.5, 11.4)	1.77 ddd(14.1, 1.3, 2.9)	2.02 (ov)
	β 1.71 br d(13.0)	*β* 2.77 dd(16.5, 4.2)	1.86 ddd(14.1, 13.5, 5.4)	2.22 ddd(14.3, 5.3, 8.9)
7	*α* 4.26 m		4.75 ddd(12.5, 13.5, 2.9)	4.80 (ov)
	β 4.68 ddd(12.5, 11.6, 3.2)		4.33 ddd(12.5, 5.4, 1.3)	4.41 ddd(12.2, 5.3, 1.4)
8	5.38 ddd(17.0, 10.2, 8.5)	4.27 dq(7.1, 6.3)	5.42 ddd(17, 6.1, 9.1)	2.67 ddd(8.9, 2.5, 4.2)
9	2.93 dd(8.5, 1.2)	2.06 ddd(7.4, 7.3, 7.1)	2.95 dd(9.1, 1.6)	1.94 dd(8.9, 1.5)

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Table 8-5-76 (continued)

H	8-5-267	8-5-268	8-5-269	8-5-270
10	5.32 dd(10.2, 1.9) 5.27 dd(17.0, 1.9)	1.36 d(6.3)	5.30 dd(17, 2.5) 5.29 dd(6.1, 2.5)	2.81 dd(4.8, 4.2) 2.73 dd(4.8, 2.5)
OMe		3.71 s		
1′	5.25 d(8.0)	4.76 d(7.8)	5.13 d(8.1)	5.14 d(8.1)
2′	5.29 dd(9.3, 8.0)	3.22 dd(9.0, 7.8)	5.02 dd(9.7, 8.1)	5.01 dd(9.6, 8.1)
3′	5.79 dd(9.3, 9.3)	3.42 dd(9.0, 9.0)	5.56 t(9.7)	5.57 t(9.6)
4′	5.45 dd(9.3, 9.3)	3.40 dd(9.0, 9.0)	5.37 t(9.6)	5.37 t(9.7)
5′	4.19 m	3.62 m	4.16 m	4.16 m
6′	4.22 dd(12.3, 1.8)	4.73 dd(11.9, 2.4)	4.24 dd(12.4, 3)	4.25 dd(12.4, 3.1)
	4.31 dd(12.3, 4.7)	4.60 dd(11.9, 5.9)	4.31 dd(12.4, 4.3)	4.32 dd(12.4, 4.2)
3″		6.78 d(8.6)		
4″	7.48 dd(8.1, 1.4)	6.98 dd(8.6, 2.8)	7.44 dd(8.1, 1.5)	7.43 dd(8.1, 1.5)
5″	6.86 d(8.1)		6.86 t(8.1)	6.85 t(8.1)
6″	7.46 dd(8.1, 1.4)	7.24 d(2.8)	7.47 dd(8.1, 1.5)	7.47 dd(8.1, 1.5)
1‴	4.84 d(7.5)		4.87 d(7.6)	4.87 d(7.6)
2‴	3.37 dd(7.5, 9.0)		3.51 dd(7.6, 9.2)	3.51 dd(7.6, 9.2)
3‴	3.49 dd(9.0, 9.0)		3.46 t(9.2)	3.46 t(9.2)
4‴	3.43 dd(9.0, 9.0)		3.39 t(9.6)	3.39 t(9.7)
5‴	3.38 m		3.40 m	3.40 m
6‴	3.85 dd(12.1, 1.5)		3.87 dd(12, 2)	3.87 dd(12, 2)
	3.67 dd(12.1, 4.9)		3.69 dd(12, 5.2)	3.69 dd(12, 5.1)
3⁗	6.76 d(9.0)			
4⁗	6.99 dd(9.0, 3.0)			
6⁗	7.11 d(3.0)			
OAc	2.00 s, 1.86 s		2.02 s, 2.00 s, 1.91 s	2.03 s, 2.00 s, 1.91 s

Table 8-5-77: ^{1}H NMR spectroscopic data of secoiridoids **8-5-271**~**8-5-273**.

H	8-5-271	8-5-272	8-5-273
1	5.66 d(1.5)	5.65 d(1.5)	5.68 d(1.5)
3	7.55 s	7.54 s	7.56 s
6	1.75 ddd(14.2, 2.9, 1.4)	1.75 ddd(14.2, 3.4, 2.0)	1.76 ddd(14.2, 2.8, 1.4)
	1.85 ddd(14.2, 12.7, 5.3)	1.85 ddd(14.2, 12.7, 4.9)	1.86 ddd(14.2, 12.7, 5.2)
7	4.33 ddd(10.7, 5.3, 1.4)	ax 4.74 ddd(12.7, 11.2, 3.4)	4.34 ddd(11.0, 5.2, 1.4)
	4.74 ddd(12.7, 10.7, 2.9)	eq 4.33 ddd(11.2, 4.9, 2.0)	4.75 ddd(12.7, 11.0, 2.8)
8	5.41 ddd(16.1, 9.0, 7.8)	5.41 ddd(16.6, 8.3, 8.3)	5.42 ddd(16.0, 8.2, 7.6)
9	2.92 ddd(7.8, 2.0, 1.5)	2.93 ddd(8.3, 2.0, 1.5)	2.93 ddd(7.6, 1.5, 1.5)
10	5.35 dd(16.1, 6.3)	5.41 dd(16.6, 5.4)	5.37 dd(16.0, 4.0)
	5.29 ddd(9.0, 6.3, 2.0)	5.29 ddd(8.3, 5.4, 2.0)	5.30 ddd(8.2, 4.0, 1.5)

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Table 8-5-77 (continued)

H	8-5-271	8-5-272	8-5-273
1′	4.90 d(8.3)	4.89 d(8.3)	4.92 d(8.6)
2′	4.80 dd(9.8, 8.3)	4.79 dd(9.3, 8.3)	4.81 dd(9.5, 8.6)
3′	3.91 dd(9.8, 9.8)	3.86 dd(9.3, 9.3)	3.92 dd(9.5, 9.5)
4′	4.92 dd(9.8, 9.8)	4.91 dd(9.3, 9.3)	4.93 dd(9.5, 9.5)
5′	3.67 ddd(9.8, 6.8, 2.0)	3.63 ddd(9.3, 5.4, 2.0)	3.67 ddd(9.5, 6.6, 2.0)
6′	3.58 dd(12.2, 6.8)	3.66 dd(10.7, 2.0)	3.59 dd(12.5, 6.6)
	3.66 br d(12.2)	3.58 dd(10.7, 5.4)	3.67 dd(12.5, 2.0)
2″	7.19 d(2.0)	7.78 d(2.0)	7.48 d(8.5)
3″			6.81 d(8.5)
5″	6.81 d(8.3)	6.76 d(8.3)	6.81 d(8.5)
6″	7.08 dd(8.3, 2.0)	7.14 dd(8.3, 2.0)	7.48 d(8.5)
7″	7.67 d(16.1)	6.91 d(12.7)	7.68 d(16.0)
8″	6.39 d(16.1)	5.80 d(12.7)	6.37 d(16.0)
OMe	3.88 s	3.86 s	
OAc	2.06 s	2.06 s	2.07 s

Table 8-5-78: ^{1}H NMR spectroscopic data of secoiridoids **8-5-274**~**8-5-277**.

H	8-5-274	8-5-275	8-5-276	8-5-277
1	5.65 d(1.5)	5.75 d(1.5)	5.56 d(1.7)	5.61 d(1.7)
3	7.54 s	7.64 s	7.55 d(2.3)	7.68 d(2.6)
5			3.03~3.10 m	–
6	1.75 ddd(14.2, 2.8, 1.4)	1.76 ddd(14.0, 2.2, 1.2)	1.63~1.70 m	2.05 ddd(2.6, 5.8, 13.8)
	1.85 ddd(14.2, 12.7, 5.2)	1.93 ddd(14.0, 13.1, 5.1)		1.92 dt(2.2, 13.8, 13.8)
7	eq 4.32 ddd(11.2, 5.2, 1.4)	eq 4.35 ddd(10.6, 5.1, 1.2)	4.25~4.42 m	6.71 t(2.2)
	ax 4.74 ddd(12.7, 11.2, 2.8)	ax 4.77 ddd(13.1, 10.6, 2.2)		
8	5.40 ddd(16.0, 9.0, 8.4)	5.46 ddd(16.9, 9.5, 9.3)	5.48 m	5.51 (ov)
9	2.92 ddd(8.4, 1.5, 1.5)	2.95 dd(9.3, 1.5)	2.63~2.68 m	2.75 ddd(1.7, 5.8, 9.1)
10	5.35 dd(16.0, 4.0)	5.38 dd(16.9, 2.4)	5.23 dd(9.9, 2.0)	5.29 (ov)
	5.28 ddd(9.0, 4.0, 1.5)	5.30 dd(9.5, 2.4)	5.26 dd(17.5, 2.0)	5.34 dd(2.3, 8.6)
1′	4.88 d(8.3)	4.73 d(8.1)	4.76 d(7.3)	4.57 d(7.4)
2′	4.79 dd(9.3, 8.3)	3.31 dd(9.3, 8.1)	3.38~3.42 m	–
3′	3.85 dd(9.3, 9.3)	3.67 dd(9.3, 9.3)	5.01 t(8.9)	–
4′	4.90 dd(9.3, 9.3)	4.86 dd(9.3, 9.3)	3.49 t(8.9)	–

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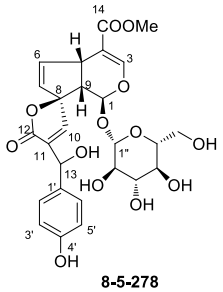
Table 8-5-78 (continued)

H	8-5-274	8-5-275	8-5-276	8-5-277
5′	3.60 ddd(9.3, 5.9, 2.0)	3.60 m	3.38~3.42 m	–
6′	3.65 br d(10.7)	3.65 dd(12.0, 2.0)	3.65 m	–
	3.56 dd(10.7, 5.9)	3.56 dd(12.0, 5.6)	3.86 dd(11.9, 2.0)	
2″	7.68 d(8.8)	7.47 d(8.5)	7.00 d(2.0)	7.16 d(1.8)
3″	6.74 d(8.8)	6.81 d(8.5)		
5″	6.74 d(8.8)	6.81 d(8.5)	6.73 d(8.2)	7.21(8.4)
6″	7.68 d(8.8)	7.47 d(8.5)	6.90 dd(8.2, 2.0)	7.09 d(1.8, 8.4)
7″	6.92 d(12.7)	7.67 d(15.9)	7.54 d(15.9)	7.67 d(16)
8″	5.80 d(12.7)	6.37 d(15.9)	6.28 d(15.9)	6.43 d(16)
1‴				4.81 d(7.0)
OAc	2.06 s			

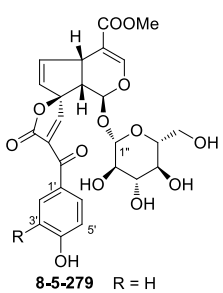
8.5.6 Iridoids containing extra carbons in molecular skeleton

Table 8-5-79: Compounds, MFs, and test solvents of iridoids containing extra carbons in molecular skeleton **8-5-278**~**8-5-282**.

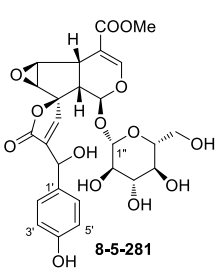
No.	Compounds	MFs	Test solvents	References
8-5-278	gaertneroside	$C_{26}H_{28}O_{13}$	CD_3OD	[181]
8-5-279	dehydrogaertneroside	$C_{26}H_{26}O_{13}$	CD_3OD	[181]
8-5-280	dehydromethoxygaertneroside	$C_{27}H_{28}O_{14}$	CD_3OD	[181]
8-5-281	epoxygaertneroside	$C_{26}H_{28}O_{14}$	CD_3OD	[181]
8-5-282	citrifolinoside A	$C_{26}H_{28}O_{14}$	CD_3OD	[182]



8-5-278



8-5-279 R = H
8-5-280 R = OMe



8-5-281

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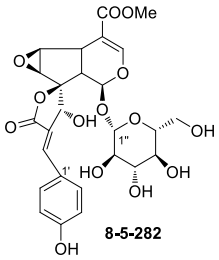

8-5-282

Table 8-5-80: ^{1}H NMR spectroscopic data of iridoids containing extra carbons in molecular skeleton **8-5-278**~**8-5-282**.

H	8-5-278	8-5-279	8-5-280	8-5-281	8-5-282
1	5.14 d(4.9)	5.40 d(5.5)	5.48 d(4.9)	5.05 br s	5.35 br s
3	7.51 d(1.6)	7.50 br s	7.50 br s	7.60 br s	7.43 d(2.0)
5	3.90 m	3.98 m	3.98 m	3.45 br d(8.3)	3.39 dd(2.0, 8.8)
6	6.46 dd(5.6, 2.5)	6.54 dd(5.6, 2.5)	6.54 dd(5.6, 2.5)	3.42 br d(2.5)	4.04 d(2.5)
7	5.56 dd(5.6, 2.2)	5.69 dd(5.6, 2.1)	5.67 dd(5.6, 2.1)	4.05 br d(2.5)	3.83 d(2.5)
9	2.90 dd(7.6, 4.9)	3.05 m	3.05 m	2.74 br d(8.3)	2.44 d(8.8)
10	7.45 d(1.3)	7.85 br s	7.85 br s	7.15 d(1.4)	5.12 s
13	5.36 d(1.3)			5.37 d(1.4)	7.58 s
2′	6.78 d(8.6)	6.88 d(8.8)	7.50 m	6.76 d(8.5)	7.62 d(8.4)
3′	7.28 d(8.6)	7.83 d(8.8)		7.23 d(8.5)	6.84 d(8.4)
5′	7.28 d(8.6)	7.83 d(8.8)	6.88 d(8.4)	7.23 d(8.5)	6.84 d(8.4)
6′	6.78 d(8.6)	6.88 d(8.8)	7.50 m	6.76 d(8.5)	7.62 d(8.4)
1″	4.67 d(7.9)	4.68 d(7.9)	4.65 d(7.9)	4.51 d(7.9)	4.41 d(8.0)
2″	3.21 m	3.15 m	3.15 m	3.11 dd(7.9, 8.0)	3.09 m
3″	3.38 m	3.32 m	3.32 m	3.30 m	3.26 m
4″	3.38 m	3.30 m	3.30 m	3.35 m	3.26 m
5″	3.25 m	3.25 m	3.25 m	3.21 m	3.21 m
6″	3.79 dd(12.2, 2.2)	3.79 dd(12.2, 2.2)	3.79 dd(12.2, 2.2)	3.70 m(2H)	3.80 m
	3.68 dd(12.2, 4.9)	3.68 dd(12.2, 4.9)	3.68 dd(12.2, 4.9)		3.62 m
OMe	3.75 s(14-OMe)	3.74 s(14-OMe)	3.74 s(14-OMe) 3.92 s(3′-OMe)	3.78 s(14-OMe)	3.73 s(14-OMe)

8.5.7 Noriridois

Table 8-5-81: Compounds, MFs, and test solvents of noriridois **8-5-283**~**8-5-305**.

No.	Compounds	MFs	Test solvents	References
8-5-283	scholarein A	$C_9H_{16}O_2$	$CDCl_3$-CD_3OD	[183]

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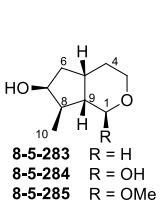
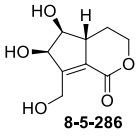
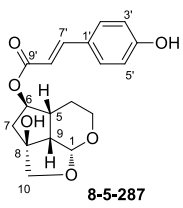
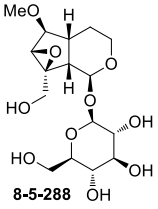
Table 8-5-81 (continued)

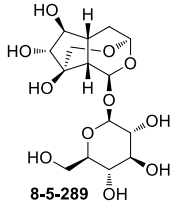
No.	Compounds	MFs	Test solvents	References
8-5-284	scholarein C	$C_9H_{16}O_3$	CD_3COCD_3	[183]
8-5-285	scholarein D	$C_{10}H_{18}O_3$	$CDCl_3$	[183]
8-5-286	7-hydroxy viteoid II	$C_9H_{12}O_5$	CD_3OD	[165]
8-5-287	6-*O*-*trans*-*p*-coumaroyl-7-deoxyrehmaglutin A	$C_{18}H_{20}O_6$	CD_3OD	[184]
8-5-288	3,4-dihydro-methylcatalpol	$C_{16}H_{26}O_{10}$	CD_3OD	[185]
8-5-289	scutelloside	$C_{15}H_{24}O_{11}$	CD_3OD	[105]
8-5-290	Ovatolactone 7-*O*-(6′-*O*-*p*-hydroxybenzoyl)-*β*-D-glucopyranoside	$C_{22}H_{28}O_{10}$	CD_3OD	[167]
8-5-291	8-*epi*-grandifloric acid	$C_{15}H_{22}O_9$	CD_3OD	[186]
8-5-292	8-cinnamoylmyoporoside	$C_{24}H_{30}O_{10}$	CD_3OD	[168]
8-5-293	6-*O*-(3,4,5-trimethoxybenzoyl)-ajugol	$C_{25}H_{34}O_{13}$	CD_3OD	[187]
8-5-294	6′-*O*-*E*-*p*-methoxycinnamoylharpagide	$C_{25}H_{32}O_{12}$	CD_3OD	[188]
8-5-295	8-*O*-*E*-*p*-methoxycinnamoylharpagide	$C_{25}H_{32}O_{12}$	CD_3OD	[188]
8-5-296	10-*O*-(4-methoxybenzoyl)-impetiginoside A	$C_{23}H_{28}O_{12}$	CD_3OD	[166]
8-5-297	6-*O*-(4-methoxybenzoyl)-5,7-bisdeoxycynanchoside	$C_{23}H_{30}O_{12}$	CD_3OD	[166]
8-5-298	kankanoside B	$C_{15}H_{24}O_{10}$	CD_3OD	[128]
8-5-299	3′-*O*-*β*-glucopyranosyl-stilbericoside	$C_{20}H_{30}O_{15}$	CD_3OD	[186]
8-5-300	urphoside A	$C_{23}H_{30}O_{14}$	CD_3OD	[189]
8-5-301	longifolioside A	$C_{22}H_{27}ClO_{13}$	CD_3OD	[190]
8-5-302	3′-*O*-*β*-D-glucopyranosyl-catalpol	$C_{21}H_{32}O_{15}$	CD_3OD	[191]
8-5-303	6′-*O*-*p*-hydroxybenzoylcatalposide	$C_{29}H_{30}O_{14}$	CD_3OD	[167]
8-5-304	10-*O*-*trans*-coumaroyl-eranthemoside	$C_{24}H_{28}O_{11}$	CD_3OD	[192]
8-5-305	scrolepidoside	$C_{32}H_{42}O_{16}$	CD_3OD	[185]

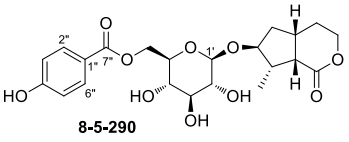


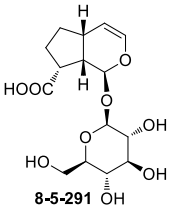


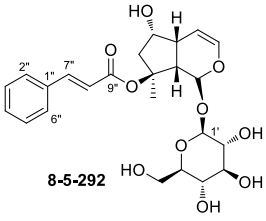












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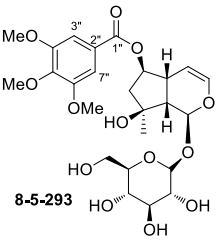
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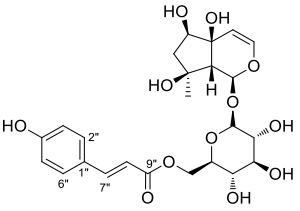
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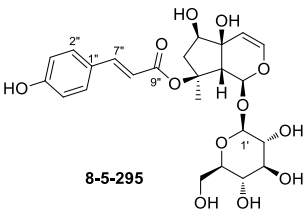
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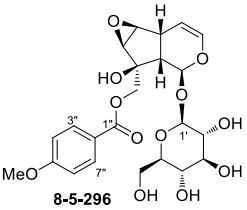
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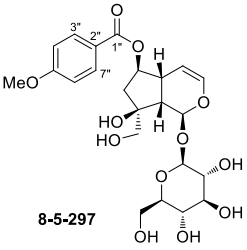
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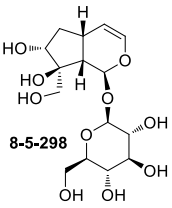
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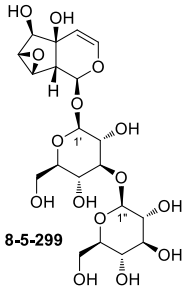
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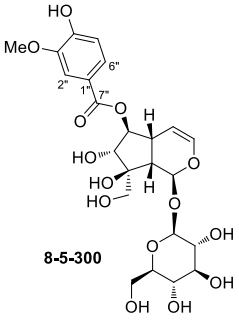
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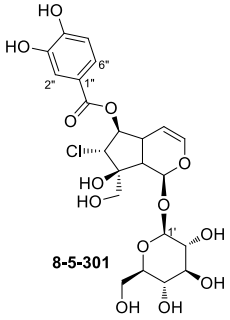
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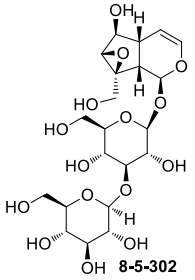
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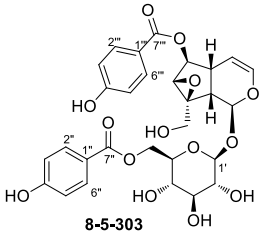
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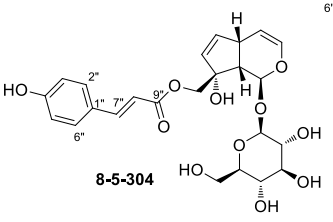
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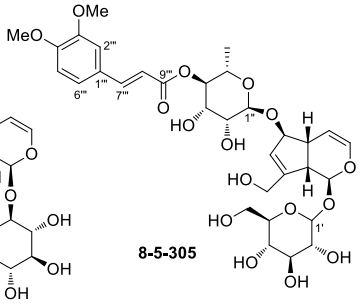
8-5-305

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Table 8-5-82: ^{1}H NMR spectroscopic data of noriridois **8-5-283**~**8-5-287**.

H	8-5-283	8-5-284	8-5-285	8-5-286	8-5-287
1	3.39~3.42 m	4.89 d(4.0)	4.54 br s		5.28 d(5.4)
3	3.43~3.46 m	3.84~3.87 m	3.70~3.73 m	4.37 dd(6.1, 3.4)	*α* 3.95 m
	3.30~3.33 m	3.36~3.39 m	3.49~3.52 m	4.44 dd(4.6, 2.9)	*β* 3.54 ddd(11.7, 5.1, 2.0)
4	1.66~1.69 m	1.40~1.44 m	1.47~1.50 m	2.28 m	*α* 1.54 br dd(14.1, 2.5)
	1.12~1.15 m	1.28~1.31 m	1.34~1.36 m	1.64 m	*β* 1.81 m
5	2.16~2.19 m	2.34~2.37 m	2.38~2.41 m	2.97 m	2.53 m
6	1.58~1.61 m	1.72~1.75 m	1.83~1.86 m	3.72 dd(7.1, 5.9)	5.23 ddd (10.3, 10.3, 6.1)
	1.32~1.35 m	1.67~1.70 m	1.73~1.76 m		
7	3.86~3.88 m	4.13~4.17 m	4.23~4.26 m	4.55 d(5.9)	*α* 2.46 dd(12.0, 6.1)
					β 2.01 ddd(12.0, 10.3, 2.0)
8	1.45~1.47 m	1.91~1.93 m	2.04~2.08 m		
9	1.69~1.72 m	1.60~1.64 m	1.71~1.74 m		2.30 dd(10.2, 5.4)
10	0.83 d(7.0)	0.98 d(6.9)	1.04 d(7.0)	4.41 d(15.9)	*α* 3.95 d(9.8)
				4.99 d(15.9)	*β* 3.63 dd(9.8, 2.0)
OH		4.92 s(1-OH)			
		3.43 d(5.0)(7-OH)			
OMe			3.37 s(1-OMe)		
2′, 6′					7.46 d(8.5)
3′, 5′					6.80 d(8.5)
7′					7.62 d(16.1)
8′					6.32 d(16.1)

Table 8-5-83: ^{1}H NMR spectroscopic data of noriridois **8-5-288**~**8-5-292**.

H	8-5-288	8-5-289	8-5-290	8-5-291	8-5-292
1	4.77 d(9.2)	5.63 d(1.6)		5.26 d(3.7)	5.87 d(1.9)
3	3.53 ddd(2.5, 12.8, 15.0)	5.27 d(2.7)	*α* 4.29 ddd(11.2, 4.9, 3.4)	6.21 dd(6.1, 2.0)	6.34 dd(6.4, 2.0)
	3.89 (ov)		*β* 4.18 ddd (11.2, 10.0, 2.4)		
4	1.56 br d(14.3)	2.44 dd(13.4, 7.8)	*α* 1.36 dddd (13.4,	4.72 dd(6.1, 2.0)	4.96 m
	1.77 m	1.67 dd(13.4, 2.7)	10.0, 10.0, 3.4) *β* 1.87 dddd (13.4, 5.8, 4.9, 2.4)		
5	2.10 q(7.7)	2.30 ddd (9.5, 7.8, 2.6)	2.56 m	2.78 m	2.89 m

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Table 8-5-83 (continued)

H	8-5-288	8-5-289	8-5-290	8-5-291	8-5-292
6	3.86 (ov)	4.03 dd(7.4, 2.6)	*α* 1.69 ddd (14.1, 8.3, 4.4) *β* 2.21 ddd (14.1, 8.5, 1.5)	1.96 m 1.49 m	4.42 dt(6.2)
7	3.68 s	4.04 dd(7.4, 0.9)	3.92 br dd(4.4, 2.2)	2.05 m 1.84 m	2.32 dd(13.2, 6.4, 1.0) 1.86 dd(13.2, 11.7)
8			2.63 m	2.80 m	
9	2.26 dd(7.7, 9.2)	2.53 dd(9.5, 1.6)	3.32 m	2.47 m	2.64 d(8.1)
10	4.05 d(13.1) 3.79 d(13.1)	3.98 d(12.4) 3.60 d(12.4)	0.88 d(7.3)		1.61 s
OMe	3.49 s(6-OMe)				
1′	4.69 d(7.9)	4.68 d(7.8)	4.35 d(7.8)	4.65 d(7.8)	4.66 d(7.9)
2′	3.22 (ov)	3.18 dd(8.6, 7.8)	3.16 dd(8.7, 7.8)	3.21 dd(8.0, 7.8)	3.18 dd(9.0, 7.9)
3′	3.37 (ov)	3.19~3.40 m	3.36 m	3.44~3.30 m	3.37 t(9.0)
4′	3.26 (ov)	–	3.36 m	3.39 dd(9.3, 8.8)	3.26 dd(9.6, 9.0)
5′	3.27 (ov)	–	3.60 m	3.44~3.30 m	3.31 m
6′	3.63 dd(6.2, 11.7) 3.90 dd(1.8, 11.7)	3.87 d(12.4) 3.66 d(12.4)	4.45 dd(11.7, 6.8) 4.56 dd(11.7, 2.3)	3.87 dd(12.0, 2.0) 3.68 dd(12.0, 4.9)	3.90 dd(12.1, 2.4) 3.68 dd(12.1, 6.3)
2″,6″			7.90 d(8.8)		7.58 m
3″,5″			6.83 d(8.8)		7.39 m
4″					7.39 m
7″					6.47 d(16.0)
8″					7.62 d(16.0)

Table 8-5-84: ^{1}H NMR spectroscopic data of noriridois **8-5-293**~**8-5-297**.

H	8-5-293	8-5-294	8-5-295	8-5-296	8-5-297
1	5.51 d(2.5)	5.68 br s	6.14 br s	5.75 br s	5.57 d(2.0)
3	6.24 dd(6.5, 2.5)	6.34 d(6.4)	6.37 d(6.4)	6.26 dd(6.5, 2.5)	6.28 dd(6.0, 2.0)
4	5.00 dd(6.5, 2.5)	4.97 dd(6.8, 1.4)	4.88 dd(6.3, 1.4)	4.86 ddd(6.5, 2.0, 0.5)	5.00 dd(6.0, 3.0)
5	3.02 m			3.12 dt(8.5, 2.0)	3.09 m
6	5.06 m	3.70 m	3.70 m	3.48 d(2.0)	5.08 m
7	2.29 dd(14.5, 6.0)	*α* 1.81 dd(15.1, 4.4)	*α* 2.02 dd(15.1, 4.4)	3.58 d(2.0)	2.40 dd(15.0, 6.5)
	2.07 dd(14.5, 3.5)	*β* 1.90 d(15.1)	*β* 2.20 d(15.1)		1.94 dd(15.0, 2.5)

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Table 8-5-84 (continued)

H	8-5-293	8-5-294	8-5-295	8-5-296	8-5-297
9	2.63 dd(9.5, 2.5)	2.56 s	2.89 s	2.29 br d(8.5)	2.65 dd(8.5, 4.5)
10	1.42 s	1.17 s	1.47 s	4.55 d(10.0) 4.36 d(10.0)	3.63 d(11.5) 3.75 d(11.5)
1′	4.68 d(8.0)	4.62 d(7.8)	4.59 d(7.8)	4.59 d(8.0)	4.68 d(8.0)
2′	3.20 t(8.0)	3.2~3.4 m	3.23 t(8.0)	3.18 t(8.0)	3.20 t(8.0)
3′	3.38 t(8.0)	3.2~3.4 m	–	3.35 t(8.0)	3.37 t(8.0)
4′	3.27 t(8.0)	3.2~3.4 m	3.30 t(8.3)	3.29 (ov)	3.27 t(8.0)
5′	3.32 m	3.2~3.4 m	3.39 dd(5.8, 2.1)	3.29 (ov)	3.31 (ov)
6′	3.67 dd(12.0, 5.5)	4.47 dd(11.2, 5.9)	3.76 dd(11.0, 5.8)	3.88 dd(11.5, 2.0)	3.89 dd(12.0, 2.0)
	3.90 (ov)	4.50 dd(11.2, 1.9)	4.00 dd(11.0, 2.1)	3.67 dd(11.5, 5.5)	3.66 dd(12.0, 6.0)
2″		7.58 d(8.8)	7.48 d(8.8)		
3″	7.36 s	6.98 d(8.8)	6.89 d(8.8)	8.04 d(9.0)	8.01 d(9.0)
4″				7.01 d(9.0)	6.98 d(9.0)
5″		6.98 d(8.8)	6.89 d(8.8)		
6″		7.58 d(8.8)	7.48 d(8.8)	7.01 d(9.0)	6.98 d(9.0)
7″	7.36 s	7.70 d(16.0)	7.55 d(16.0)	8.04 d(9.0)	8.01 d(9.0)
8″		6.44 d(16.0)	6.30 d(16.0)		
OMe	3.89 s(4″, 6″-OMe) 3.83 s(5″-OMe)	3.82 s(4″-OMe)	3.71 s(4″-OMe)	3.87 s(5″-OMe)	3.86 s(5″-OMe)

Table 8-5-85: ^{1}H NMR spectroscopic data of noriridois **8-5-298**~**8-5-302**.

H	8-5-298	8-5-299	8-5-300	8-5-301	8-5-302
1	5.49 d(6.4)	5.21 d(8.7)	5.55 d(4.3)	5.69 d(3.5)	5.02 d(9.8)
3	6.22 dd(1.8, 6.1) 4.95 dd(4.0, 6.1)	6.37 d(6.1)	6.27 dd(6.3, 2.1)	6.30 dd(6.2, 1.8)	6.34 d(5.4)
4	–	4.92 d(6.1)	5.27 dd(6.3, 3.5)	5.25 dd(6.2, 3.3)	5.07 dd(5.4, 4.6)
5	2.83 m		2.81 dddd (10.1, 4.9, 3.5, 2.1)	2.88 m	2.27 m
6	*α* 1.40 ddd (5.2, 7.3, 13.5) *β* 2.52 ddd (7.0, 9.2, 13.5)	4.06 d(1.5)	4.85 dd(5.8, 4.9)	5.05 dd(5.0, 7.4)	3.92 br d(8.0)
7	*β* 4.02 dd(5.2, 7.0)	3.53 m	4.20 d(5.8)	4.35 d(7.4)	3.45 br s
8		3.62 d(2.7)			
9	2.21 dd(6.4, 8.6)	2.45 d(8.7)	2.52 dd(10.1, 4.3)	2.62 dd(10.5, 3.5)	2.53 dd(9.8, 8.3)
10	3.85 d(11.9) 3.99 d(11.9)	–	4.04 d(11.9) 4.85 d(11.9)	4.00 d(11.8) 3.82 d(11.8)	4.11 d(13.1) 3.80 d(13.1)

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Table 8-5-85 (continued)

H	8-5-298	8-5-299	8-5-300	8-5-301	8-5-302
1′	4.72 d(7.9)	4.71 d(8.0)	4.66 d(7.9)	4.65 d(7.9)	4.77 d(7.8)
2′	3.20 dd(7.9, 9.2)	3.47~3.25 m	3.19 t(7.9)	3.19 dd(9.2, 7.9)	–
3′	3.38 dd(8.9, 9.2)	3.47~3.25 m	3.36 t(8.9)	3.36 t-like(9.2)	–
4′	3.27 m	3.47~3.25 m	3.28(ov)	3.28 m	–
5′	3.28 m	3.47~3.25 m	3.28(ov)	3.29 m	–
6′	3.65 dd(5.8, 11.9)	3.91~3.84 m	3.66 dd(12.0, 5.2)	3.87 br d(11.5)	–
	3.88 dd(1.5, 11.9)		3.87 dd(12.0, 2.4)	3.67 dd(11.5, 5.1)	
1″		4.58 d(7.8)			4.59 d(7.8)
2″		3.47~3.25 m	7.58 d(1.8)	7.45 m	–
3″		3.47~3.25 m			–
4″		3.47~3.25 m			–
5″		3.47~3.25 m	6.85 d(8.2)	6.81 d-like(8.8)	–
6″		3.91~3.84 m	7.60 dd(8.2, 1.8)	7.45 m	–
OMe			3.90 s(3″-OMe)		

Table 8-5-86: ^{1}H NMR spectroscopic data of noriridois **8-5-303**~**8-5-305**.

H	8-5-303	8-5-304	8-5-305
1	4.85 m	5.37 d(3.4)	4.93 d(7.3)
3	6.31 dd(5.8, 1.7)	6.11 dd(6.2, 2.0)	6.34 dd(6.1, 1.8)
4	4.95 m	4.90 dd(6.2, 3.4)	5.13 dd(3.9, 6.1)
5	2.62 m	3.25 m	2.82 m
6	4.84 m	5.89 dd(5.6, 2.4)	4.48 dd(1.7, 3.5)
7	3.62 d(1.2)	5.56 dd(5.6, 1.9)	5.89 br s
9	2.64 m	2.52 dd(8.3, 3.4)	2.92 m
10	3.59 d(13.2),	4.20 d(11.2),	4.19 d(16.1),
	4.17 d(13.2)	4.09 d(11.2)	4.38 d(16.1)
1′	4.81 d(7.8)	4.61 d(7.8)	4.69 d(8.0)
2′	3.30 m	3.17 dd(8.8, 7.8)	3.22 dd(8.0, 9.2)
3′	3.44 m	3.30 dd(8.8, 8.5)	3.39 t(9.0)
4′	3.44 m	3.23 dd(8.5, 8.1)	3.29 (ov)
5′	3.60 m	3.24 m	3.28 (ov)
6′	4.53 dd(11.7, 6.1),	3.74 dd(12.0, 2.0),	3.64 dd(12.0, 5.4),
	4.64 dd(11.7, 2.4)	3.56 dd(12.0, 5.1)	3.85 (ov)
1″			4.86 d(1.2)
2″	7.91 d(8.8)	7.37 d(8.8)	3.83 (ov)
3″	6.838 d(8.8)	6.72 d(8.8)	3.89 (ov)
4″			5.08 t-like dd(9.7)
5″	6.838 d(8.8)	6.72 d(8.8)	3.92 (ov)
6″	7.91 d(8.8)	7.37 d(8.8)	1.19 d(6.3)
7″		7.54 d(15.9)	
8″		6.25 d(15.9)	

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Table 8-5-86 (continued)

H	8-5-303	8-5-304	8-5-305
2‴	7.92 d(9.0)		7.22 d(1.9)
3‴	6.844 d(9.0)		
5‴	6.844 d(9.0)		6.97 d(8.4)
6‴	7.92 d(9.0)		7.19 dd(1.9, 8.4)
7‴			7.67 d(15.9)
8‴			6.45 d(15.9)
OMe			3.86 s, 3.87 s

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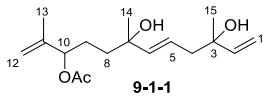
9 Sesquiterpenoids

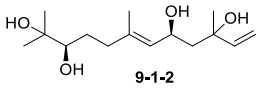
9.1 Farnesane-type sesquiterpenoids

Table 9-1-1: Compounds, MFs, and test solvents of farnesane-type sesquiterpenoids **9-1-1**~**9-1-20**.

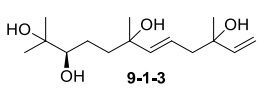
No.	Compounds	MFs	Test solvents	References
9-1-1	10-acetoxy-3,7,11-trimethyldodeca-1,5,11-triene-3,7-diol	$C_{17}H_{28}O_4$	$CDCl_3$	[1]
9-1-2	amarantholidol A	$C_{15}H_{28}O_4$	CD_3OD	[2]
9-1-3	amarantholidol B	$C_{15}H_{28}O_4$	CD_3OD	[2]
9-1-4	amarantholidol C	$C_{15}H_{26}O_3$	CD_3OD	[2]
9-1-5	amarantholidol D	$C_{15}H_{26}O_3$	CD_3OD	[2]
9-1-6	hedychiol A	$C_{15}H_{26}O_2$	$CDCl_3$	[3]
9-1-7	hedychiol B 8,9-diacetate	$C_{19}H_{30}O_5$	$CDCl_3$	[3]
9-1-8	mucronatone	$C_{15}H_{26}O_2$	$CDCl_3$	[4]
9-1-9	(3*E*,5*E*)-3,7,11-trimethyl-9-oxododeca-1,3,5-triene	$C_{15}H_{24}O$	$CDCl_3$	[5]
9-1-10	(3*E*,5*E*,9*E*)-8,11-diacetoxy-3,7,11-trimethyldodeca-1,3,5,9-tetraene	$C_{19}H_{28}O_4$	$CDCl_3$	[5]
9-1-11	*epi*-antheindurolide A	$C_{15}H_{20}O_4$	$CDCl_3$	[6]
9-1-12	*epi*-antheindurolide A 5,6-oxide	$C_{15}H_{20}O_5$	$CDCl_3$	[6]
9-1-13	5-hydroxy-5,6-dihydro-6,13-dehydro-*epi*-antheindurolide A	$C_{15}H_{18}O_5$	$CDCl_3$	[6]
9-1-14	5-hydroperoxy-5,6-dihydro-6,13-dehydro-*epi*-antheindurolide A	$C_{15}H_{18}O_6$	$CDCl_3$	[6]
9-1-15	*epi*-antheindurolide B	$C_{15}H_{18}O_5$	$CDCl_3$	[6]
9-1-16	6-hydroxy-5,6-dihydro-4,5-dehydro-*epi*-antheindurolide A	$C_{15}H_{20}O_5$	$CDCl_3$	[6]
9-1-17	6-hydroperoxy-5,6-dihydro-4,5-dehydro-*epi*-antheindurolide A	$C_{15}H_{18}O_6$	$CDCl_3$	[6]
9-1-18	sinularioperoxide A	$C_{15}H_{20}O_5$	$CDCl_3$	[7]
9-1-19	sinularioperoxide B	$C_{15}H_{20}O_5$	$CDCl_3$	[7]
9-1-20	sinularioperoxide C	$C_{15}H_{20}O_5$	$CDCl_3$	[7]



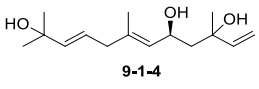
9-1-1



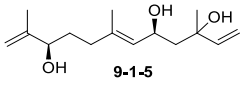
9-1-2



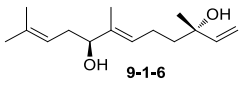
9-1-3



9-1-4



9-1-5



9-1-6

https://doi.org/10.1515/9783110631593-009

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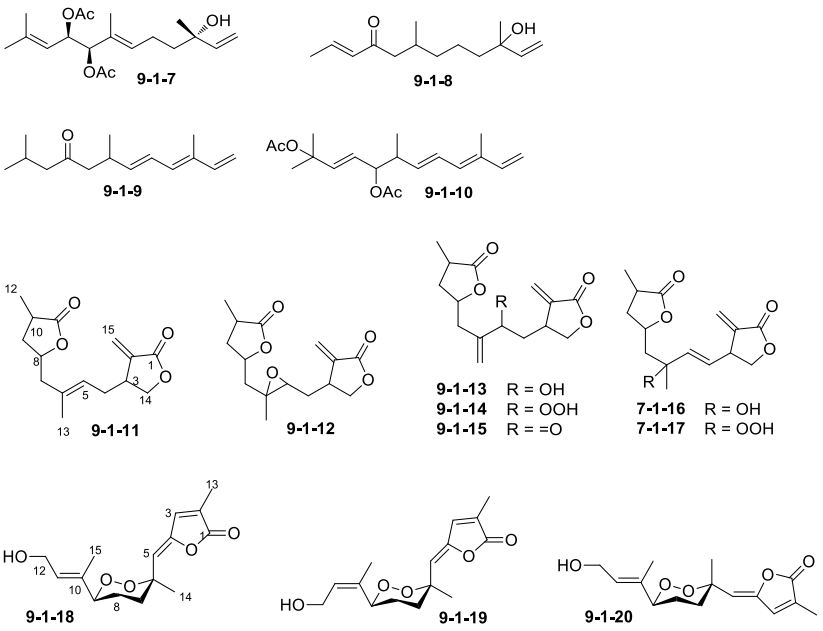

Table 9-1-2: ^{1}H NMR spectroscopic data of farnesane-type sesquiterpenoids **9-1-1**~**9-1-5**.

H	9-1-1	9-1-2	9-1-3	9-1-4	9-1-5
1α	5.05 d(10.7)	5.11 dd(10.8, 1.8)	5.01 dd(10.8, 1.5)	5.11 dd(10.5, 1.5)	5.11 dd(10.5, 1.5)
1β	5.20 d(17.2)	5.30 dd(17.4, 1.8)	5.19 dd(17.4, 1.5)	5.30 dd(17.1, 1.5)	5.30 dd(17.4, 1.5)
2	5.93 dd(17.0, 10.7)	5.95 dd(17.4, 10.8)	5.94 dd(17.4, 10.8)	5.96 dd(17.1, 10.5)	5.96 dd(17.1, 10.5)
4	2.28 ddd(19, 13.3, 5.5)	1.55 dd(14.4, 3.3) 1.75 dd(14.4, 9.9)	2.22 d(7.2)	1.74 dd(14.1, 8.1) 1.54 dd(14.1, 4.2)	1.74 dd(14.1, 8.1) 1.54 dd(14.1, 4.2)
5	5.61 m	4.60 ddd(9.9, 8.7, 3.3)	5.64 dt(15.6, 7.2)	4.60 dt(9.9, 3.3)	4.60 dt(9.9, 3.3)
6	5.59 s	5.21 d(8.7)	5.54 d(15.6)	5.20 dd(8.7, 1.5)	5.20 m
8	1.49 m	2.30 ddd(13.8, 9.9, 4.8) 2.01 ddd(13.8, 9.9, 6.6)	1.35 m	2.66 d(5.7)	1.63 m
9	1.65 m	1.33 m, 1.60 m	1.61 m	5.55 dd(15.9, 5.7)	2.15 m

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Table 9-1-2 (continued)

H	9-1-1	9-1-2	9-1-3	9-1-4	9-1-5
10	5.14 t(6.6)	3.22 dd(10.5, 1.5)	3.21 d(10.5)	5.78 d(15.9)	3.98 t(6.6)
12	4.88 s, 4.93 s	1.16 s	1.14 s	1.24 s	4.95①
13	1.70 s	1.12 s	1.12 s	1.28 s	1.70 s
14	1.27 s	1.65 d(1.2)	1.22 s	1.62 s	1.62 s
15	1.27 s	1.24 s	1.25 s	1.28 s	1.28 s
OAc	2.05 s				

① Obscured.

Table 9-1-3: ^{1}H NMR spectroscopic data of farnesane-type sesquiterpenoids **9-1-6**~**9-1-10**.

H	9-1-6	9-1-7	9-1-8	9-1-9	9-1-10
1α	5.06 dd(10.7, 0.9)	5.06 dd(10.7, 1.2)	5.02 dd(10.8, 1.5)	5.01 d(10.8)	5.02 d(10.4)
1β	5.22 dd(17.4, 0.9)	5.20 dd(17.4, 1.2)	5.20 dd(17.4, 1.5)	5.18 d(17.2)	5.19 d(17.2)
2	5.91 dd(17.4, 10.7)	5.89 dd(17.4, 10.7)	5.90 dd(17.4, 10.8)	6.37 dd(17.2, 10.8)	6.39 ddd(17.2, 10.4, 0.8)
4	1.59 m	1.54 m	1.30 m, 1.50 m	6.00 d(11.2)	6.04 d(11.2)
5	2.07 m	2.03 m	1.30 m	6.35 ddd (15.2, 11.2, 1.2)	6.37 ddd (15.0, 11.2, 1.2)
6	5.40 dd(7.3, 7.0)	5.49 dd(7.3, 7.3)	1.15 m, 1.35 m	5.65 dd(15.2, 7.6)	5.65 dd(15.0, 7.8)
7			2.00 m	2.83 m	2.60 m
8	3.97 dd(7.3, 7.3)	5.15 d(7.9)	2.38 dd(15, 6)	2.35 dd(16.0, 7.2)	5.16 ddd(7.2, 6.0, 1.2)
			2.18 dd(15, 7.8)	2.45 dd(16.0, 6.8)	
9	2.23 m	5.72 dd(9.5, 7.9)			5.52 ddd(16.0, 16.0, 7.2)
10	5.08 dd-like	5.00 br d(10)	6.06 m	2.25 d(6.8)	5.90 dd(16.0, 1.2)
11				2.11 m	
12	1.71 s	1.74 s	1.87 d(1.2)	0.89 d(6.8)	1.48 s
13	1.63 s	1.70 s	2.13 d(1.2)	0.90 d(6.8)	1.49 s
14	1.62 s	1.59 s	0.87 d(6.6)	1.04 d(6.8)	1.04 d(6.8)
15	1.29 s	1.27 s	1.26 s	1.83 d(1.2)	1.85 d(1.2)
OAc		2.01 s			2.07 s
OAc		2.04 s			1.96 s

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Table 9-1-4: ^{1}H NMR spectroscopic data of farnesane-type sesquiterpenoids **9-1-11**~**9-1-15**.

H	9-1-11	9-1-12	9-1-13	9-1-14	9-1-15
3	3.10 m	3.25 m	3.18 m	3.23 m	3.58 m
4	2.35 br ddd (5.3, 7.2, 14.5)	1.70~1.95(ov)	1.84 br ddd (4.2, 5.8, 14.0)	2.04 ddd (4.3, 9.3, 14.5)	3.21 dd(4.9, 18.1)
	2.27 br ddd (7.2, 7.2, 14.5)		1.68 br ddd (8.8, 9.5, 14.0)	1.72~1.84	2.97 dd(9.1, 18.1)
5	5.21 tq(7.2, 1.2)	2.91 dd(4.5, 7.5)	4.18 br dd(4.2, 9.5)	4.44 dd(4.2, 9.3)	
7	2.42 br dd(7.0, 13.9)	1.84 dd(2.8, 15.4)	2.46 br dd(8.7, 15.1)	2.53~2.65(ov)	2.76 br dd(3.9, 14.2)
	2.27 br dd(5.4, 13.9)	2.05 dd(8.7, 15.4)	2.30 br dd(5.1, 15.1)	2.46 br dd(4.7, 15.7)	2.49 br dd(8.8, 14.2)
8	4.42 dddd (5.4, 5.4, 7.0, 10.4)	4.22 dddd (2.8, 5.4, 8.7, 10.5)	4.48 m	4.62 m(ov)	4.44 dddd (3.9, 5.6, 8.8, 10.5)
9	2.43 ddd (5.4, 8.6, 12.2)	2.41 ddd (5.4, 8.5, 12.2)	2.48 ddd (5.4, 8.3, 12.2)	1.62 ddd (10.6, 11.8, 12.4)	2.50 ddd (5.6, 8.6, 12.2)
	1.48 ddd (10.4, 12.2, 12.2)	1.47 ddd (10.5, 12.2, 12.2)	1.52 ddd (10.4, 12.2, 12.2)	2.59 ddd (5.4, 8.6, 12.4, ov)	1.51 ddd (10.5, 12.2, 12.2)
10	2.65 ddq (7.0, 8.6, 12.2)	2.61 ddq (7.0, 8.5, 12.2)	2.61 ddq (6.9, 8.3, 12.2)	2.73 ddq (6.9, 8.6, 11.8)	2.66 ddq (6.9, 8.6, 12.2)
12	1.24 d(7.0)	1.20 d(7.0)	1.22 d(6.9)	1.29 d(6.8)	1.27 d(6.9)
13	1.65 br s	1.29 s	5.15 br s, 4.99 br s	5.32 br s, 5.24 br s	6.19 br s, 6.08 br s
14	4.40 dd(8.2, 9.1)	4.48 dd(8.6, 9.1)	4.50 dd(8.2, 9.3)	4.57 dd(8.1, 9.6, ov)	4.66 dd(8.5, 9.4)
	3.95 dd(5.1, 9.1)	4.04 dd(5.9, 9.1)	4.03 dd(5.8, 9.3)	4.04 dd(5.8, 9.6)	3.91 dd(5.7, 9.4)
15	6.24 d(2.7)	6.28 d(2.8)	6.24 d(2.8)	6.33 d(2.8)	6.30 d(2.9)
	5.65 d(2.4)	5.69 d(2.5)	5.60 d(2.5)	5.68 d(2.5)	5.63 d(2.6)
OOH				9.06 br s	

Table 9-1-5: ^{1}H NMR spectroscopic data of farnesane-type sesquiterpenoids **9-1-16**~**9-1-20**.

H	9-1-16	9-1-17	9-1-18	9-1-19	9-1-20
3	3.67 m	3.75 m	7.04 s	7.06 s	7.00 s
4	5.63 dd(6.6, 15.0)	5.57 dd(8.3, 15.9)			
5	5.71 d(15.0)	5.87 d(15.9)	5.66 s	5.66 s	5.27 s

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Table 9-1-5 (continued)

H	9-1-16	9-1-17	9-1-18	9-1-19	9-1-20
7	1.90 dd(8.8, 14.9) 1.80 dd(3.4, 14.9)	2.13 dd(8.2, 13.7) 2.02 dd(2.8, 13.7)	1.80 m 2.58 ddd (13.0, 3.5, 3.5)	1.80 m 2.59 ddd (12.0, 3.5, 3.5)	2.12 m
8	4.42 dddd (3.4, 5.4, 8.8, 10.6)	4.52 dddd (2.8, 5.5, 8.2, 11.0)	1.70 m, 1.75 m	1.58 m, 1.83 m	1.83 m, 1.98 m
9	2.43 ddd(5.4, 8.3, 12.2) 1.50 ddd(10.6, 12.2, 12.2)	2.50 ddd(5.5, 8.2, 12.0) 1.58 ddd(11.1, 12.0, 12.0)	4.44 d(11.0)	4.87 dd(10.3, 2.5)	4.41 dd(8.0, 3.5)
10	2.57 ddq(6.9, 8.3, 12.2)	2.62 ddq(6.9, 8.2, 12.0)			
11			5.63 t(6.5)	5.62 t(6.5)	5.70 t(6.5)
12	1.21 d(6.9)	1.28 d(6.9)	4.21 d(6.5)	4.16 dd(12.8, 6.8) 4.21 dd(12.8, 7.3)	4.25 d(6.5)
13	1.30 s	1.39 s	2.01 s	2.02 s	2.01 s
14	4.46 dd(8.9, 9.0) 3.97 dd(7.3, 9.0)	4.56 dd(9.0, 9.1) 4.04 dd(7.2, 9.0)	1.41 s	1.41 s	1.57 s
15	6.26 d(3.1) 5.53 d(2.8)	6.34 d(3.1) 5.66 d(2.7)	1.68 s	1.69 s	1.75 s
OOH		8.26 br s			

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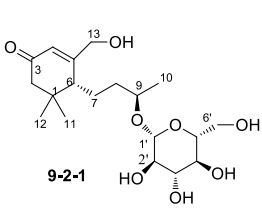
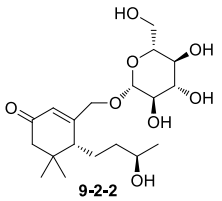
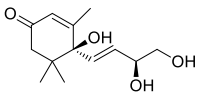
9.2 Monocyclofarnesane-type sesquiterpenoids

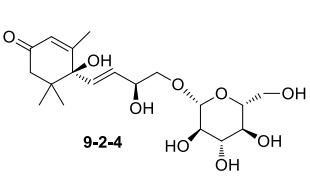
Table 9-2-1: Compounds, MFs, and test solvents of monocyclofarnesane-type sesquiterpenoids **9-2-1**~**9-2-20**.

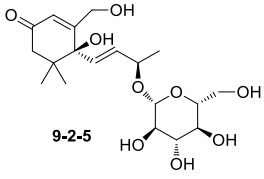
No.	Compounds	MFs	Test solvents	References
9-2-1	euodionoside F	$C_{19}H_{32}O_8$	CD_3OD	[8]
9-2-2	euodionoside G	$C_{19}H_{32}O_8$	CD_3OD	[8]
9-2-3	cucumegastigmane I	$C_{13}H_{20}O_4$	CD_3OD	[9]
9-2-4	cucumegastigmane II	$C_{19}H_{30}O_9$	CD_3OD	[9]
9-2-5	bridelionoside A	$C_{19}H_{30}O_9$	CD_3OD	[10]
9-2-6	macarangioside D	$C_{19}H_{30}O_8$	CD_3OD	[11]
9-2-7	excoecarioside A	$C_{19}H_{32}O_8$	CD_3OD	[12]
9-2-8	(1*R*,6*R*,9*S*)-6,9,11-trihydroxy-4,7-megastigmadien-3-one 11-*O*-*β*-D-glucopyranoside	$C_{19}H_{30}O_9$	CD_3OD	[13]
9-2-9	lauroside E	$C_{19}H_{32}O_8$	CD_3OD	[14]
9-2-10	(2*R*,6*R*,9*R*)-2,9-dihydroxy-4-megastigmen-3-one	$C_{13}H_{22}O_3$	$CDCl_3$	[15]
9-2-11	annuionone A	$C_{13}H_{20}O_3$	$CDCl_3$	[16]
9-2-12	annuionone E	$C_{13}H_{22}O_3$	$CDCl_3$	[16]
9-2-13	annuionone F	$C_{13}H_{22}O_4$	$CDCl_3$	[16]
9-2-14	(8*R*∗)-8-bromo-10-*epi*-*β*-snyderol	$C_{15}H_{24}Br_2O$	$CDCl_3$	[17]
9-2-15	(8*S*∗)-8-bromo-*β*-snyderol	$C_{15}H_{24}Br_2O$	$CDCl_3$	[17]
9-2-16	5-bromo-3-(3′-hydroxy-3′-methylpent-4′-enylidene)-2,4,4-trimethylcyclohexanone	$C_{15}H_{23}BrO_2$	$CDCl_3$	[17]
9-2-17	acetic acid 1-methyl-3-(2,2,6-trimethyl-7-oxa-bicyclo-[4.1.0]hept-1-yl)-1-vinyl-allyl ester	$C_{17}H_{26}O_3$	$CDCl_3$	[17]
9-2-18	*β*-snyderol	$C_{15}H_{25}BrO$	$CDCl_3$	[17]
9-2-19	3-acetylpelseneeriol-1	$C_{17}H_{24}O_3$	$CDCl_3$	[18]
9-2-20	3-acetylpelseneeriol-2	$C_{17}H_{24}O_3$	$CDCl_3$	[18]

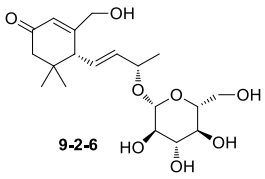












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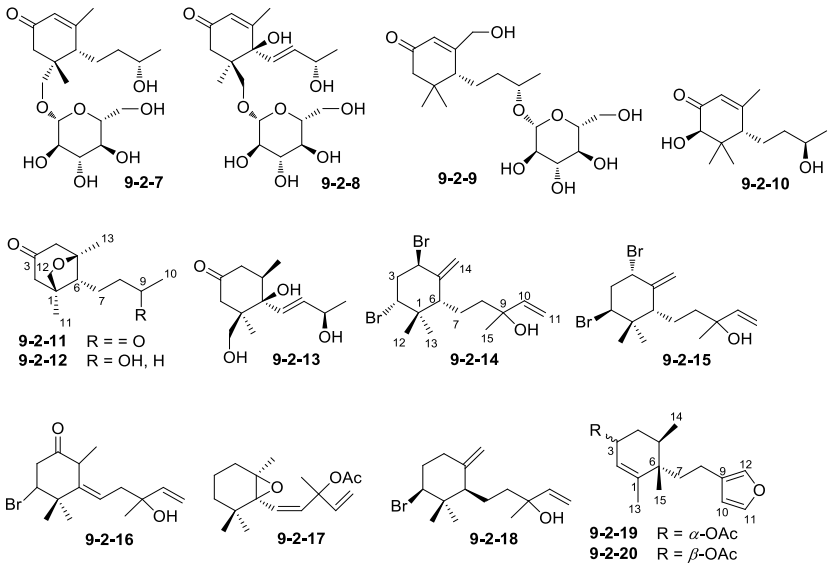

Table 9-2-2: ^{1}H NMR spectroscopic data of monocyclofarnesane-type sesquiterpenoids **9-2-1**~**9-2-5**.

H	9-2-1	9-2-2	9-2-3	9-2-4	9-2-5
2	2.58 d(17)	2.54 d(18)	2.51 d(16.8)	2.52 d(17.0)	2.49 d(17)
	2.03 d(17)	2.03 d(18)	2.16 d(16.8)	2.16 d(17.0)	2.18 d(17)
4	6.60 br s	6.17 br s	5.87 s	5.88 d(1.1)	6.17 br s
6	1.92 m	2.03 t(6)			
7	1.80~1.52 m	1.80~1.52 m	5.89 dd(15.6, 1.0)	5.93 dd(15.5, 1.3)	5.87 m
8	1.80~1.52 m	1.80~1.52 m	5.79 dd(15.6, 5.6)	5.78 dd(15.5, 5.6)	5.87 m
9	3.82 m	3.68 m	4.19 m	4.40 m	4.41 quint d(6, 1)
10	1.24 d(6)	1.60 d(6)	3.50 dd(11.1, 5.0)	3.91 dd(10.1, 3.8)	1.29 d(6)
			3.46 dd(11.1, 6.7)	3.46 dd(10.1, 8.1)	
11	1.02 s	1.11 s	1.04 s	1.04 s	1.02 s
12	1.11 s	1.03 s	1.02 s	1.02 s	1.05 s
13	4.16 dd(18, 1)	4.37 dd(18, 2)	1.92 d(1.2)	1.91 d(1.2)	4.20 dd(19, 2)
	4.32 dd(18, 1)	4.53 dd(18, 2)			4.38 dd(19, 2)
1′	4.33 d(8)	4.33 d(8)		4.29 d(7.8)	4.33 d(8)
2′	3.15 dd(9, 8)	3.36~3.15 m		3.21 dd(9.0, 7.8)	3.10 dd(9, 8)
3′	3.36~3.26 m	3.36~3.15 m		3.36 m	
4′	3.36~3.26 m	3.36~3.15 m		3.27 (ov)	
5′	3.36~3.26 m	3.36~3.15 m		3.27 (ov)	
6′	3.67 dd(11, 6)	3.62 dd(12, 6)		3.86 d-like(12.1)	3.61 dd(12, 5)
	3.84 m	3.88 dd(12, 2)		3.64 dd(12.1, 3.7)	3.86 dd(12, 2)

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Table 9-2-3: ^{1}H NMR spectroscopic data of monocyclofarnesane-type sesquiterpenoids **9-2-6**~**9-2-10**.

H	9-2-6	9-2-7	9-2-8	9-2-9	9-2-10
2	2.54 d(16.8) 2.10 d(16.8)	2.33 d(16.8) 2.33 d(16.8)	2.64 dd(17.3, 0.7) 2.38 br d(17.3)	2.57 d(16.9) 2.02 d(16.9)	4.18 s
4	6.15 s	5.82 s	5.90 dd(1.3, 0.7)	6.04 s	5.90 s
6	2.70 d(9.3)	2.35 m		1.95 m	2.05 m
7	5.77 dd(15.4, 9.3)	1.65 m, 1.75 m	5.75 dd(16.0, 1.2)	1.40~1.70(ov)	1.27 m, 1.55 m
8	5.57 dd(15.4, 7.3)	1.56 m	5.83 dd(16.0, 5.6)	1.40~1.70(ov)	1.58 m
9	4.45 qd(6.6, 7.3)	3.70 m	4.33 m	3.84 m	3.78 m
10	1.28 d(6.6)	1.15 d(6.1)	1.24 d(6.4)	1.18 d(6.8)	1.22 d(6.0)
11	1.03 s	3.70 m	1.06 s	1.01 s	0.88 s
12	1.00 s	1.12 s	3.59 d(10.0) 3.96 d(10.0)	1.11 s	1.23 s
13	4.13 dd(17.8, 1.7) 4.23 dd(17.8, 1.5)	2.04 s	1.92 d(1.3)	4.35 d(18.0) 4.18 d(18.0)	2.02 d(1.2)
1′	4.28 d(7.8)	4.15 d(7.8)	4.14 d(7.8)	4.32 d(7.8)	
2′	3.19(ov)	3.15 m	3.14 dd(9.0, 7.8)	3.21(ov)	
3′	3.31(ov)	3.30 m	3.31 dd(9.0, 9.0)	3.36(ov)	
4′	3.24(ov)	3.30 m	3.27 dd(9.0, 9.0)	3.26(ov)	
5′	3.16(ov)	3.30 m	3.21 ddd(9.0, 5.6, 2.4)	3.20(ov)	
6′	3.63 dd(11.7, 5.9) 3.85 dd(11.7, 2.4)	3.70 m 3.86 br d(11.2)	3.65 dd(12.0, 5.6) 3.84 dd(12.0, 2.4)	3.66(ov) 3.87(ov)	

Table 9-2-4: ^{1}H NMR spectroscopic data of monocyclofarnesane-type sesquiterpenoids **9-2-11**~**9-2-15**.

H	9-2-11	9-2-12	9-2-13	9-2-14	9-2-15
2	*α* 2.22 dd(17.6, 1.1) *β* 2.37 dd(17.6, 2.7)	*α* 2.12 dd(17.8, 1.2) *β* 2.32 dd(17.8, 1.8)	*α* 3.32 d(13.8) *β* 1.85 dd(13.8, 2.0)	4.49 dd(12.5, 5)	4.43 t(3)
3				2.13 ddd(3, 12.5, 12) 2.45 ddd(3, 5, 12)	2.51 m
4	2.34 d(17.6) 2.39 d(17.6)	2.24 d(17.6) 2.31 d(17.6)	*α* 2.52 dd(14.3, 14.3) *β* 2.22 ddd (14.3, 4.6, 2.0)	4.28 t(3)	4.27 dd(13, 5)
5			2.12 m		
6	1.63 ddd(8.0, 8.0, 1.1)	1.58 ddd(6.2, 6.2, 1.2)		2.35 br d(10.5)	2.20 m

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Table 9-2-4 (continued)

H	9-2-11	9-2-12	9-2-13	9-2-14	9-2-15
7	1.64 dddd (15.1, 8.1, 8.1, 6.6) 1.83 dddd (15.1, 8.1, 8.1, 6.6)	1.26 dddd (18.0, 11.4, 6.2, 6.0) 1.65 dddd (18.0, 6.2, 6.0, 6.0)	5.70 d(15.5)	1.21 m	1.28 m
8	2.66 ddd(18.0, 8.0, 6.6) 2.65 ddd (18.0, 8.0, 6.6)	1.53 dddd(18.8, 11.4, 6.1, 6.0) 1.52 dddd (18.8, 6.0, 6.1, 6.0)	6.01 dd(15.5, 6.3)	1.33 m, 1.72 m	1.34 m, 1.75 m
9		3.71 ddq(6.1, 6.1, 6.1)	4.45 dq(6.3, 6.5)		
10	2.18 s	1.12 d(6.1)	1.33 d(6.5)	5.90 dd(17.5, 10.5)	5.91 dd(17.5, 10.5)
11	1.07 s	0.99 s	0.78 s	5.22 dd(17.5, 1.2) 5.08 dd(10.5, 1.2)	5.25 br d(17.5) 5.17 dd(10.5, 1.2)
12	3.55 dd(8.1, 2.7) 3.62 d(8.1)	3.47 dd(7.8, 1.8) 3.52 d(7.8)	3.88 d(10.8) 3.17 d(10.8)	1.17 s	1.13 s
13	1.31 s	1.22 s	0.85 d(6.6)	0.77 s	0.75 s
14				5.11 br s, 4.73 t(1.5)	5.29 br s, 4.90 br s
15				1.29 s	1.28 s

Table 9-2-5: ^{1}H NMR spectroscopic data of monocyclofarnesane-type sesquiterpenoids **9-2-16**~**9-2-20**.

H	9-2-16	9-2-17	9-2-18	9-2-19	7-2-20
2	4.43 t(3.5)	0.85 m, 1.23 m	4.12 dd(11.5, 4.5)	5.60 d(4.8)	5.42 br s
3	1.88 dd(3.5, 13) 2.01 dd(3.5, 13)	1.60 m, 1.78 m	2.01 m, 2.23 m	5.12 br s	5.31 br t(7)
4		1.91 m, 2.08 m	2.02 m, 2.32 m	1.70 m, 1.62 br d(14)	1.51 m, 1.92 m
5	2.35 m			2.08 m	1.87 m
6			1.71 m		
7	5.33 d(2)	6.18 d(10)	1.28 m, 1.55 m	1.68 m, 1.74 m	1.68 ddd(14, 9, 4) 1.62 ddd(14, 13, 5)

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Table 9-2-5 (continued)

H	9-2-16	9-2-17	9-2-18	9-2-19	7-2-20
8		6.72 d(10)	1.63 m, 1.75 m	2.41 ddd(14, 12, 6)	2.35 ddd(15, 13, 5)
				2.09 m	2.01 ddd(15, 9, 4)
10	5.95 dd(17.5, 10.5)	5.97 dd(17, 10)	5.90 dd(17.5, 10.5)	6.26 s	6.25 s
11	5.11 dd(17.5, 1.5)	5.29 br d(17)	5.21 br d(17.5)	7.35 s	7.34 s
	5.02 dd(10.5, 1.5)	5.17 br d(10)	5.06 br d(10.5)		
12	1.24 s	1.24 s	0.82 s	7.21 s	7.20 s
13	1.22 s	1.22 s	1.16 s	1.72 s	1.70 s
14	0.89 d(7)	1.37 s	4.60 br s, 4.91 br s	0.9 d(7)	0.92 d(7)
15	1.31 s	1.62 s	1.27 s	0.86 s	0.94 s
OAc		1.89 s		2.05 s	2.06 s

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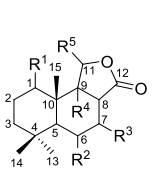
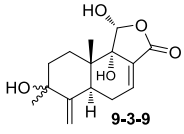
9.3 Bicyclofarnesane-type sesquiterpenoids

Table 9-3-1: Compounds, MFs, and test solvents of bicyclofarnesane-type sesquiterpenoids **9-3-1**~**9-3-20**.

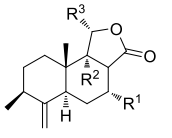
No.	Compounds	MFs	Test solvents	References
9-3-1	cinnamadin	$C_{17}H_{24}O_5$	$CDCl_3$	[19]
9-3-2	6*α*,9*α*,11*α*-trihydroxycinnamolide	$C_{15}H_{22}O_5$	CD_3CN	[20]
9-3-3	6*β*,9*α*,11*α*-trihydroxycinnamolide	$C_{15}H_{22}O_5$	CD_3CN	[20]
9-3-4	cinnamacrin A	$C_{17}H_{22}O_4$	$CDCl_3$	[21]
9-3-5	nebularilactone A	$C_{15}H_{22}O_3$	$CDCl_3$	[22]
9-3-6	nebularilactone B	$C_{15}H_{22}O_3$	$CDCl_3$	[22]
9-3-7	1*β*-acetoxy-7-drimen-11*α*-ol-12,11-lactone	$C_{17}H_{24}O_5$	$CDCl_3$	[23]
9-3-8	7*α*,11*α*-dihydroxy-4(13),8-coloratadien-12,11-olide	$C_{15}H_{20}O_4$	CD_3COCD_3	[24]
9-3-9	3*ξ*,9*α*,11*α*-trihydroxy-muzigadiolide	$C_{15}H_{20}O_5$	CD_3CN	[20]
9-3-10	4(13),7-coloratadien-12,11-olide	$C_{15}H_{20}O_2$	$CDCl_3$	[25]
9-3-11	(+)-(5*S*,10*S*)-4′-hydroxymethylcyclozonarone	$C_{22}H_{26}O_3$	$CDCl_3$	[26]
9-3-12	tauranin	$C_{22}H_{30}O_4$	$CDCl_3$	[26]
9-3-13	3-ketotauranin	$C_{22}H_{28}O_5$	$CDCl_3$	[26]
9-3-14	3*α*-hydroxytauranin	$C_{22}H_{30}O_5$	$CDCl_3$	[26]
9-3-15	12-hydroxytauranin	$C_{22}H_{30}O_5$	$CDCl_3$	[26]
9-3-16	phyllospinarone	$C_{22}H_{30}O_4$	CD_3COCD_3	[26]
9-3-17	20-*O*-acetyl-21-hydroxy-*ent*-isozonarol	$C_{23}H_{32}O_4$	$CDCl_3$	[27]
9-3-18	20-*O*-acetylneoavarol	$C_{23}H_{32}O_3$	$CDCl_3$	[27]
9-3-19	*ent*-yahazunol	$C_{21}H_{32}O_3$	$CDCl_3$	[27]
9-3-20	dysienone	$C_{20}H_{30}O_2$	$CDCl_3$	[27]



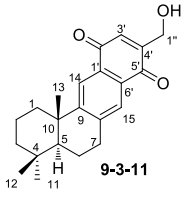
	R^1	R^2	R^3	R^4	R^5	
9-3-1	H	*β*-OAc	*α*-OH		H	Δ^8
9-3-2	H	*α*-OH	H	*α*-OH	*α*-OH	Δ^7
9-3-3	H	*β*-OH	H	*α*-OH	*α*-OH	Δ^7
9-3-4	H	OAc	H		H	Δ^6 Δ^8
9-3-5	*β*-OH	H	H	*α*-H	H	Δ^7
9-3-6	*α*-OH	H	H	*α*-H	H	Δ^7
9-3-7	*β*-OAc	H	H	*α*-H	*α*-OH	Δ^7



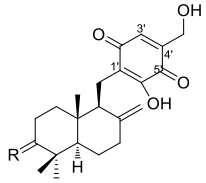
9-3-9



	R^1	R^2	R^3	
9-3-8	OH	-	OH	Δ^8
9-3-10	H	H	H	Δ^7



9-3-11



9-3-12 R = H_2
9-3-13 R = O
9-3-14 R = *α*-OH, *β*-H

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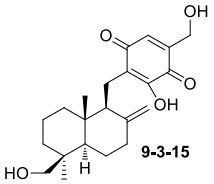
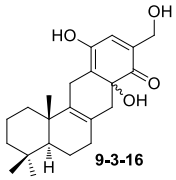
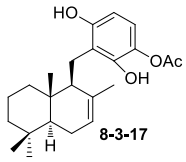


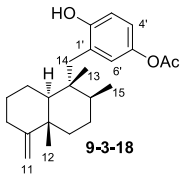
9-3-15



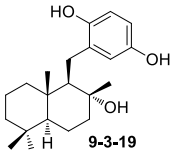
9-3-16



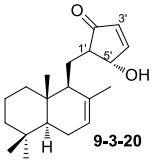
8-3-17



9-3-18



9-3-19



9-3-20

Table 9-3-2: ^{1}H NMR spectroscopic data of bicyclofarnesane-type sesquiterpenoids **9-3-1**~**9-3-5**.

H	9-3-1	9-3-2	9-3-3	9-3-4	9-3-5
1		*α* 1.72 td(13.4, 3.5) *β* 1.23 dm(13.4)	–	1.53 m, 1.68 m	3.39 dd(10.8, 4.7)
2		*α* 1.46 dquint (13.6, 3.5) *β* 1.59 qt(13.6, 3.0)	–	1.72 m, 1.92 m	1.63 m
3		*α* 1.27 td(13.4, 3.6) *β* 1.41 dm(13.4)	*α* 1.23 tm(12.6) *β* 1.36 dm(12.6)	1.28 td(14.0, 4.4) 1.48 dm(14.2)	1.32 m, 1.52 m
5	1.65 br s	1.93	1.76 d(4.9)	2.64 d(2.7)	1.34 m
6	5.38 br s	4.35 ddd(10.2, 8.4, 2.9)	4.60 m		2.20 m, 2.40 m
7	4.24 br s	6.66 d(2.9)	6.74 d(3.8)	6.11 d(2.6)	6.85 dd(7.0, 3.4)
9					2.82 m
11	4.79 dd(17.2, 2) 4.71 d(17.2)	5.69 d(10.2)	5.75 d(10.7)	4.75 d(17.3) 4.83 d(17.3)	4.15 4.50 dt(9.6)
13	1.41 s	1.15 s	1.09 s	1.15 s	0.94 s
14	0.98 s	1.08 s	1.31 s	1.11 s	0.90 s
15	0.99 s	0.96 s	1.11 s	1.14 s	0.78 s
OAc	1.98 s			2.22 s	
OH		2.96 br d(8.4, 6-OH) 4.00 br s(9-OH) 5.54 br d(10.2, 11-OH)	2.98 d(6.3, 6-OH) 3.82 br s 5.46 br d(10.7, 12-OH)		

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Table 9-3-3: ^{1}H NMR spectroscopic data of bicyclofarnesane-type sesquiterpenoids **9-3-6**~**9-3-10**.

H	9-3-6	9-3-7	9-3-8	9-3-9	9-3-10
1	3.51 br s	4.66 dd(11.2, 4.2)	α 1.78 dt(12.6, 4.0) β 1.99 m	α 2.44 td(13.6, 4.1) β 1.10 dm(13.6)	α 1.54 dt(13.5, 4.0) β 1.65 td(13.5, 3.0)
2	1.59 1.98	1.78 m 1.64 m	α 1.35 m β 1.80 m	α 1.67 ddd(13.6, 4.2, 2.7) β 1.53 td(14, 4.1)	α 1.25 m β 1.70 td(13.0, 3.0)
3	1.26, 1.76	1.52 m	2.13 m		2.05 m
5	1.75 dd	1.44 dd(10.5, 4.4)	2.53 d(12.0)	3.14 t(8.1)	2.18 m
6	2.15, 2.43	2.44 m, 2.18 m	α 1.85 m, β 1.89 m	2.28 dd(8.1, 3.6)	α 2.35 m, β 2.32 m
7	6.80 dd(6.9, 3.3)	6.86 dd(6.6, 3.6)	4.48 d(3.0)	6.94 t(3.6)	6.91 q(3.5)
9	3.58 m	2.58 br s			2.99 m
11	4.00, 4.42 dt(9.3)	5.72 d(5.4)	6.22 s	5.62 d(10.9)	4.48 t(9.0), 4.02 t(9.0)
13	0.94 s	0.93 s	α 4.86 br s, β 4.67 br s	4.80 d(1.8), 5.15 d(1.8)	4.73 s, 4.90 s
14	0.93 s	0.95 s	1.09 d(6.5)	1.36 s	1.11 d(6.5)
15	0.78 s	0.94 s	0.98 s	0.69 s	0.65 s
OAc		2.07 s			
OH				2.51 br s(3-OH) 3.93 br s(9-OH) 5.45 br d(10.9, 11-OH)	

Table 9-3-4: ^{1}H NMR spectroscopic data of bicyclofarnesane-type sesquiterpenoids **9-3-11**~**9-3-15**.

H	9-3-11	9-3-12	9-3-13	9-3-14	9-3-15
1	2.35 br d(13.0) 1.36 td(13.0, 3.9)	1.91 dt(12.8, 4.8) 1.39 m	2.33 m 1.93 dt(12.8, 6.5)	1.81 dt(12.6, 4.3) 1.52 dt(12.6, 4.3)	1.25~1.65 m
2	1.63~1.77 m	1.51 m 1.48 m	2.63 ddd(15.2, 12.8, 6.5) 2.44 m	1.36 dd(12.9, 4.3) 1.39 dd(12.9, 4.3)	1.25~1.65 m
3	1.49 br d(13.3) 1.22 dd(13.3, 4.0)	1.51 m 1.21 dt(13.3, 3.9)		3.29 dd(11.3, 4.3)	1.25~1.65 m
5	1.27 dd(12.6, 2.4)	1.16 dd(12.5, 2.0)	1.65 m	2.34 br d(10.4)	1.80 br d(14.2)

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Table 9-3-4 (continued)

H	9-3-11	9-3-12	9-3-13	9-3-14	9-3-15
6	1.92 br dd (13.5, 7.8) 1.63~1.77 m	1.78 m 1.29 dd(12.5, 4.7)	1.66 m 1.48 dd(13.2, 4.3)	1.72 m 1.41 dd(12.9, 4.8)	1.62 m
7	2.97 dd(18.5, 6.1) 2.87 ddd(18.5, 10.8, 7.7)	2.27 br d(12.8) 1.90 dt(12.8, 4.7)	2.07 ddd(12.8, 6.6, 3.8)	2.31 ddd(12.6, 4.6, 2.4)	2.27 ddd(12.5, 4.2, 3.1)
			1.93 dt(12.8, 4.3)	1.90 dt(12.6, 4.8)	1.94 dt(12.5, 5.0)
9		2.38 m	2.42 m	1.15 m	2.45 m
11	0.97 s	0.81 s	1.02 s	0.77 s	0.80 s
12	0.98 s	0.85 s	1.08 s	0.98 s	3.39 d(10.9) 3.10 d(10.9)
13	1.21 s	0.75 s	0.93 s	0.76 s	0.76 s
14	7.97 s	2.64 dd(13.8, 11.2)	2.73 dd(13.9, 10.9)	2.66 dd(13.9, 11.0)	2.65 dd(13.9, 11.0)
		2.52 dd(13.8, 2.7)	2.49 dd(13.9, 2.8)	2.50 dd(13.9, 2.9)	2.53 dd(13.9, 3.1)
15	7.32 s	4.65 s	4.74 d(0.8), 4.77 d(0.8)	4.67 d(1.2), 4.69 d(1.2)	4.66 d(1.2)
3′	6.96 s	6.66 s	6.66 t(1.9)	6.65 t(1.7)	6.65 t(1.9)
1″	4.49 d(1.2)	4.52 s	4.52 d(1.9)	4.52 d(1.7)	4.52 d(1.9)
OH		6.96(6′-OH)	6.95 s(6′-OH)	1.25 br s(3-OH) 6.94 s(6′-OH)	6.92 s(6′-OH)

Table 9-3-5: ^{1}H NMR spectroscopic data of bicyclofarnesane-type sesquiterpenoids **9-3-16**~**9-3-20**.

H	9-3-16	9-3-17	9-3-18	9-3-19	9-3-20
1	1.88~1.98 m 1.20 dt(13.7, 3.7)	1.13 m, 1.91 m	1.55 m, 2.00 m	0.79 m, 1.77 m	1.18 m, 1.75 m
2	1.42~1.47 m 1.22 dt(13.2, 4.0)	1.38 m, 1.51 m	1.30 m, 1.88 m	1.40 m, 1.58 m	1.44 m, 1.50 m
3	1.69 dt(13.8, 3.5) 1.51 dt(13.8, 3.4)	1.15 m, 1.38 m	2.09 m, 2.33 m	1.34 m, 1.05 ddd (13.7, 13.3, 3.8)	1.20 m, 1.39 m
5	1.28 dd(12.6, 1.9)	1.25 m		0.95 m	1.30 dd(12.2, 4.9)
6	1.73 m, 1.42~1.47 m	1.86 m, 1.96 m	1.30 m, 1.50 m	1.29 m, 1.69 m	1.88 m, 1.99 m
7	1.88~1.98 m	5.40 br s	1.42 m	1.89 ddd(12.2, 3.3, 3.3) 1.58 m	5.44 br s
8			1.38 m		
9		2.62 m		1.62 dd(6.0, 2.3)	2.39 br s
10			0.97 dd(12.3, 2.3)		

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Table 9-3-5 (continued)

H	9-3-16	9-3-17	9-3-18	9-3-19	9-3-20
11	0.88 s	0.86 s	4.43 t(1.8) 4.39 t(1.5)	0.83 s	0.86 s
12	0.93 s	0.90 s	1.06 s	0.80 s	0.88 s
13	1.05 s	0.93 s	0.86 s	0.93 s	0.78 s
14	3.37 br d(16.4)	2.76 dd(14.7, 8.4)	2.68 d(14.4)	2.86 dd(15.2, 2.3)	1.82 ddd(14.6, 9.2, 2.9)
	2.87 d(16.4)	2.70 dd(14.7, 4.6)	2.52 d(14.4)	2.37 dd(15.2, 6.0)	1.50 m
15	2.31 d(17.2) 2.01 d(17.2)	1.59 br s	0.99 d(6.2)	1.31 s	1.74 br s
1′					2.41 ddd(9.2, 6.3, 2.5)
3′	7.04 t(1.5)	6.30 d(8.7)	6.68 d(8.5)	6.70 d(8.4)	6.16 dd(5.8, 1.1)
4′		6.82 d(8.7)	6.79 dd(8.5, 2.8)	6.56 dd(8.4, 3.1)	7.45 dd(5.8, 2.1)
5′					4.67 br s
6′			6.73 d(2.8)	6.61 d(3.1)	
1″	4.44 dd(5.3, 1.5)				
OAc		2.30 s	2.26 s		
OH	7.18 s(2′-OH) 4.22 s(6′-OH) 4.03 t(5.3, 1″-OH)	5.36 s 4.81 s	4.75 br s		

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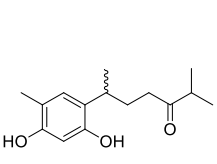
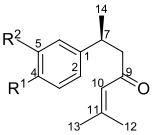
9.4 Bisabolane-, majapolane-, and heliannane-type sesquiterpenoids

Table 9-4-1: Compounds, MFs, and test solvents of bisabolane-type sesquiterpenoids **9-4-1**~**9-4-12**.

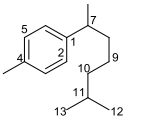
No.	Compounds	MFs	Test solvents	References
9-4-1	chiloscyphone A	$C_{15}H_{22}O_3$	$CDCl_3$	[28]
9-4-2	(6*S*)-2-methyl-6-(4-hydroxyphenyl-3-methyl)-2-hepten-4-one	$C_{15}H_{20}O_2$	$CDCl_3$	[29]
9-4-3	(6*S*)-2-methyl-6-(4-hydroxyphenyl)-2-hepten-4-one	$C_{14}H_{18}O_2$	$CDCl_3$	[29]
9-4-4	(6*S*)-2-methyl-6-(4-formylphenyl)-2-hepten-4-one	$C_{15}H_{18}O_2$	$CDCl_3$	[29]
9-4-5	bisabola-1,3,5,7(14)-tetraene	$C_{15}H_{22}$	C_6D_6	[30]
9-4-6	bisabola-1,3,5,7-tetraene	$C_{15}H_{22}$	C_6D_6	[30]
9-4-7	bisabola-1,3,5,7(14),11-pentaene	$C_{15}H_{20}$	C_6D_6	[31]
9-4-8	bisabola-1,3,5,7,11-pentaene	$C_{15}H_{20}$	C_6D_6	[31]
9-4-9	4-hydroxy-bisabol-1-one	$C_{15}H_{24}O_2$	$CDCl_3$	[32]
9-4-10	4-hydroxy-1-oxo-bisabol-13-al	$C_{15}H_{22}O_3$	$CDCl_3$	[32]
9-4-11	4,13-dihydroxy-bisabol-1-one	$C_{15}H_{24}O_3$	$CDCl_3$	[32]
9-4-12	(6*R*)-2-chloro-6-[(1*S*)-1,5-dimethylhex-4-en-1-yl]-3-methylcyclohex-2-en-1-one	$C_{15}H_{23}ClO$	$CDCl_3$	[33]



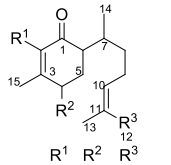
9-4-1



	R^1	R^2
9-4-2	OH	Me
9-4-3	OH	H
9-4-4	CHO	H



9-4-5 $\Delta^{7(14)}$
9-4-6 $\Delta^{7(8)}$
9-4-7 $\Delta^{7(14)}, \Delta^{11}$
9-4-8 $\Delta^{7(8)}, \Delta^{11}$



	R^1	R^2	R^3
9-4-9	H	OH	Me
9-4-10	H	OH	CHO
9-4-11	H	OH	CH_2OH
9-4-12	Cl	H	Me

Table 9-4-2: ^{1}H NMR spectroscopic data of bisabolane-type sesquiterpenoids **9-4-1**~**9-4-6**.

H	9-4-1	9-4-2	9-4-3	9-4-4	9-4-5	9-4-6
2		6.92 br d(8.1)	7.06 d(8.3)	7.39 d(8.2)	7.33 d(8.2)	7.34 d(8.2)
3	6.40 s	6.68 d(8.1)	6.72 d(8.3)	7.81 d(8.2)	7.01 d(7.9)	7.04 d(8.2)
4						
5			6.72 d(8.3)	7.81 d(8.2)	7.01 d(7.9)	7.04 d(8.2)
6	6.83 s	6.96 br s	7.06 d(8.3)	7.39 d(8.2)	7.33 d(8.2)	7.34 d(8.2)
7	2.84 d(6.0)	3.23 m	3.26 m	3.45 m		

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Table 9-4-2 (continued)

H	9-4-1	9-4-2	9-4-3	9-4-4	9-4-5	9-4-6
8	1.51~1.55 m	2.69 dd(15.4, 6.8)	2.69 dd(15.4, 6.2)	2.76 dd(16.2, 6.7)	2.44 t(7.5)	5.84 br t(6.9)
	1.85~1.87 m	2.61 dd(15.4, 7.7)	2.60 dd(15.4, 8.1)	2.68 dd(16.2, 7.6)		
9	2.43~2.49 m 2.58~2.61 m				1.40~1.50 m	2.14 q(7.6)
10		6.03 s	6.03 s	6.02 s	1.16 q(6.9)	1.28 q(6.9)
11	2.62~2.65 m				1.40~1.50 m	1.48~1.60 m
12	1.12 d(6.6)	1.86 s	1.86 s	1.87 s	0.82 d(6.6)	0.88 d(6.9)
13	1.12 d(6.6)	2.10 s	2.09 s	2.10 s	0.82 d(6.6)	0.88 d(6.9)
14	1.24 d(7.2)	1.22 d(6.9)	1.24 d(6.9)	1.29 d(6.9)	5.05 d(1.3) 5.34 d(1.6)	1.96 s
15	2.18 s	2.22 s		9.97 s	2.12 s	2.16 s
4-OH		5.01 br s	5.47 br s			

Table 9-4-3: ^{1}H NMR spectroscopic data of bisabolane-type sesquiterpenoids **9-4-7**~**9-4-12**.

H	9-4-7	9-4-8	9-4-9	9-4-10	9-4-11	9-4-12
2	7.31 d(8)	7.32 d(8)	5.84 q(1.4)	5.83 d(1.4)	5.82 d(1.3)	
3	7.00 d(8)	7.03 d(8)				
4			4.34 br d(3.0)	4.32 br s	4.30 t(3.9)	2.52 m
5	7.00 d(8)	7.03 d(8)	1.90~2.10	2.00~2.10	1.98~2.08	1.81 m
			1.90~2.10	2.00~2.10	1.98~2.08	1.93 m
6	7.31 d(8)	7.32 d(8)	2.58 ddd (9.9, 5.5, 4.5)	2.60 ddd (10.2, 5.1, 5.1)	2.60 ddd (9.2, 7.2, 4.1)	2.34 m
7			2.30 m	2.35 m	2.32 m	2.32 m
8	2.45 t(7)	5.82 t(8)	2.00~2.10	1.90~2.10	1.95~2.15	1.29 dd(7.6, 7.6)
			2.00~2.10	1.90~2.10	1.95~2.15	
9	1.58 m	2.26 q(7)	2.10~2.15	1.90~2.15	1.98~2.08	1.98 m, 2.01 m
10	1.96 t(7)	2.06 t(8)	5.11 tq(7.2, 1.4)	6.48 tq(7.2, 1.4)	5.43 tq(6.5, 1.6)	5.10 tt(7.2, 1.3)
12	4.76 s, 4.77 s	4.81 s, 4.82 s	1.61 q(1.4)	1.74 s	1.65 s	1.68 s
13	1.58 s	1.65 s	1.69 q(1.4)	9.38 s	3.97 s	1.60 s
14	5.03 s, 5.32 s	1.93 s	0.83 d(6.8)	0.87 d(6.8)	0.80 d(6.8)	0.82 d(6.4)
15	2.12 s	2.16 s	2.06 d(1.4)	2.04 br s	2.02 d(1.3)	2.11 s

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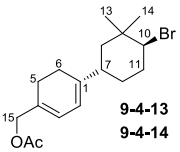
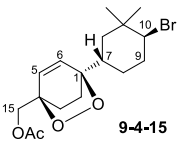
Table 9-4-4: Compounds, MFs, and test solvents of majapolan-type sesquiterpenoids **9-4-13**~**9-4-16**.

No.	Compounds	MFs	Test solvents	References
9-4-13	tiomanene	$C_{17}H_{25}O_2Br$	$CDCl_3$	[34]
9-4-14	acetylmajapolene B	$C_{17}H_{23}O_2Br$	$CDCl_3$	[34]
9-4-15	(1*R*,4*R*,7*S*,10*S*)-(–)-acetylmajapolene	$C_{17}H_{25}O_4Br$	$CDCl_3$	[35]
9-4-16	(1*S*,4*S*,7*S*,10*S*)-(–)-acetylmajapolene	$C_{17}H_{25}O_4Br$	$CDCl_3$	[35]



9-4-13
9-4-14 Δ^5



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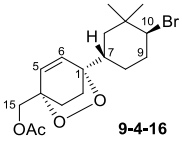

9-4-16

Table 9-4-5: ^{1}H NMR spectroscopic data of majapolan-type sesquiterpenoids **9-4-13**~**9-4-16**.

H	9-4-13	9-4-14	9-4-15	9-4-16
2	5.62 d(5.4)	7.18 d(8.3)	6.54 s	6.54 s
3	5.88 d(5.4)	7.28 d(8.3)	6.54 s	6.54 s
5	2.10 m	7.28 d(8.3)	2.14 ddd(12.6, 9.3, 3.1) 1.52 ddd(12.2, 12.2, 3.1)	2.13 ddd(12.4, 9.1, 2.8) 1.51 ddd(12.1, 12.1, 2.8)
6	2.14 m	7.18 d(8.3)	2.05 ddd(12.7, 9.3, 3.3) 1.45 ddd(12.2, 12.2, 3.1)	2.06 ddd(12.4, 9.3, 2.8) 1.45 ddd(12.0, 12.0, 2.9)
7	2.25 dddd (13.6, 13.6, 3.4, 3.4)	2.84 dddd (12.6, 12.6, 3.4, 3.4)	1.93 dddd (12.7, 12.7, 3.2, 3.1)	1.94 dddd (12.8, 12.7, 3.3, 3.2)
8	1.72 m 1.26 dd(13.6, 13.6)	1.84 ddd(12.6, 3.0, 3.0) 1.52 dd(12.6, 12.6)	1.84 ddd(13.5, 2.9, 2.8) 1.22 dd(13.2, 13.2)	1.76 ddd(13.5, 3.0, 3.0) 1.27 dd(13.1, 13.1)
10	3.94 dd(12.7. 4.4)	4.04 dd(12.6, 4.4)	3.94 dd(12.6, 4.2)	3.93 dd(12.6, 4.3)
11	2.19 m 2.16 m	2.26 m 2.16 dddd (12.9, 12.9, 12.6, 3.9)	2.23 dddd (13.3, 3.7, 3.7, 3.4) 2.03 dddd(13.2, 13.2, 13.2, 3.9)	2.21 dddd (13.4, 3.7, 3.7, 3.4) 2.01 dddd(13.1, 13.1, 13.1, 4.0)
12	1.75 m 1.29 m	1.88 m 1.53 m	1.79 ddddd(13.2, 3.3, 3.3, 3.3, 3.3) 1.26 dddd(13.1, 13.1, 13.1, 3.9)	1.86 ddddd(13.3, 3.3, 3.3, 3.3, 3.3) 1.24 dddd(13.1, 13.1, 13.1, 3.9)
13	1.07 s	1.09 s	1.07 s	1.08 s
14	1.08 s	1.16 s	1.05 s	1.06 s

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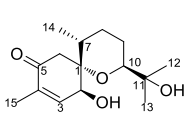
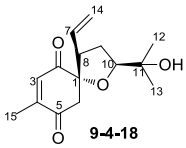
Table 9-4-5 (continued)

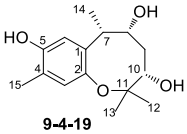
H	9-4-13	9-4-14	9-4-15	9-4-16
15	4.54 s	5.07 s	4.33 d(12.5), 4.21 d(12.5)	4.33 d(12.5), 4.21 d(12.5)
OAc	2.08 s	2.09 s	2.11 s	2.11 s

Table 9-4-6: Compounds, MFs, and test solvents of heliannane-type sesquiterpenoids **9-4-17**~**9-4-21**.

No.	Compounds	MFs	Test solvents	References
9-4-17	heliespirone B	$C_{15}H_{24}O_4$	$CDCl_3$	[36]
9-4-18	heliespirone C	$C_{15}H_{20}O_4$	$CDCl_3$	[36]
9-4-19	heliannuol L	$C_{15}H_{22}O_4$	$CDCl_3$	[37]
9-4-20	helibisabonol A	$C_{15}H_{24}O_4$	CD_3COCD_3	[37]
9-4-21	helibisabonol B	$C_{15}H_{22}O_4$	CD_3COCD_3	[37]







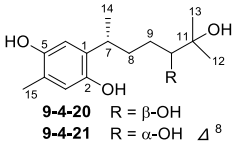


Table 9-4-7: ^{1}H NMR spectroscopic data of heliannane-type sesquiterpenoids **9-4-17**~**9-4-21**.

H	9-4-17	9-4-18	9-4-19	9-4-20	9-4-21
2	4.48 dt(4.8, 2)				
3	6.60 dt(4.8, 1.4)	6.63 q(1.5)	6.77 s	6.51 s	6.52 s
6	3.09 d(16.4) 2.44 d(16.4)	2.95 d(16.2) 2.83 d(16.2)	6.56 s	6.59 s	6.49 s
7	2.05 ddt (13.4, 4.1, 6.9)	5.61 ddd (16.4, 10.5, 8.5)	3.49 dq(7.5, 3.5)	3.06 ddq (7.6, 7.0, 5.1)	3.70 dq(6.6, 6.6)
8	*α* 1.46 dddd (13.4, 13.3, 12.5, 3.5) *β* 1.64 dddd (4.1, 13.3, 3.9, 2.9)	3.26 br ddd (12.2, 10.5, 7.1)	4.32 ddd (9.0, 6.0, 3.5)	1.74 dddd (12.4, 9.8, 7.0, 5.5) 1.55 dddd (12.4, 8.7, 7.6, 5.8)	5.81 dd(15.5, 6.6)
9	*α* 1.60 dddd (3.5, 2.9, 12.5, 2.3)	*α* 2.04 ddd (12.2, 7.1, 5.1)	2.35 ddd (14.3, 6.1, 6.0)	1.45 dddd (13.1, 8.7, 5.5, 1.4)	5.46 dd(15.5, 7.7)

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Table 9-4-7 (continued)

H	9-4-17	9-4-18	9-4-19	9-4-20	9-4-21
	β 1.37 dddd (12.5, 3.9, 12.5, 11.7)	*β* 1.92 ddd (12.2, 12.2, 10.7)	1.62 ddd (14.3, 9.0, 2.5)	1.23 m	
10	3.26 dd(11.7, 2.3)	3.95 dd(10.7, 5.1)	3.70 br dd(6.1, 2.5)	3.66 dd(4.9, 1.4)	3.78 d(7.7)
12	1.11 s	1.12 s	1.15 s	1.04 s	1.07 s
13	1.09 s	1.23 s	1.13 s	1.03 s	1.02 s
14	0.82 d(6.9)	5.12 dd(8.5, 1.1) 5.09 dd(16.4, 1.1)	1.21 d(7.5)	1.09 d(5.1)	1.26 d(6.6)
15	1.75 dd(2, 1.4)	1.98 d(1.5)	2.18 s	2.04 s	2.1 s

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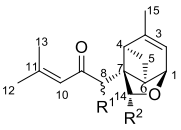
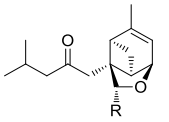
9.5 Bergamotane-, campherenane-, isocampherenane-, and santalane-type sesquiterpenoids

Table 9-5-1: Compounds, MFs, and test solvents of bergamotane-type sesquiterpenoids **9-5-1**~**9-5-6**.

No.	Compounds	MFs	Test solvents	References
9-5-1	clavigerin A	$C_{19}H_{24}O_6$	$CDCl_3$	[38]
9-5-2	methoxy clavigerin B	$C_{16}H_{22}O_3$	$CDCl_3$	[38]
9-5-3	ethoxy clavigerin B	$C_{17}H_{24}O_3$	$CDCl_3$	[38]
9-5-4	clavigerin B	$C_{17}H_{22}O_4$	$CDCl_3$	[39]
9-5-5	methoxy clavigerin C	$C_{16}H_{24}O_3$	$CDCl_3$	[38]
9-5-6	clavigerin C	$C_{17}H_{24}O_4$	$CDCl_3$	[39]



	R^1	R^2
9-5-1	OAc	OAc
9-5-2	H	OMe
9-5-3	H	OEt
9-5-4	H	OAc



9-5-5 R = OMe
9-5-6 R = OAc

Table 9-5-2: ^{1}H NMR spectroscopic data of bergamotane-type sesquiterpenoids **9-5-1**~**9-5-6**.

H	9-5-1	9-5-2	9-5-3	9-5-4	9-5-5	9-5-6
1	4.88 dd(5, 4)	4.74 t(5)	4.73 t(5)	4.81 dd(5, 4)	4.73 dd(5, 4.8)	4.80 dd(5, 4)
2	5.50 br m	5.42 br m	5.41 br m	5.49 br m	5.41 br m	5.48 br m
4	2.40 td(6, 2)	2.43 td(6, 2)	2.45 td(6, 2)	2.43 td(6, 2)	2.39 td(5.7, 1.8)	2.3 m
5	2.65 dt(9.5, 6)	2.35 ddd(10, 6, 5)	2.34 ddd(10, 6, 5)	2.38 dt(9, 6)	1.34 d(9), 2.32 m	1.39 d(8), 2.35 m
	1.46 d(9.5)	1.33 d(9)	1.33 d(9)	1.39 d(9.0)		
6	3.28 q(6)	2.50 br q(5)	2.51 br q(5)	2.59 br q(5)	2.49 br q(5.5)	2.56 br q(6)
8	5.58 s	3.07 d(18)	3.09 d(18)	3.07 d(18)	3.04 d(17.8)	3.06 d(18)
		2.77 d(18)	2.76 d(18)	2.91 d(18)	2.69 d(17.8)	2.89 d(18)
10	6.12 br m	6.06 br m	6.08 br m	6.07 br m	2.2~2.3 m	2.30 m
11					2.13 m	2.12 m
12	1.93 s	1.87 d(1)	1.87 d(1)	1.88 d(1)	0.91 d(6.6)	0.90 d(7)
13	2.17 s	2.10 d(1)	2.10 d(1)	2.09 d(1)	0.91 d(6.6)	0.91 d(7)
14	5.86 s	4.71 s	4.77 s	5.93 s	4.65 s	5.90 s
15	1.81 d(2)	1.81 d(2)	1.81 d(2)	1.82 d(2)	1.80 d(2)	1.80 d(1)
14*R*	1.91 s	3.32 s	3.71 dq(9.5, 7) 3.37 dq(9.5, 7) 1.05 t(7)	1.91 s	3.30 s	1.95 s
8*R*	2.18 s					

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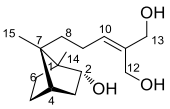
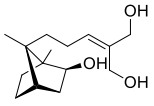
Table 9-5-3: Compounds, MFs, and test solvents of campherenane-type sesquiterpenoids **9-5-7**~**9-5-9**.

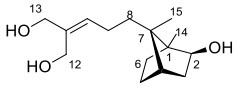
No.	Compounds	MFs	Test solvents	References
9-5-7	(2*R*,7*R*)-2,12,13-trihydroxy-10-campherene	$C_{15}H_{26}O_3$	$CDCl_3$	[40]
9-5-8	(2*S*,7*R*)-2,12,13-trihydroxy-10-campherene	$C_{15}H_{26}O_3$	$CDCl_3$	[40]
9-5-9	(2*S*,7*S*)-2,12,13-trihydroxy-10-campherene	$C_{15}H_{26}O_3$	$CDCl_3$	[40]



9-5-7



9-5-8



9-5-9

Table 9-5-4: ^{1}H NMR spectroscopic data of campherenane-type sesquiterpenoids **9-5-7**~**9-5-9**.

H	9-5-7	9-5-8	9-5-9
2	4.06 ddd(9.6, 3, 1.8)	3.64 dd(7.8, 3.6)	3.64 dd(7.2, 4.2)
3β	2.17 ddd(13.2, 9.6, 4.8)	1.65 ddd(13.2, 4.2, 3.6)	1.72 ddd(13.2, 4.2, 3.6)
3α	0.99 dd(13.2, 3.0)	1.75 dd(13.2, 7.8)	1.74 dd(13.2, 7.2)
4	1.79 t(4.8)	1.85 br t(4.2)	1.87 br t(3.6)
5β	1.68 ddd(13.2, 9.6, 4.8)	1.61 dd(11.4, 3.6)	1.55 m
5α	1.26 ddd(13.2, 8.4, 3)	1.02 ddd(11.4, 9.6, 4.2)	1.05 m
6β	1.25 dddd(13.2, 9.6, 3, 1.8)	1.51 dt(12, 4.2)	1.54 m
6α	1.88 ddd(13.2, 8.4, 4.8)	0.93 ddd(12, 9.6, 3.6)	0.95 m
8	1.36 dt(13.2, 4.8)	1.93 dt(13.2, 4.8)	1.30 dt(12.6, 4.8)
	1.13 dt(13.2, 4.8)	1.13 dt(13.2, 4.8)	1.09 dt(12.6, 4.8)
9	2.15 ddd(12.6, 7.8, 4.8)	2.09 ddd(13.2, 7.8, 4.8)	2.22 ddd(12.6, 7.8, 4.8)
	1.97 ddd(12.6, 7.8, 4.8)	2.02 ddd(13.2, 7.8, 4.8)	1.99 ddd(12.6, 7.8, 4.8)
10	5.56 br t(7.8)	5.59 br t(7.8)	5.58 br t(7.8)
12	4.32 br s	4.30 d(12.6), 4.24 d(12.6)	4.34 br s
13	4.21 br s	4.15 br s	4.22 br s
14	0.85 s	0.90 s	0.91 s
15	0.89 s	0.84 s	1.04 br s

Table 9-5-5: Compounds, MFs, and test solvents of isocampherenane-type sesquiterpenoids **9-5-10**~**9-5-12**.

No.	Compounds	MFs	Test solvents	References
9-5-10	11-hydroxy-isocampheren-9-ene	$C_{15}H_{26}O_2$	$CDCl_3$	[41]
9-5-11	10ζ-hydroxy-isocampheren-11-ene	$C_{15}H_{26}O_2$	$CDCl_3$	[41]
9-5-12	isocampheren-11-ene-10-one	$C_{15}H_{24}O_2$	$CDCl_3$	[41]

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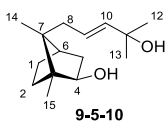
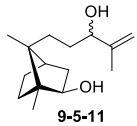
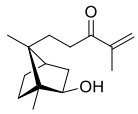


9-5-10



9-5-11



9-5-12

Table 9-5-6: ^{1}H NMR spectroscopic data of isocampherenane-type sesquiterpenoids **9-5-10**~**9-5-12**.

H	9-5-10	9-5-11	9-5-12
1	1.02 m, 1.62 m	1.01 m, 1.62 m	1.30 m, 1.35 m
2	*α* 0.97 m, *β* 1.50 m	*α* 0.95 m, *β* 1.51 m	*α* 0.97 m, *β* 1.53 m
4	3.67 t(6.0)	3.63 dd(7.7, 4.2)	3.66 t(6.0)
5	1.74 m	1.69 m, 1.74 m	1.66 m, 1.76 m
6	1.82 m	1.83 m	1.83 m
8	1.80 m, 2.70 dd(14.8, 5.0)	1.00 m, 2.01 m	1.42 m, 2.28 m
9	5.64 m	1.47 m, 1.64 m	2.66 m
10	5.64 m	4.00 t(6.4)	
12	1.32 s	4.83 d(1.5), 4.94 s	5.76 s, 5.97 s
13	1.32 s	1.73 s	1.87 s
14	0.81 s	0.82 s	0.84 s
15	0.93 s	0.92 s	0.94 s

Table 9-5-7: Compounds, MFs, and test solvents of santalane-type sesquiterpenoids **9-5-13**~**9-5-27**.

No.	Compounds	MFs	Test solvents	References
9-5-13	(2*R*,3*R*)-13-hydroxysandalnol	$C_{15}H_{26}O_3$	$CDCl_3$	[40]
9-5-14	(2*R*∗,3*R*∗)-10(*E*)-13-sandalnol-13-al	$C_{15}H_{24}O_2$	$CDCl_3$	[40]
9-5-15	(2*S*∗,3*R*∗)-13-hydroxyneosandalnol	$C_{15}H_{26}O_3$	$CDCl_3$	[40]
9-5-16	9(*E*)-11-hydroxy-*β*-santalol	$C_{15}H_{24}O_2$	$CDCl_3$	[42]
9-5-17	10(*E*)-*β*-santalic acid	$C_{15}H_{22}O_2$	$CDCl_3$	[42]
9-5-18	9(*E*)-11-hydroxy-*α*-santalol	$C_{15}H_{24}O_2$	$CDCl_3$	[42]
9-5-19	11-hydroperoxy-*α*-santal-9-ene	$C_{15}H_{24}O_2$	$CDCl_3$	[41]
9-5-20	11-hydroxy-*α*-santal-9-ene	$C_{15}H_{24}O$	$CDCl_3$	[41]
9-5-21	10*ζ*-hydroperoxy-*α*-santal-11-ene	$C_{15}H_{24}O_2$	$CDCl_3$	[41]
9-5-22	10*ζ*-hydroperoxy-*α*-santal-11-ene	$C_{15}H_{24}O_2$	$CDCl_3$	[41]
9-5-23	10*ζ*-hydroxy-*α*-santal-11-ene	$C_{15}H_{24}O$	$CDCl_3$	[41]
9-5-24	10*ζ*-hydroxy-*α*-santal-11-ene	$C_{15}H_{24}O$	$CDCl_3$	[41]
9-5-25	*α*-santal-10-ene	$C_{15}H_{24}$	$CDCl_3$	[41]
9-5-26	*α*-santal-11-en-10-one	$C_{15}H_{22}O$	$CDCl_3$	[41]
9-5-27	norecasantalic acid	$C_{11}H_{16}O_2$	$CDCl_3$	[41]

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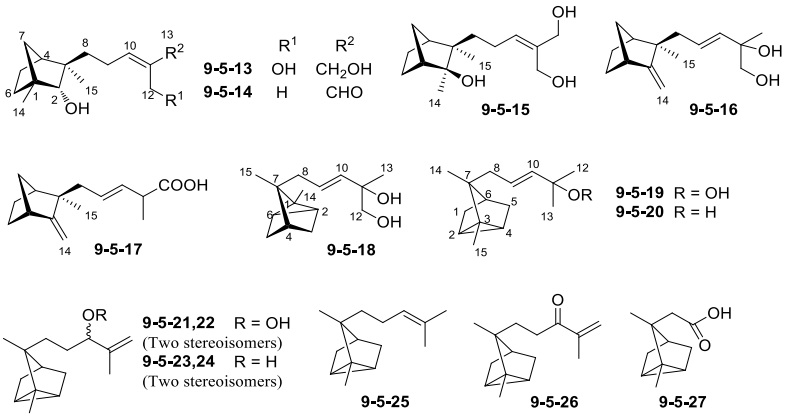

Table 9-5-8: ^{1}H NMR spectroscopic data of santalane-type sesquiterpenoids **9-5-13**~**9-5-17**.

H	9-5-13	9-5-14	9-5-15	9-5-16	9-5-17
1			1.89 m	2.68 d(4.2)	2.68 br d(4.2)
2	3.29 d(1.8)	3.27 d(1.8)			
4	1.76 br d(3)	1.84 br d(3.6)	1.82 br d(1.8)	2.06 br s	2.11 br d(4.2)
5	1.66 dddd(12, 9, 6, 3)	1.66 m	*β* 1.55 dddd(12.6, 9.6, 7.2, 1.8) *α* 1.25 dddd (12.6, 9.6, 6, 3.6)	*α* 1.41 m, *β* 1.62 m	*α* 1.42 m, *β* 1.69 m
6*β*	1.04 ddd (11.4, 3, 1.8)	1.46 m	1.42 dddd (12, 9.6, 7.2, 3.6)	1.65 m	1.68 m
6*α*	1.59 ddd (11.4, 9, 6)	1.08 m	1.34 dddd (12, 9.6, 6, 2.4)	1.23 m	1.26 m
7	1.42 m 1.14 dd(10.2, 1.2)	1.43 m 1.18 dd(10.2, 1.8)	2.01 m 1.06 br d(10.2)	1.69 m 1.19 d(9.6)	1.66 m 1.20 m
8	1.35 ddd(13.8, 10.2, 6) 1.41 m	1.29 m	1.31 m, 1.53 m	1.98 m, 2.15 m	1.32 m, 1.49 m
9	2.09 m, 2.15 m	2.33 br dd(13.2, 7.2) 2.32 br dd(13.2, 7.2)	2.18 br dd(12.2, 6.6) 2.05 br dd(12.2, 6.6)	5.78 m	2.18 m
10	5.57 br t(7.2)	6.49 ddt(1.2, 2.4, 7.2)	5.59 br t(7.2)	5.49 m	6.88 m
12	4.34 d(12) 4.28 d(12)	1.75 m	4.34 d(12) 4.19 d(12)	3.50 d(10.8) 3.43 d(10.8)	1.84 d(0.6)
13	4.20 br s	9.39 s	4.18 s	1.28 s	
14	1.08 s	1.10 s	1.21 s	4.45 s, 4.77 s	4.47 s, 4.76 s
15	0.85 s	0.90 s	0.89 s	1.02 d(1.8)	1.06 s

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Table 9-5-9: ^{1}H NMR spectroscopic data of santalane-type sesquiterpenoids **9-5-18**~**9-5-22**.

H	9-5-18	9-5-19	9-5-20	9-5-21	9-5-22
1		*α* 1.06 m, *β* 1.61 m	*α* 1.06 m, *β* 1.60 m	1.06 m, 1.59 m	1.06 m, 1.59 m
2	0.87 m	0.88 m	0.86 m	0.83 m	0.84 m
3	*α*1.05 dd(10.6, 6.0) *β*1.63 td(4.8, 1.8)				
4	1.53 br s	0.88 m	0.84 m	0.83 m	0.84 m
5*α*	1.06 dd(10.6, 6.0)	1.06 m	1.03 m	1.03 m	1.02 m
5*β*	1.61 br d(10.8)	1.63 m	1.64 m	1.56 m	1.49 m
6	0.87 m	1.52 m	1.53 m	1.53 m	1.53 m
8	2.00 dd(14.4, 7.8) 1.89 dd(13.8, 7.8)	1.95 dd(13.9, 7.5) 1.85 dd(13.9, 7.5)	1.97 dd(15.9, 4.6) 1.84 dd(15.9, 4.0)	1.07 m, 1.31 m	1.15 m, 1.18 m
9	5.73 dt(15.8, 7.8)	5.66 dt(15.7, 7.5)	5.59 m	1.43 m, 1.46 m	1.35 m, 1.54 m
10	5.49 dt(15.6, 1.2)	5.52 d(15.7)	5.59 m	4.25 t(6.7)	4.25 t(6.9)
12	3.48 dd(10.8, 1.2) 3.42 d(10.8)	1.34 s	1.31 s	5.03 t(1.5) 5.02 d(0.7)	5.04 t(1.6) 5.02 s
13	1.27 s	1.34 s	1.31 s	1.73 s	1.73 s
14	1.02 s	0.81 s	0.80 s	0.79 s	0.81 s
15	0.81 s	1.02 s	1.01 s	0.99 s	1.00 s
OOH		7.29 s		7.77 s	7.75 s

Table 9-5-10: ^{1}H NMR spectroscopic data of santalane-type sesquiterpenoids **9-5-23**~**9-5-27**.

H	9-5-23	9-5-24	9-5-25	9-5-26	9-5-27
1	1.05 m	1.06 m	1.05 m	1.08 m	1.11 m
	1.59 m	1.60 m	1.61 m	1.61 m	1.66 m
2	0.83 m	0.83 m	0.82 m	0.86 m	0.89 m
4	0.83 m	0.83 m	0.82 m	0.86 m	0.89 m
5*α*	1.02 m	1.03 m	1.03 m	1.04 m	1.13 m
5*β*	1.57 m	1.52 m	1.59 m	1.57 m	1.71 m
6	1.54 m	1.55 m	1.59 m	1.54 m	1.91 m
8	1.02 m, 1.29 m	1.10 m, 1.18 m	1.13 m, 1.23 m	1.47 m, 1.50 m	2.27 d(14.5) 2.20 d(14.5)
9	1.44 m, 1.52 m	1.48 m, 1.52 m	1.88 m, 1.90 m	2.61 m	
10	3.99 t(6.5)	3.99 t(6.5)	5.11 t(7.2)		
12	4.83 t(1.6), 4.92 t(1.0)	4.83 t(1.5), 4.92 t(0.9)	1.67 s	5.76 t(0.7), 5.95 s	
13	1.72 s	1.72 s	1.60 s	1.88 s	
14	0.81 s	0.82 s	0.83 s	0.83 s	0.99 s
15	1.00 s	1.00 s	1.00 s	1.02 s	1.02 s

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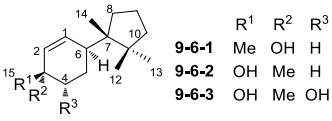
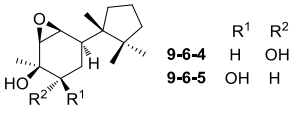
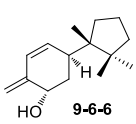
9.6 Cuparane-, cyclolaurane-, gymnomitrane-, herbertane-, laurane-, and trichothecane-type sesquiterpenoids

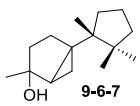
Table 9-6-1: Compounds, MFs, and test solvents of cuparane-type sesquiterpenoids **9-6-1**~**9-6-10**.

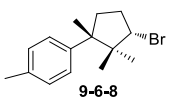
No.	Compounds	MFs	Test solvents	References
9-6-1	infuscol A	$C_{15}H_{26}O$	$CDCl_3$	[43]
9-6-2	infuscol B	$C_{15}H_{26}O$	C_6D_6	[43]
9-6-3	infuscol E	$C_{15}H_{26}O_2$	$CDCl_3$	[43]
9-6-4	infuscol C	$C_{15}H_{26}O_3$	$CDCl_3$	[43]
9-6-5	infuscol D	$C_{15}H_{26}O_3$	$CDCl_3$	[43]
9-6-6	(+)-*δ*-cuprenen-4*α*-ol	$C_{15}H_{24}O$	$CDCl_3$	[43]
9-6-7	*ent*-cyclopropanecuparenol	$C_{15}H_{26}O$	$CDCl_3$	[43]
9-6-8	(+)-*α*-isobromocuparene	$C_{15}H_{21}Br$	$CDCl_3$	[44]
9-6-9	(–)-*α*-bromocuparene	$C_{15}H_{21}Br$	$CDCl_3$	[44]
9-6-10	–	$C_{15}H_{19}BrO$	–	[45]

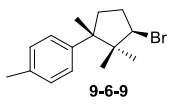












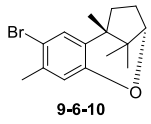


Table 9-6-2: ^{1}H NMR spectroscopic data of cuparane-type sesquiterpenoids **9-6-1**~**9-6-5**.

H	9-6-1	9-6-2	9-6-3	9-6-4	9-6-5
1	5.50 dt(10.6, 1.8)	5.53 ddd(10.2, 1.9, 1.4)	5.75 ddd(10.4, 2.5, 1.4)	3.33 dd(4.0, 1.1)	3.30 d-like(3.8)
2	5.60 ddd(10.6, 2.6, 1.8)	5.64 ddd(10.2, 2.5, 1.9)	5.64 ddd(10.4, 2.7, 1.6)	2.92 dd(4.0, 1.1)	2.98 d(3.8)
4	1.54~1.76 m	*α*1.35 ddd(13.2, 13.2, 4.7)	3.78 br s	3.57 br s	3.14 ddd(11.8, 10.4, 3.8)
	1.82~1.91 m	*β*1.80 dddd (13.2, 3.6, 3.6, 1.9)			
5	1.48 m	1.55~1.61 m	*α*1.90 dddd (13.7, 6.3, 5.2, 1.1)	1.57~1.69 m	1.34 q(12.1)

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Table 9-6-2 (continued)

H	9-6-1	9-6-2	9-6-3	9-6-4	9-6-5
	1.82~1.91 m		*β*1.96 ddd(13.7, 9.3, 2.7)	1.71~1.87 m	1.61~1.68 m
6	2.25 m	2.01 tt(8.0, 8.0, 2.5)	2.45 ddd(10.4, 6.3, 2.7)	2.31 br dd(10.3, 6.2)	2.02 br dd(11.8, 3.8)
8	1.54~1.76 m	1.49~1.54 m 1.55~1.61 m	*α* 1.79 br q *β* 1.69 ddd (12.6, 9.3, 3.6)	1.71~1.87 m	1.76~1.78 m
9	1.54~1.76 m	1.49~1.54 m	1.57~1.65 m	1.57~1.69 m	1.61~1.68 m
10	1.35 ddd(11.7, 11.7, 8.4)	*α* 1.31 m	*α* 1.38 ddd (12.4, 8.8, 3.6)	*α* 1.38 br q	1.41 dd(12.6, 6.3)
	1.54~1.76 m	*β* 1.66 m	*β* 1.72 br q	*β* 1.76 m	1.74 dd(12.6, 9.6)
12	0.98 s	0.95 s	1.02 s	1.00 s	1.00 s
13	0.95 s	0.84 s	0.98 s	0.97 s	0.96 s
14	0.75 s	0.72 s	0.80 s	0.97 s	0.96 s
15	1.27 s	1.25 s	1.33 s	1.37 s	1.40 d(0.5)
OH				2.58 s	2.44 d(10.4), 2.50 s

Table 9-6-3: ^{1}H NMR spectroscopic data of cuparane-type sesquiterpenoids **9-6-6**~**9-6-10**.

H	9-6-6	9-6-7	9-6-8	9-6-9	9-6-10
1	5.81 dd(10.2, 1.4)	*α* 1.62~1.70 m *β* 2.12 ddd(12.8, 8.8, 1.8)	7.25 d(7.2)	7.07 s	7.18 s
2	6.13 dd(10.2, 3.0)	1.31 m, 1.47~1.62 m	7.11d(8.2)	7.07 s	
4	4.41 s	0.88~0.93 m	7.11d(8.2)	7.07 s	6.56 s
5	*α* 2.13 dddd(13.5, 3.8, 3.8, 1.4) *β* 1.56 ddd(13.7, 11.0, 2.7)	*α* 0.20 dd(5.5, 3.7) *β* 0.97 m	7.25 d(7.2)	7.07 s	
6	2.64 br d				
8	*α* 1.83 br q *β* 1.75 ddd(13.2, 9.2, 4.1)	0.88~0.93 m 1.47~1.61 m	1.58 m, 2.69 m	1.94 m, 2.26 m	1.88 m
9	1.60~1.68 m	1.47~1.61 m, 1.62~1.70 m	2.18 m, 2.50 m	2.18 m, 2.49 m	2.09 m
10	*α* 1.39 ddd(12.1, 8.8, 3.0) *β* 1.72 br t	1.38 m, 1.62~1.70 m	4.44 dd(9.2, 9.2)	4.04 dd(9.9, 8.9)	4.10 d(5.1)
12	1.00 s	0.96 s	0.63 s	0.59 s	0.89 s
13	1.01 s	1.00 s	1.08 s	1.06 s	0.97 s
14	0.78 s	1.06 s	1.27 s	1.40 s	1.22 s
15	4.92 s, 5.01 s	1.30 s	2.32 s	2.29 s	2.26 s

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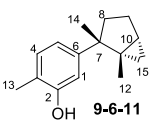
Table 9-6-4: Compounds, MFs, and test solvents of cyclolaurane-type sesquiterpenoids **9-6-11**~**9-6-14**.

No.	Compounds	MFs	Test solvents	References
9-6-11	cyclolauren-2-ol	$C_{15}H_{20}O$	CD_3COCD_3	[46]
9-6-12	laurentristich-4-ol	$C_{15}H_{18}O_2$	CD_3COCD_3	[46]
9-6-13	–	$C_{15}H_{18}BrIO$	$CDCl_3$	[44]
9-6-14	–	$C_{15}H_{18}Br_2O$	$CDCl_3$	[44]



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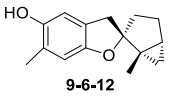

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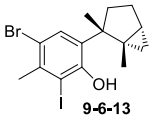

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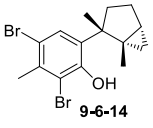

9-6-14

Table 9-6-5: ^{1}H NMR spectroscopic data of cyclolaurane **9-6-11**~**9-6-14**.

H	9-6-11	9-6-12	9-6-13	9-6-14
1	6.95 s			
2		6.41 s		
4	6.96 d(7.5)			
5	6.80 d(7.5)	6.63 s	7.70 s	7.68 s
8*α*	1.37 m	1.45 m	1.19 m	1.22 m
8*β*	1.58 ddd(12.5, 7.5, 7.5)	1.85 dd(14.0, 8.0)	2.20 dd(13.7, 8.2)	2.21 dd(13.4, 7.5)
9*α*	1.58 ddd(12.5, 7.5, 7.5)	1.64 dd(12.0, 7.5)	1.61 dd(12.2, 8.3)	1.61 dd(12.0, 7.9)
9*β*	1.92 m	1.98 m	1.92 dddd(12.2, 11.7, 8.2, 4.4)	1.92 dddd(12.0, 12.0, 7.5, 4.1)
10	1.05 ddd(7.5, 4.0, 4.0)	1.25 ddd(7.5, 4.0, 4.0)	1.09 ddd(7.8, 4.9, 3.9)	1.08 ddd(7.8, 4.9, 3.0)
12	1.20 s	1.06 s	1.28 s	1.28 s
13	2.14 s	2.12 s	2.61 s	2.51 s
14	1.29 s	2.89 d(15.5), 3.27 d(15.5)	1.37 s	1.38 s
15	*α* 0.58 dd(5.0, 4.0)	*α* 0.45 dd(5.0, 4.0)	0.48 dd(7.8, 4.9)	0.47 dd(7.8, 4.9)
	β 0.38 dd(7.5, 5.0)	*β* 0.29 dd(7.5, 5.0)	0.52 dd(4.9, 3.9)	0.51 dd(4.9, 3.0)
OH	7.85 br s	7.41 br s	5.59 s	5.76 s

Table 9-6-6: Compounds, MFs, and test solvents of gymnomitrane-type sesquiterpenoids **9-6-15**~**9-6-24**.

No.	Compounds	MFs	Test solvents	References
9-6-15	(–)-4*β*,5*β*-diacetoxygymnomitr-3(15)-ene	$C_{19}H_{28}O_4$	C_6D_6	[47]
9-6-16	(+)-5*β*-acetoxygymnomitr-3(15)-ene	$C_{17}H_{26}O_2$	C_6D_6	[47]
9-6-17	5(–)-gymnomitr-3(15)-4-diene	$C_{15}H_{22}$	C_6D_6	[47]
9-6-18	(–)-3*β*,15*β*-epoxy-4*β*-acetoxygymnomitrane	$C_{17}H_{26}O_3$	C_6D_6	[47]

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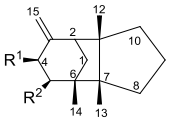
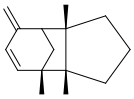
Table 9-6-6 (continued)

No.	Compounds	MFs	Test solvents	References
9-6-19	(–)-3α,15α-epoxy-4β-acetoxygymnomitrane	$C_{17}H_{26}O_3$	C_6D_6	[47]
9-6-20	(–)-15-acetoxygymnomitr-3-ene	$C_{17}H_{26}O_2$	C_6D_6	[47]
9-6-21	(+)-barbatenal	$C_{15}H_{22}O$	C_6D_6	[47]
9-6-22	3-gymnomitren-15-ol	$C_{15}H_{24}O$	$CDCl_3$	[48]
9-6-23	15-*nor*-3-gymnomitrone	$C_{14}H_{22}O$	$CDCl_3$	[48]
9-6-24	gymnomitr-8(12)-en-4-one	$C_{15}H_{22}O$	$CDCl_3$	[49]



	R^1	R^2
9-6-15	OAc	OAc
9-6-16	H	OAc



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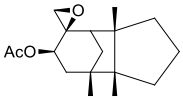

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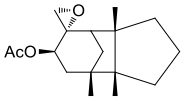

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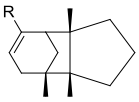
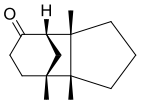


9-6-20 R = CH_2OAc
9-6-21 R = CHO
9-6-22 R = CH_2OH



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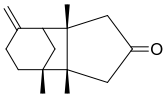

9-6-24

Table 9-6-7: ^{1}H NMR spectroscopic data of gymnomitrane-type sesquiterpenoids **9-6-15**~**9-6-19**.

H	9-6-15	9-6-16	9-6-17	9-6-18	9-6-19
1	1.67~1.72 m 2.10 d(12.0)	1.70~1.75 m 2.05 d(11.7)	1.58 d(10.7) 1.80~1.85 m	1.68~1.80 m 1.89 d(11.4)	1.29 d(11.7) 1.82 ddd(3.2, 5.0, 11.7)
2	2.28 d(4.8)	2.18 d(4.7)	2.29 d(4.4)	1.19 d(4.7)	1.16~1.21 m
4	6.27~6.29 m	2.38 d(18.0) 2.73 ddd(2.5, 5.7, 18.0)	5.97 d(9.5)	5.85 dd(7.6, 11.4)	5.95 dd(7.6, 10.7)
5	5.48 d(4.1)	5.10 d(5.7)	5.55 d(8.8)	1.50~1.58 m 2.04~2.18 m	1.16~1.21 m 2.30 ddd(3.2, 7.6, 13.2)
8	1.01 dd(7.3, 13.6) 2.25~2.32 m	0.89~0.94 m 1.70~1.75 m	1.02~1.08 m 1.80~1.85 m	1.09 dd(6.9, 13.2) 2.04~2.18 m	1.09 dd(6.9, 13.6) 2.17 dt(6.3, 12.9)
9	1.67~1.72 m 1.92~2.04 m	1.64~1.69 m	1.50~1.56 m 1.68~1.74 m	1.68~1.80 m 1.88~1.92 m	1.67~1.75 m 1.91 p(6.9)
10	1.21 dd(6.9, 12.3) 1.92~2.04 m	1.12~1.18 m 1.64~1.69 m	1.17~1.23 m 1.86~1.92 m	1.18 dd(7.6, 14.8) 2.04~2.18 m	1.41 dd(7.6, 13.6) 2.65 dt(6.9, 13.9)
12	0.86 s	0.92 s	0.99 s	0.82 s	0.87 s
13	0.74 s	0.79 s	0.80 s	0.72 s	0.73 s
14	0.78 s	0.83 s	0.87 s	0.73 s	0.74 s
15	4.87 t(2.2) 5.03 t(2.2)	4.68 t(2.2) 4.74 t(2.5)	4.68 br s 4.80 d(2.5)	2.27 d(5.0) 2.60 d(5.0)	2.09 d(5.7) 2.90 d(5.7)
OAc	1.76 s, 1.80 s	1.71 s		1.68 s	1.60 s

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Table 9-6-8: ^{1}H NMR spectroscopic data of gymnomitrane-type sesquiterpenoids **9-6-20**~**9-6-24**.

H	9-6-20	9-6-21	9-6-22	9-6-23	9-6-24
1	1.42 d(9.5)	1.05 d(11.5)	1.93 ddd(10.8, 4.4, 1.0)	2.08 ddd(12.1, 4.5, 2.9)	1.34 d(11.7)
	1.78~1.87 m	1.71 dd(4.6, 11.5)	1.43 d(10.8)	1.70 d(12.1)	1.98 ddd(11.7, 4.9, 3)
2	1.78~1.87 m	2.78 d(4.3)	1.81 d(4.4)	2.21 d(4.5)	2.35 d(4.9)
4	5.41 br s	5.87 br t(3.3)	5.48 m	2.36 m	1.78 ddddd(17.3, 12.7, 7.7, 2.5, 2.5) 2.22 dd(17.3, 7.7)
5	1.78~1.87 m	1.65 dd(3.3, 21.1)	α 2.22 m		1.46 ddd(14, 12.7, 7.9)
	2.10 br d(18.9)	2.04 dd(2.8, 20.1)	β 1.93 br dd (18.8, 3.4)		1.68 ddd(14, 7.9, 3)
8	1.00 dd(6.9, 12.0)	0.85~0.92 m			1.92 dd(20.3, 1.7)
	1.51~1.64 m	1.32~1.45 m			2.66 dd(20.3, 1.7)
9	1.51~1.64 m	1.12~1.21 m 1.32~1.45 m			
10	1.78~1.87 m	1.12~1.21 m			2.02 dd(20.3, 1.7)
	1.14~1.20 m	1.50~1.55 m			2.62 dd(20.3, 1.7)
12	0.94 s	0.97 s	1.00 s	1.07 s	1.19 s
13	0.78 s	0.72 s	0.91 s	0.99 s	1.07 s
14	0.83 s	0.70 s	0.85 s	0.95 s	0.91 s
15	4.51d(8.8)	9.30 s	3.98 m		4.65 dd(2.5, 2.5) 4.68 ddd(2.5, 2.5, 0.6)
OAc	1.70 s				

Table 9-6-9: Compounds, MFs, and test solvents of herbertane-type sesquiterpenoids **9-6-25**~**9-6-34**.

No.	Compounds	MFs	Test solvents	References
9-6-25	13-hydroxy-α-herbertenol	$C_{15}H_{22}O_2$	$CDCl_3$	[50]
9-6-26	14-hydroxy-α-herbertenol	$C_{15}H_{22}O_2$	$CDCl_3$	[50]
9-6-27	15-hydroxy-α-herbertenol	$C_{15}H_{22}O_2$	$CDCl_3$	[50]
9-6-28	12-methoxyherbertenediol	$C_{16}H_{24}O_3$	$CDCl_3$	[50]
9-6-29	herberteneacetal	$C_{15}H_{20}O_2$	$CDCl_3$	[50]
9-6-30	herbertenone A	$C_{15}H_{22}O_2$	$CDCl_3$	[50]
9-6-31	herbertenone B	$C_{15}H_{22}O_2$	$CDCl_3$	[50]
9-6-32	(–)-herbertene-1,12-diol	$C_{15}H_{22}O_2$	$CDCl_3$	[51]
9-6-33	(–)-γ-herbertenol	$C_{15}H_{22}O$	$CDCl_3$	[51]
9-6-34	mastigophoric acid methyl ester	$C_{16}H_{22}O_3$	$CDCl_3$	[52]

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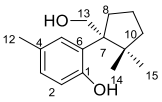

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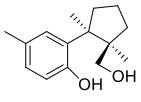

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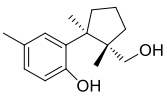

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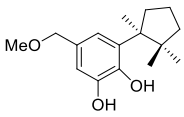

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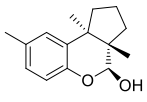

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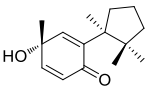

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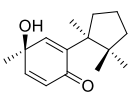

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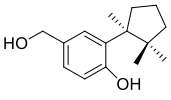

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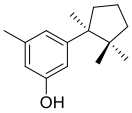

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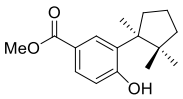

9-6-34

Table 9-6-10: ^{1}H NMR spectroscopic data of herbertane-type sesquiterpenoids **9-6-25**~**9-6-29**.

H	9-6-25	9-6-26	9-6-27	9-6-28	9-6-29
2	6.69 d(8.2)	6.74 d(8.0)	6.76 (8.0)		6.72 d(8.2)
3	6.92 qdd (0.6, 2.1, 8.2)	6.92 qdd (0.8, 2.1, 8.0)	6.92 qdd (0.5, 2.2, 8.0)	6.72 d(1.9)	6.89 qdd (0.7, 2.2, 8.2)
5	7.02 d(2.1)	6.96 d(2.1)	1.47~1.75 m	6.81 d(1.9)	6.79 d(2.2)
8	2.05 m, 2.37 m	1.84 m, 2.45 m	1.47~1.75 m, 2.68 m	1.73 m, 2.61 m	1.61 m, 2.00 m
9	1.82 m	1.93 m	1.47~1.75 m	1.76 m	1.93 m
10	1.52 m, 1.61 m	1.27 m, 1.45 m	1.47~1.75 m	1.53 m, 1.65 m	1.80 m
12	2.27 d(0.6)	2.27 d(0.8)	2.27 d(0.5)	4.34 s	2.26 d(0.7)
13	3.78 d(10.7) 4.40 d(10.7)	1.56 s	1.50 s	1.41 s	1.12 q(0.8)
14	0.86 s	3.28 d(11.3) 3.37 d(11.3)	0.82 s	0.73 s	0.72 q(0.8)
15	1.24 s	1.23 s	3.50 d(11.0) 4.02 d(11.0)	1.17 s	5.67 d(7.7)
OMe				3.37 s	
OH					3.02 d(7.7)

Table 9-6-11: ^{1}H NMR spectroscopic data of herbertane-type sesquiterpenoids **9-6-30**~**9-6-34**.

H	9-6-30	9-6-31	9-6-32	9-6-33	9-6-34
2	6.03 d(9.9)	6.03 d(9.9)	6.64 d(8.0)	6.62 t(2.0)	6.70 d(8.2)
3	6.76 dd(3.0, 9.9)	6.75 dd(3.0, 9.9)	7.05 dd(8.0, 2.0)	6.46 br s	7.77 dd(8.2, 1.9)
5	6.71 qd(0.5, 3.0)	6.69 qd(0.3, 3.0)	7.28 d(2.0)	6.72 br s	8.06 d(1.9)

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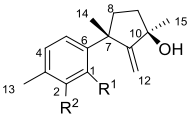
Table 9-6-11 (continued)

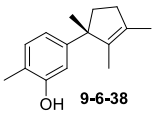
H	9-6-30	9-6-31	9-6-32	9-6-33	9-6-34
8	1.48~1.74 m	1.50~1.75 m	1.76 m, 2.59 m	2.43 ddd(12.5, 9.0, 9.0)	1.80 m
	2.21 m	2.26 m		1.65 m	2.63 m
9	1.48~1.74 m	1.50~1.75 m	1.75 m	1.74 m, 0.82 m	1.80 m
10	1.48~1.74 m	1.50~1.75 m	1.53 m, 1.66 m	1.55 m, 1.67 m	1.56 m, 1.69 m
12	1.46 s	1.46 s	4.57 s	2.27 s	
13	1.25 d(0.5)	1.28 d(0.8)	1.40 s	1.21 s	1.41 s
14	0.72 s	0.72 s	1.17 s	1.05 s	1.20 s
15	1.13 s	1.11 s	0.73 s	0.56 s	0.74 s
OMe					3.87 s
2-OH				4.53 s	

Table 9-6-12: Compounds, MFs, and test solvents of laurane-type sesquiterpenoids **9-6-35**~**9-6-52**.

No.	Compounds	MFs	Test solvents	References
9-6-35	laur-11-en-2,10-diol	$C_{15}H_{20}O_2$	CD_3COCD_3	[46]
9-6-36	laur-11-en-10-ol	$C_{15}H_{20}O$	CD_3COCD_3	[46]
9-6-37	laur-11-en-1,10-diol	$C_{15}H_{20}O_2$	CD_3COCD_3	[46]
9-6-38	10-hydroxyisolaurene	$C_{15}H_{20}O$	$CDCl_3$	[53]
9-6-39	10-hydroxy-epiaplysin	$C_{15}H_{19}BrO_2$	CD_3COCD_3	[54]
9-6-40	10-hydroxy-aplysin	$C_{15}H_{19}BrO_2$	CD_3COCD_3	[54]
9-6-41	10-hydroxy-debromoepiaplysin	$C_{15}H_{20}O_2$	CD_3COCD_3	[54]
9-6-42	epiaplysinol	$C_{15}H_{19}BrO_2$	CD_3COCD_3	[54]
9-6-43	debromoepiaplysinol	$C_{15}H_{20}O_2$	CD_3COCD_3	[54]
9-6-44	debromoaplysin	$C_{15}H_{20}O$	$CDCl_3$	[55]
9-6-45	laureperoxide	$C_{15}H_{19}BrO_3$	$CDCl_3$	[53]
9-6-46	10-bromoisoaplysin	$C_{15}H_{18}Br_2O$	$CDCl_3$	[53]
9-6-47	aplysinol	$C_{15}H_{19}BrO$	$CDCl_3$	[53]
9-6-48	aplysin-9-ene	$C_{15}H_{17}BrO$	CD_3COCD_3	[54]
9-6-49	4-bromo-1,10-epoxylaur-11-ene	$C_{15}H_{17}BrO$	CD_3COCD_3	[46]
9-6-50	–	$C_{15}H_{17}Br_3O$	$CDCl_3$	[44]
9-6-51	laurokomurene A	$C_{15}H_{19}BrO$	$CDCl_3$	[55]
9-6-52	laurokomurene B	$C_{15}H_{20}$	$CDCl_3$	[55]



	R^1	R^2
9-6-35	H	OH
9-6-36	H	H
9-6-37	OH	H



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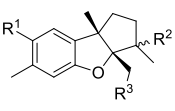

	R^1	R^2	R^3
9-6-39	Br	α-OH	H
9-6-40	Br	β-OH	H
9-6-41	H	α-OH	H

	R^1	R^2	R^3
9-6-42	Br	α-H	OH
9-6-43	H	α-H	OH
9-6-44	H	β-H	H

	R^1	R^2	R^3
9-6-45	Br	β-H	OOH
9-6-46	Br	β-H	Br
9-6-47	Br	β-H	OH

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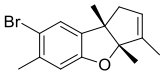

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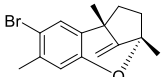

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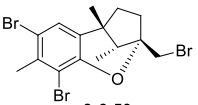

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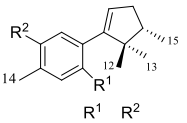

	R^1	R^2
9-6-51	OH	Br
9-6-52	H	H

Table 9-6-13: ^{1}H NMR spectroscopic data of laurane-type sesquiterpenoids **9-6-35**~**9-6-39**.

H	9-6-35	9-6-36	9-6-37	9-6-38	9-6-39
1	6.84 s	7.25 d(8.0)		6.65 d(1.6)	
2		7.07 d(8.0)	6.67 s		6.64 s
4	6.96 d(7.5)	7.07 d(8.0)	6.54 d(8.0)	7.03 d(7.6)	
5	6.75 d(7.5)	7.25 d(8.0)	7.13 d(8.0)	6.74 dd(7.6, 1.6)	7.25 s
8	*α* 1.97 ddd	*α* 2.01 ddd	*α* 2.37 ddd	1.93 ddd	1.63 m
	(13.0, 6.5, 6.5)	(13.0, 6.5, 6.5)	(13.0, 6.5, 6.5)	(12.8, 8.2, 5.7)	1.72 m
	β 1.90 ddd	*β* 1.93 ddd	*α* 1.98 ddd	1.93 ddd	
	(13.0, 7.0, 6.5)	(13.0, 7.0, 6.5)	(13.0, 7.0, 6.5)	(12.8, 9.2, 7.7)	
9	*α* 1.58 ddd	*α* 1.58 ddd	*α* 1.59 ddd	2.29 m	1.56 m
	(13.0, 6.5, 7.0)	(13.0, 7.0, 6.5)	(13.0, 7.0, 6.5)		1.67 m
	α 1.77 ddd	*α* 1.81 ddd	*α* 1.77 ddd		
	(13.0, 6.5, 6.5)	(13.0, 6.5, 6.5)	(13.0, 6.5, 6.5)		
12	4.86 s, 5.38 s	4.88 s, 5.40 s	4.89 s, 5.46 s	1.39 q(1.2)	1.21 s
13	2.13 s	2.26 s	2.20 s	2.22 s	2.27 s
14	1.41 s	1.44 s	1.57 s	1.38 s	1.37 s
15	1.28 s	1.28 s	1.32 s	1.71 q(1.2)	1.16 s
OH	7.94 br s(2-OH)	3.59 br s(10-OH)	8.12 br s(1-OH)		3.40 br s(10-OH)
	3.59 br s(10-OH)		3.51 br s(10-OH)		

Table 9-6-14: ^{1}H NMR spectroscopic data of laurane-type sesquiterpenoids **9-6-40**~**9-6-44**.

H	9-6-40	9-6-41	9-6-42	9-6-43	9-6-44
2	6.61 s	6.48 s	6.71 s	6.48 s	6.54 d(1.6)
4		6.65 d(7.5)		6.63 d(7.5)	6.67 dd(8.4, 1.6)
5	7.24 s	6.96 d(7.5)	7.31 s	6.96 d(7.5)	6.93 d(8.4)
8	*α* 1.68 dd(12.0, 7.0)	1.61 m	*α* 1.94 dd(11.0, 6.0)	*α* 1.84 dd(11.0, 6.0)	1.60 m
	β 2.07 ddd (12.0, 12.0, 7.0)	1.69 m	*β* 1.77 ddd (11.0, 5.5, 5.5)	*β* 1.66 ddd (11.0, 5.5, 5.5)	1.78 m
9	*α* 1.50 ddd (12.0, 12.0, 7.0)	1.56 m 1.63 m	1.14 m 1.75 ddd (12.0, 6.0, 5.0)	1.06 m 1.69 ddd (12.0, 6.0, 5.0)	1.17 m 1.60 m
	β 1.61 dd(12.0, 7.0)				
10			2.18 m	2.13 m	1.84 m

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Table 9-6-14 (continued)

H	9-6-40	9-6-41	9-6-42	9-6-43	9-6-44
12	1.25 s	1.19 s	3.77 d(12.0), 3.86 d(12.0)	3.72 d(12.0), 3.78 d(12.0)	1.30 s
13	2.26 s	2.23 s	2.35 s	2.25 s	2.29 s
14	1.38 s	1.34 s	1.59 s	1.50 s	1.33 s
15	1.33 s	1.16 s	1.12 d(7.0)	1.06 d(7.0)	1.07 d(6.8)
10-OH	3.65 br s	3.30 br s			

Table 9-6-15: ^{1}H NMR spectroscopic data of laurane-type sesquiterpenoids **9-6-45**~**9-6-49**.

H	9-6-45	9-6-46	9-6-47	9-6-48	9-6-49
2	6.68 s	6.67 s	6.66 s	6.67 s	6.58 s
4					
5	7.16 s	7.14 s	7.16 s	7.35 s	7.21 s
8	1.87 ddd(12.6, 6.0, 3.9)	1.69 m	1.65 m	α 2.49 d(16.0)	α 2.04 ddd(12.0, 12.0, 3.0)
	1.63 ddd(12.6, 11.8, 6.5)	1.89 dd(11.2, 5.6)	1.86 m	β 2.68 d(16.0)	β 1.69 ddd(12.0, 12.0, 6.5)
9	1.17 m, 1.69 m	1.20 m, 1.72 m	1.26 m, 1.68 m	5.47 br s	α 1.88 ddd(12.0, 12.0, 3.0) β 2.19 ddd(12.0, 12.0, 6.5)
10	1.97 m	2.15 m	1.83 m		
12	4.26 d(11.8) 4.30 d(11.8)	3.55 d(11.2) 3.69 d(11.2)	3.71 d(12.2) 3.85 d(12.2)	1.31 s	4.97 s, 5.09 s
13	2.32 s	2.33 s	2.32 s	2.29 s	2.22 s
14	1.41 s	1.52 s	1.48 s	1.42 s	1.49 s
15	1.13 d(6.8)	1.11 d(6.8)	1.09 d(6.7)	1.70 br s	1.52 s

Table 9-6-16: ^{1}H NMR spectroscopic data of laurane-type sesquiterpenoids **9-6-50**~**9-6-52**.

H	9-6-50	9-6-51	9-6-52
1			7.21 d(7.9)
2		6.84 s	7.10 d(7.9)
4			7.10 d(7.9)
5	7.20 s	7.20 s	7.21 d(7.9)
8	1.69 m, 1.89 m	5.77 dd(3.1, 1.7)	5.69 br s
9	2.02 m, 2.17 m	2.11 ddd(11.0, 9.2, 1.7) 2.55 ddd(11.0, 8.5, 3.1)	2.01 m, 2.41 ddd(11.5, 9.7, 2.9)
10		2.06 m	2.01 m
11	1.86 m		

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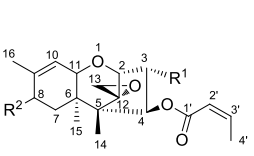
Table 9-6-16 (continued)

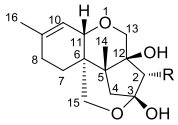
H	9-6-50	9-6-51	9-6-52
12	0.72 d(7.1)	0.90 s	0.97 s
13	2.50 s	0.99 s	1.09 s
14	1.35 s	2.34 s	2.33 s
15	3.52 d(10.4), 3.71 d(10.4)	1.03 d(6.6)	0.99 d(6.6)
1-OH		5.34 s	

Table 9-6-17: Compounds, MFs, and test solvents of trichothecane-type sesquiterpenoids **9-6-53**~**9-6-62**.

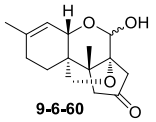
No.	Compounds	MFs	Test solvents	References
9-6-53	trichothecinol A	$C_{19}H_{24}O_6$	$CDCl_3$	[56]
9-6-54	trichothecinol B	$C_{19}H_{26}O_5$	$CDCl_3$	[56]
9-6-55	trichothecinol C	$C_{19}H_{26}O_6$	$CDCl_3$	[56]
9-6-56	*epi*-trichothecinol B	$C_{19}H_{26}O_5$	$CDCl_3$	[56]
9-6-57	*epi*-trichothecinol C	$C_{19}H_{26}O_6$	$CDCl_3$	[56]
9-6-58	paecilomycine A	$C_{15}H_{22}O_4$	$CDCl_3$	[57]
9-6-59	paecilomycine B	$C_{15}H_{22}O_5$	CD_3OD	[57]
9-6-60	paecilomycine C	$C_{15}H_{20}O_4$	$CDCl_3$	[57]
9-6-61	spirotenuipesine A	$C_{15}H_{22}O_4$	$CDCl_3$	[58]
9-6-62	spirotenuipesine B	$C_{15}H_{22}O_5$	$CDCl_3$	[58]



	R^1	R^2
9-6-53	OH	= O
9-6-54	H	α-OH, β-H
9-6-55	OH	α-OH, β-H
9-6-56	H	α-H, β-OH
9-6-57	OH	α-H, β-OH



9-6-58 R = H
9-6-59 R = OH



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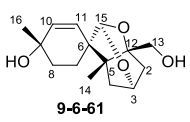
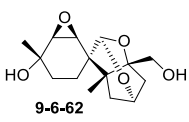


9-6-61



9-6-62

Table 9-6-18: ^{1}H NMR spectroscopic data of trichothecane-type sesquiterpenoids **9-6-53**~**9-6-57**.

H	9-6-53	9-6-54	9-6-55	9-6-56	9-6-57
2	3.78 d(5.0)	3.81 d(5.2)	3.70 d(4.9)	3.86 d(5.2)	3.73 d(5.2)
3	4.29 ddd(2.6, 3.0, 5.0)	2.04 ddd(3.6, 5.2, 15.5) 2.58 dd(7.8, 15.5)	4.22 ddd(2.7, 3.0, 4.9)	2.04 ddd(15.6, 5.2, 3.7) 2.55 dd(15.6, 8.0)	4.22 ddd(5.2, 3.1, 2.8)

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Table 9-6-18 (continued)

H	9-6-53	9-6-54	9-6-55	9-6-56	9-6-57
4	4.99 d(3.0)	5.61 dd(3.6, 7.8)	5.00 d(3.0)	4.07 dd(8.0, 3.7)	4.99 d(3.1)
7	2.31 dd(1.6, 15.2)	1.73 d(14.2)	1.73 d(14.2)	1.33 d(8.6), 1.88 m	1.40 d(7.9)
	2.95 dd(1.2, 15.2)	2.25 dd(5.8, 14.2)	2.30 dd(4.9, 14.2)		1.92 m
8		4.15 d(5.8)	4.13 d(4.9)	5.89 dd(7.9, 4.0)	4.06~4.10 m
10	6.56 dq(1.4, 5.8)	5.65 d(5.7)	5.68 d(5.8)	5.50 dq(5.5, 1.2)	5.61 dq(5.5, 1.2)
11	4.41 dd(0.8, 5.8)	3.71 d(5.7)	4.11 d(5.8)	3.66 d(5.4)	4.10~4.06 m
13	2.81 d(3.9), 3.08 d(3.9)	2.85 d(4.0), 3.10 d(4.0)	2.81 d(4.0), 3.05 d(4.0)	3.13 d(4.0), 3.86 d(4.0)	2.82 d(4.0), 3.07 d(4.0)
14	0.77 s	0.76 s	0.81 s	0.74 s	0.78 s
15	1.05 d(1.2)	1.14 s	1.10 s	1.02 s	0.98 s
16	1.84 dd(0.8, 1.4)	1.87 s	1.88 s	1.83 d(1.2)	1.84 d(1.2)
2′	5.88 dq(1.8, 11.5)	5.83 dq(1.8, 11.5)	5.88 dq(1.8, 11.5)	5.83 dq(11.6, 1.9)	5.89 dq(11.6, 1.9)
3′	6.45 dq(7.3, 11.5)	6.35 dq(7.2, 11.5)	6.42 dq(7.3, 11.5)	6.36 dq(11.6, 7.4)	6.43 dq(11.6, 7.3)
4′	2.17 dd(1.8, 7.3)	2.16 dd(1.8, 7.2)	2.17 dd(1.8, 7.3)	2.16 dq(7.4, 1.9)	2.17 dd(7.3, 1.9)
3-OH	3.50 d(2.6)		3.36 d(2.7)		3.32d(2.8)

Table 9-6-19: ^{1}H NMR spectroscopic data of trichothecane-type sesquiterpenoids **9-6-58**~**9-6-62**.

H	9-6-58	9-6-59	9-6-60	9-6-61	9-6-62
2	*α* 2.76 dd (15.4, 2.2) *β* 1.98 d(15.4)	3.66 s	*α* 2.47 d(18.5) *β* 2.36 d(18.5)	*α* 2.22 ddd (11.6, 3.6, 1.3) *β* 1.48 dq(11.6, 1.3)	*α* 2.17 br dd (11.2, 3.7) *β* 1.46 br dd (11.2, 1.5)
3				4.44 quint(1.3)	4.44 t(1.5)
4*α*	1.66 dd(11.5, 2.2)	1.68 d(12.6)	2.42 d(17.9)	2.36 ddd (12.9, 3.6, 1.3)	2.27 ddd (12.7, 3.7, 1.5)
4*β*	1.99 d(11.5)	1.96 d(12.6)	1.99 d(17.9)	1.19 br d(12.9)	1.16 br d(12.7)
7	1.95 dd(13.7, 6.3)	1.65~1.70 m	1.51 ddd (13.3, 5.7, 1.4)	2.10 dddd (13.6, 4.5, 3.2, 1.7)	1.84 dtd (13.8, 3.6, 1.7)
7*β*	1.49~1.55 m	1.52 dt(13.2, 9.0)	1.66 ddd(13.3, 11.6, 6.6)	1.50 td(13.6, 3.4)	1.26 td(13.8, 3.6)
8	*α* 2.08~2.16 m	1.91~1.98 m	*α* 1.83~1.92 m	*α* 1.68 td(13.6, 3.2)	*α* 1.60 td(13.8, 3.6)
	β 1.95~2.02 m		*β* 1.98 br d(17.9)	*β* 1.87 dddd (13.6, 4.5, 3.4, 1.7)	*β* 1.48 dtd (13.8, 3.6, 1.2)

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Table 9-6-19 (continued)

H	9-6-58	9-6-59	9-6-60	9-6-61	9-6-62
10	5.16 dt(3.5, 1.5)	5.23 m	5.33 br s	5.70 dd(10.5, 1.7)	*α* 3.07 dd(4.0, 1.2)
11	3.98 br s	3.94~3.99 m	4.60 br s	5.46 dd(10.5, 1.7)	3.47 dd(4.0, 1.7)
13	3.83 d(11.6) 3.41 d(11.6)	4.10 d(11.6) 3.31 d(11.6)	5.08 d(12.8)	*α* 3.82 d(12.1) *β* 3.71 d(12.1)	*α* 3.85 d(12.7) *β* 3.78 d(12.7)
14	1.01 s	1.03 s	1.21 s	1.01 s	1.22 s
15	4.16 dd(12.9, 2.1) 3.71 d(12.9)	4.33 d(12.2) 3.70 d(12.2)	3.67 d(8.1) 4.21 d(8.1)	4.99 s	5.22 s
16	1.62 s	1.64 s	1.70 s	1.26 s	1.30 s
13-OH			3.25 d(12.8)		

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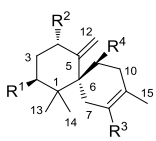
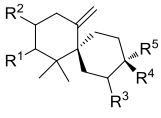
9.7 Chamigrane- and widdrane-type sesquiterpenoids

Table 9-7-1: Compounds, MFs, and test solvents of chamigrane- and widdrane-type sesquiterpenoids **9-7-1**~**9-7-13**.

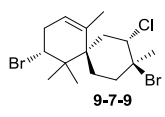
No.	Compounds	MFs	Test solvents	References
9-7-1	9-deoxyelatol	$C_{15}H_{22}BrCl$	$CDCl_3$	[59]
9-7-2	β-chamigrene-1β-ol	$C_{15}H_{24}O$	$CDCl_3$	[60]
9-7-3	β-chamigrene-10α-ol	$C_{15}H_{24}O$	$CDCl_3$	[60]
9-7-4	acetyldeschloroelatol	$C_{17}H_{25}BrO_2$	$CDCl_3$	[61]
9-7-5	acetylelatol	$C_{17}H_{24}BrClO_2$	$CDCl_3$	[61]
9-7-6	isorigidol	$C_{15}H_{23}BrO_2$	$CDCl_3$	[62]
9-7-7	10-bromo-9-hydroxy-chamigra-2,7(14)-diene	$C_{15}H_{23}BrO$	$CDCl_3$	[63]
9-7-8	ma'iliohydrin	$C_{15}H_{21}Br_3O_2$	$CDCl_3$	[64]
9-7-9	–	$C_{15}H_{23}Br_2Cl$	$CDCl_3$	[61]
9-7-10	(+)-3-(*Z*)-bromomethylidene-10β-bromo-β-chamigrene	$C_{15}H_{20}Br_2$	$CDCl_3$	[62]
9-7-11	(–)-3-(*E*)-bromomethylidene-10β-bromo-β-chamigrene	$C_{15}H_{20}Br_2$	$CDCl_3$	[62]
9-7-12	12-hydroxywiddrol	$C_{15}H_{26}O_2$	$CDCl_3$	[65]
9-7-13	3-hydroxypseudowiddran-6(7)-en-4-ol	$C_{15}H_{26}O_2$	$CDCl_3$	[65]



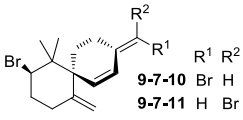
	R^1	R^2	R^3	R^4
9-7-1	Br	H	Cl	H
9-7-2	H	H	H	OH
9-7-3	H	OH	H	H



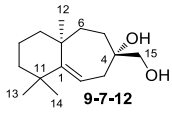
	R^1	R^2	R^3	R^4	R^5	
9-7-4	α-Br	β-OAc	H	Me		Δ^8
9-7-5	α-Br	β-OAc	Cl	Me		Δ^8
9-7-6	α-Br	β-OH	H	Me	OH	Δ^{10}
9-7-7	α-Br	β-OH	H	Me		Δ^9
9-7-8	α-Br	β-OH	H	$CHBr_2$	OH	Δ^{10}



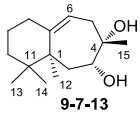
9-7-9



	R^1	R^2
9-7-10	Br	H
9-7-11	H	Br



9-7-12



9-7-13

Table 9-7-2: ^{1}H NMR spectroscopic data of chamigrane- and widdrane-type sesquiterpenoids **9-7-1**~**9-7-5**.

H	9-7-1	9-7-2	9-7-3	9-7-4	9-7-5
2	4.56 dd(12.9, 4.4)	1.21 m 2.28 ddd(4.4, 4.4, 13.5)	1.13 m, 2.02 m	4.59 d(3.3)	4.52 d(3.4)

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Table 9-7-2 (continued)

H	9-7-1	9-7-2	9-7-3	9-7-4	9-7-5
3	2.05 m, 2.21 m	1.54 m, 1.62 m	1.66 m, 1.81 m	5.26 ddd(3.2, 3.2, 3.2)	5.24 ddd(3.2, 3.2, 3.2)
4	2.19 m, 2.31 m	2.20 m	4.35 t(3.6)	*α* 2.39 dd(2.8, 14,9)	*α* 2.40 dd(2.8, 15.0)
		2.56 ddd(5.2, 5.2, 13.2)		*β* 2.65 dddd(1.5, 1.5, 3.1, 14.9)	*β* 2.57 m
7	2.30 br d(17.4)	2.03 m	1.90 m, 2.14 m	*α* 2.09 m, *β* 2.24 m	*α* 2.35 m, *β* 2.61 m
	2.60 br d(17.4)				
8		5.25 m	5.33 m	5.28 m	
10	1.78 m, 1.93 m	1.96 m	1.78 m, 1.85 m	*α* 1.82 m, *β* 1.62 m	*α* 1.97 m, *β* 1.79 m
11	1.60 m, 1.87 m	4.08 dd(9.6, 9.6)	1.54 m, 2.23 m	*α* 1.79 m, *β* 1.61 m	*α* 1.80 m, *β* 1.63 m
12	4.60 br s, 4.98 br s	4.63 s, 4.93 t(1.6)	4.89 d(1.6)	4.95 dd(1.6, 1.6)	4.76 s, 4.99 s
			5.14 d(1.9)	4.76 s	
13	0.96 s	0.82 s	0.79 s	1.07 s	1.09 s
14	1.13 s	1.06 s	0.90 s	1.03 s	1.05 s
15	1.69 s	1.59 s	1.59 s	1.57 s	1.69 s
OAc				2.06 s	2.09 s

Table 9-7-3: ^{1}H NMR spectroscopic data of chamigrane- and widdrane-type sesquiterpenoids **9-7-6**∼**9-7-9**.

H	9-7-6	9-7-7	9-7-8	9-7-9
2	4.47 d(10.5)	4.68 d(2.9)	4.59 d(2.9)	4.52 dd(6.8, 10.8)
3	3.86 ddd(11.0, 10.5, 6.2)	4.16 dd(2.9, 2.9)	4.14 m	2.69 m, 2.55 m
4	2.41 ddt(14.0, 11.0, 2.0)	2.48 dd(2.9, 14.2)	2.56 dd(2.4, 15.1)	5.24 m
	2.69 dd(11.0, 6.2)	2.71 dddd(1.5, 2.9, 2.9, 14.2)	2.70 dm(15.0)	
7	1.98 ddd(13.5, 13.4, 3.0)	1.75 m, 1.80 m	1.90 m, 2.04 m	1.55 m, 2.00 m
	1.78 br d(13.4)			
8	1.54 ddd(13.6, 13.5, 3.0)	1.67 m, 1.84 m	1.83 m, 2.11 m	2.41 ddd(4.4, 4.4, 14.1)
	1.66 m			2.55 m
10	5.84 dd(10.3, 1.6)	5.29 br s	5.92 d(10.6)	4.88 dd(6.4, 11.8)
11	5.69 dd(10.3, 1.9)	2.19 m, 2.20 m	6.07 d(10.5)	2.08 m
12	5.06 t(2.0), 4.74 t(2.0)	4.80 br s, 5.10 dd(1.5, 1.5)	4.84 br s, 5.09 br s	1.94 br s
13	1.09 s	1.10 s	1.21 s	0.94 s
14	1.12 s	1.10 s	1.01 s	1.20 s

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Table 9-7-3 (continued)

H	9-7-6	9-7-7	9-7-8	9-7-9
15	1.24 s	1.50 s	5.57 s	1.84 s
OH			2.23 br s(3-OH)	
			2.60 br s(9-OH)	

Table 9-7-4: ^{1}H NMR spectroscopic data of chamigrane- and widdrane-type sesquiterpenoids **9-7-10**~**9-7-13**.

H	9-7-10	9-7-11	9-7-12	9-7-13
2	4.57 dd(12.6, 4.6)	4.61 dd(12.7, 4.7)	5.44 dd(8.7, 6.0)	2.18~2.21 m, 2.05~2.08 m
3	2.15~2.3 m	2.2~2.3 m	2.40 dd(14.0, 6.0) 2.15 dd(14.0, 8.7)	3.84 br s
4	2.45 tm(14.2) 2.15~2.3 m	2.44 btd(14, 6) 2.20~2.30 m		
5			1.54~1.58 m	1.77 dd(13.0, 1.3) 1.56 dd(13.0, 5.5)
6			1.34~1.51 m, 1.70~1.78 m	5.46 dd(5.3, 1.51)
7	2.15~2.3 m	2.05 br d(14) 1.73 ddd(14, 13, 3)		
8	1.98 dm(13.0) 1.75 td(13.0, 3.6)	2.65 br d(15.6) 1.96 br d(15.6)	1.34~1.51 m 1.23~1.27 m	2.09~2.16 m 1.40~1.45 m
9			1.34~1.51 m, 1.70~1.78 m	1.59~1.65 m
10	6.65 d(10.4)	6.22 d(10.3)	1.34~1.51 m, 1.23~1.27 m	1.59~1.65 m, 1.48 m
11	6.00 d(10.4)	5.81 d(10.3)		
12	4.7 s, 5.01 s	4.68 s, 4.98 s	3.41 d(11.0), 3.45 d(11.0)	1.21 s
13	1.16 s	1.15 s	1.21 s	0.99 s
14	1.08 s	1.08 s	1.07 s	0.78 s
15	5.9 s	6.11 br s	1.04 s	1.0 s

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9.8 Acorane- (cedrane- or anislactone-), carotane-, and prezizaane-type sesquiterpenoids

Table 9-8-1: Compounds, MFs, and test solvents of acorane-type (cedrane- or anislactone-type) sesquiterpenoids **9-8-1**~**9-8-10**.

No.	Compounds	MFs	Test solvents	References
9-8-1	colletoic acid	$C_{15}H_{24}O_3$	DMSO-d_6	[66]
9-8-2	(–)-10-*epi*-β-acoradiene	$C_{15}H_{24}$	C_6D_6	[67]
9-8-3	1*S**,4*S**,5*S**, acora-8(15),9-dien-7*R**-ol	$C_{15}H_{24}O$	$CDCl_3$	[68]
9-8-4	(+)-(3*R*)-hydroxy-4-acorene	$C_{15}H_{26}O$	$CDCl_3$	[69]
9-8-5	15-hydroxyallo-cedrol	$C_{15}H_{26}O_2$	$CDCl_3$	[70]
9-8-6	α-cedren-3β-ol	$C_{15}H_{24}O$	$CDCl_3$	[71]
9-8-7	α-cedren-12-ol	$C_{15}H_{24}O$	$CDCl_3$	[71]
9-8-8	3α,15-dihydroxy cedrane	$C_{15}H_{26}O_2$	$CDCl_3$	[72]
9-8-9	merrilactone B	$C_{15}H_{20}O_6$	CD_3OD	[73]
9-8-10	merrilactone C	$C_{17}H_{22}O_8$	CD_3OD	[73]

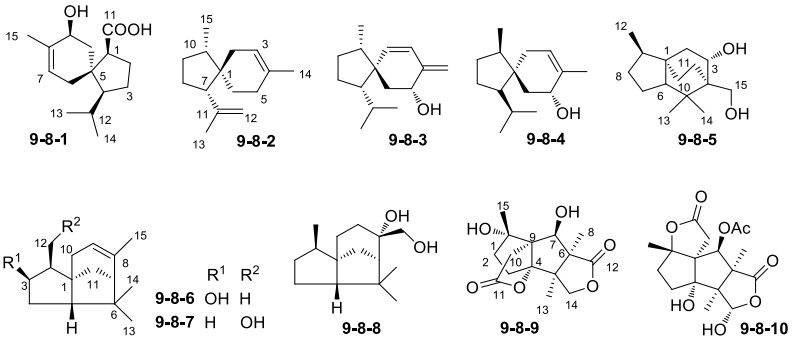

Table 9-8-2: ^{1}H NMR spectroscopic data of acorane-type (cedrane- or anislactone-type) sesquiterpenoids **9-8-1**~**9-8-5**.

H	9-8-1	9-8-2	9-8-3	9-8-4	9-8-5
1	2.47 t(8.4)				
2	1.69 m, 1.80 m	ax 2.00 br dm(17)	5.54 d(10.1)	1.69~1.74 m	2.09 ddd(12.6, 9.6, 2.9)
		eq 1.88 br dm(17)		2.31 d sext(18.1, 2.7)	1.10 dd(12.6, 5.7)
3	1.58 m	5.38 br s	6.19 d(10.1)	5.46 m	4.37 ddd(9.6, 5.7, 2.1)

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Table 9-8-2 (continued)

H	9-8-1	9-8-2	9-8-3	9-8-4	9-8-5
4	1.50 m				
5		eq 2.00 br dm(17) ax 1.88 br dm(17)	4.50 dt(12.8, 2.1)	4.29 br s	
6	1.88 br d(18.1) 1.94 br d(18.1)	1.44 dd(6.8, 6.0)	1.76 dd(12.8, 2.1) 1.92 t(12.8)	1.43 dd(13.2, 9.9) 1.99 ddd (13.2, 6.3, 1.9)	1.18 m
7	5.34 br s	2.14 dd(9.8, 8.3)	1.40 m	1.27 m	1.35 m 1.29 m
8		β 1.64 m, α 1.78 m	1.47 m	1.30~1.41 m, 1.69~1.74 m	0.98 m, 1.94 m
9	3.99 br t(6.5)	α 1.29 m, β 1.69 m	1.25 m, 1.78 m	1.30~1.41 m, 1.62~1.68 m	1.48 m
10	1.78 m, 1.85 m	1.68 m	1.89 m	1.62~1.68 m	1.20 m, 1.45 m
11	12.07 br s		1.63 dd(13.7, 6.7)	1.62~1.68 m	1.84 ddd(13.8, 11.1, 8.3) 1.21 m
12	1.75 m	4.80 s, 4.90 s	0.88 d(6.7)	0.87 d(6.6)	0.81 d(7.1)
13	0.85 d(6.8)	1.74 s	0.85 d(6.7)	0.95 d(6.6)	0.90 s
14	0.78 d(6.6)	1.62 br s	4.95 br m 5.20 br m	1.75 sext(1.6)	0.96 s
15	1.63 br s	0.93 d(6.7)	0.88 d(6.7)	0.93 d(6.9)	3.82 d(11.3), 3.48 d(11.3)

Table 9-8-3: ^{1}H NMR spectroscopic data of acorane-type (cedrane- or anislactone-type) sesquiterpenoids **9-8-6**~**9-8-10**.

H	9-8-6	9-8-7	9-8-8	9-8-9	9-8-10
2	1.83 dq(7.0, 5.0)	1.82 m	1.70 m	1.89 dd(13.2, 7.2) 2.19 ddd(13.2, 13.2, 7.8)	1.99 ddd(14.6, 11.0, 8.8) 2.32 ddd(14.6, 8.5, 2.5)
3	4.32 ddd(5.0, 5.0, 5.0)	1.58 m, 1.83 m	1.29 m, 1.89 m	1.96 dd(13.8, 7.8) 2.03 ddd(13.8, 13.2, 7.2)	1.78 ddd(14.0, 11.0, 8.5) 2.45 ddd(14.0, 8.8, 2.5)
4	1.59 m	1.41 m, 1.58 m	1.41 m, 1.54 m		
5	1.94 dd(8.5, 8.5)	1.75 m	1.75 m		
7	1.76 br d(3.6)	1.77 d(3.7)	1.73 m	4.03 s	5.30 s
8				1.22 s	1.22 s
9	5.20 br s	5.18 br s	1.57 m, 1.69 m		
10	α 2.20 br d(14.6)	α 2.28 br d(16.3)	1.61 m, 1.40 m	2.33 d(19.2), 3.15 d(19.2)	2.89 d(16.8), 3.05 d(16.8)
	β 1.88 br d(14.6)	β 1.78 m			

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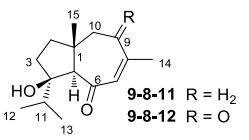
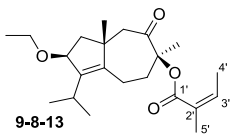
Table 9-8-3 (continued)

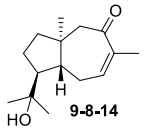
H	9-8-6	9-8-7	9-8-8	9-8-9	9-8-10
11	*α* 1.64 m *β* 1.46 br d(11.0)	*α* 1.72 m *β* 1.48 br d(10.6)	1.90 m 1.57 m		
12	0.88 d(7.0)	3.67 dd(10.9, 6.9) 3.47 dd(10.9, 8.1)	0.86 d(7.3)		
13	1.03 s	1.01 s	1.13 s	1.14 s	1.06 s
14	0.95 s	0.95 s	1.01 s	3.96 d(9.0), 4.39 d(9.0)	6.05 s
15	1.66 br s	1.66 br s	3.59 d(10.8) 3.67 d(10.8)	1.42 s	1.38 s
OAc					2.06 s

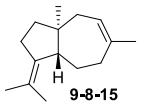
Table 9-8-4: Compounds, MFs, and test solvents of carotane-type sesquiterpenoids **9-8-11**~**9-8-20**.

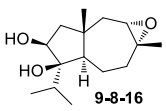
No.	Compounds	MFs	Test solvents	References
9-8-11	(1*R*,4*R*)-4-hydroxydauca-7-ene-6-one	$C_{15}H_{24}O_2$	$CDCl_3$	[74]
9-8-12	(1*R*,4*R*)-4-hydroxydauca-7-ene-6,9-dione	$C_{15}H_{22}O_3$	$CDCl_3$	[74]
9-8-13	(1*R*,3*S*,8*S*)-3-ethoxy-8-angeloyloxydauca-4-en-9-one	$C_{22}H_{34}O_4$	$CDCl_3$	[74]
9-8-14	styxone B	$C_{15}H_{24}O_2$	–	[75]
9-8-15	dauca-4(11),8-diene	$C_{15}H_{24}$	C_6D_6	[76]
9-8-16	trichocarane A	$C_{15}H_{26}O_3$	$CDCl_3$	[77]
9-8-17	trichocarane B	$C_{15}H_{26}O_3$	$CDCl_3$	[77]
9-8-18	trichocarane C	$C_{15}H_{28}O_3$	$CDCl_3$	[77]
9-8-19	trichocarane D	$C_{15}H_{26}O_4$	$CDCl_3$	[77]
9-8-20	(+)-*trans*-dauca-4(11),8-diene	$C_{15}H_{24}$	C_6D_6	[78]

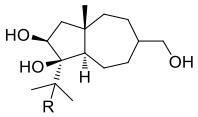












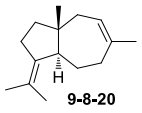


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Table 9-8-5: ^{1}H NMR spectroscopic data of carotane-type sesquiterpenoids **9-8-11**~**9-8-15**.

H	9-8-11	9-8-12	9-8-13	9-8-14	9-8-15
2	*α* 1.46 dt(12.3, 10.2) *β* 1.70 m	*α* 1.58 m, *β* 1.83 m	*α* 2.11 dd(13.4, 6.3) *β* 1.72 br d(13.4)	1.42 m	1.53 ddd(11.6, 7.5, 1) 1.42 ddd(11.6, 11.3, 9)
3	1.90 m	1.85 m	4.18 d(6.3)	1.54 m, 1.82 m	2.28~2.35 br m 2.39~2.47 br m
4				1.82 m	
5	2.59 s	2.82 s		2.01 m	2.25~2.32 br m
6			2.44 ddd(2.8, 5.0, 13.5) 2.21 td(2.2, 13,5)	2.18 m, 2.92 m	1.58 dddd(13.7, 12.1, 11.7, 2.6) 2.33~2.36 m
7	5.92 d(1.1)	6.34 d(1.4)	2.24 ddd(2.2, 5.0, 14.4) 1.29 td(2.8, 13.7)	6.32 d(7.2)	2.11 ddd(14.7, 5.2, 2.6) 2.18~2.25 br m
9	2.45 m				5.59 br m
10	*α* 1.93 m *β* 1.75 m	2.89 s	*α* 2.24 d(12.0) *β* 2.72 d(12.0)	2.62 d(15.2) 2.48 d(15.2)	2.15 br d(15) 2.20 dd(15.1, 8.1)
11	1.80 h(6.8)	1.84 h(11.5)	2.58 h(7.0)		
12	0.91 d(6.7)	0.89 d(11.5)	1.01 d(7.0)	1.18 s	1.77 s
13	0.93 d(6.7)	0.91 d(11.5)	1.07 d(7.0)	1.16 s	1.85 br q(1.7)
14	1.98 d(1.1)	2.05 d(1.4)	1.49 s	1.77 s	1.88 s
15	1.17 s	1.26 s	1.21 s	0.89 s	0.98 s
OH	5.17 s	4.45 s			
3′			6.18 qq(7.3, 1.4)		
4′			2.03 dq(7.3, 1.4)		
5′			1.97 t(1.4)		
OCH_2CH_3			3.36 ddd(9.2, 7.0, 14.0) 3.56 ddd(9.2, 7.0, 14.0)		
OCH_2CH_3			1.15 t(7.0)		

Table 9-8-6: ^{1}H NMR spectroscopic data of carotane-type sesquiterpenoids **9-8-16**~**9-8-20**.

H	9-8-16	9-8-17	9-8-18	9-8-19	9-8-20
2	1.57 m		1.58 m	1.67 dd(14.0, 0.8) 1.57 dd(14.0, 7.2)	1.67~1.77 m 1.43~1.54 m
3	4.04 ddd(7.4, 5.6, 1.5)	4.05 dd(7.4, 1.5)	4.03 m	4.19 br d(7.2)	1.43~1.54 m 1.30~1.42 m
5	1.32 m	1.51 dd(11.6, 1.4)		1.54 d(11.7)	2.35~2.44 m

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Table 9-8-6 (continued)

H	9-8-16	9-8-17	9-8-18	9-8-19	9-8-20
6	1.59 m	*α* 1.62 m *β* 1.43 ddd (12.1, 12.0, 2.2)		1.92 m 1.46 dd(13.8, 12.1)	2.24~2.34 m 2.29~2.41 m
7	*α* 1.37 m *β* 2.13 ddd (14.3, 5.9, 2.2)	*α* 2.00 br ddd (15.1, 12.0, 2.2) *β* 2.28 ddd (15.1, 5.3, 2.2)		1.98 ddd (15.4, 12.1, 2.3) 2.23 ddd (15.4, 5.0, 1.8)	2.86 ddd (17.0, 6.1, 2.5) 2.03~2.14 m
8			1.86 m		
9	2.74 dd(7.2, 7.2)	5.63 br d(8.9)		5.60 br d(8.8)	5.61 dd(7.6, 1.0)
10	*α* 1.15 dd(13.7, 7.2) *β* 2.21 dd(13.7, 7.2)	*α* 1.85 br d(14.7) *β* 2.13 dd(14.7, 8.9)		2.13 dd(15.0, 8.8) 1.87 br d(15.0)	1.98~2.07 m 2.18~2.29 m
11	1.81 d(6.8)	1.82 sept(6.8)	1.79 sept(6.8)		
12	0.94 d(6.8)	0.97 d(6.8)	0.96 d(6.8)	1.20 s	1.70 s
13	0.82 d(6.8)	0.88 d(6.8)	0.86 d(6.8)	1.25 s	1.76 s
14	1.34 s	4.00 s	3.43 dd(10.3, 5.9) 3.37 dd(10.3, 6.6)	3.98 s	1.81 s
15	1.19 s	1.02 s	1.16 s	1.00 s	0.93 s
OH	2.46 s(4-OH) 2.36 d(5.6, 3-OH)		2.38 m(3-OH)		

Table 9-8-7: Compounds, MFs, and test solvents of prezizaane-type sesquiterpenoids **9-8-21**~**9-8-30**.

No.	Compounds	MFs	Test solvents	References
9-8-21	3-deoxypseudoanisatin	$C_{15}H_{22}O_5$	CD_3OD	[79]
9-8-22	2*β*-hydroxy-3,6-dedioxypseudoanisatin	$C_{15}H_{22}O_5$	$CDCl_3$-CD_3OD	[79]
9-8-23	10*β*-hydroxypseudoanisatin	$C_{15}H_{22}O_7$	CD_3OD	[79]
9-8-24	1*α*-hydroxy-6-deoxypseudoanisatin	$C_{15}H_{22}O_6$	CD_3OD	[80]
9-8-25	(2*S*)-hydroxy-6-deoxypseudoanisatin	$C_{15}H_{22}O_6$	CD_3OD	[80]
9-8-26	3-oxopseudoanisatin	$C_{15}H_{20}O_6$	C_5D_5N	[80]
9-8-27	3,6-dideoxy-10-hydroxypseudoanisatin	$C_{15}H_{22}O_5$	$CDCl_3$	[81]
9-8-28	1,6-dihydroxy-3-deoxyminwanensin	$C_{15}H_{24}O_6$	CD_3OD	[79]
9-8-29	(1*S**)-minwanenone	$C_{15}H_{20}O_4$	CD_3OD	[80]
9-8-30	(1*R**)-minwanenone	$C_{15}H_{20}O_4$	CD_3OD	[80]

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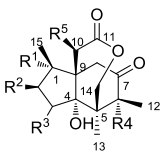
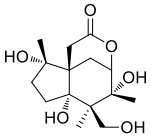
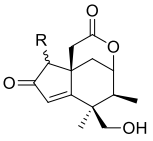


	R^1	R^2	R^3	R^4	R^5
9-8-21	H	H	H	OH	H
9-8-22	H	OH	H	H	H
9-8-23	H	H	α-OH	OH	OH
9-8-24	OH	H	β-OH	H	H
9-8-25	H	OH	β-OH	H	H
9-8-26	H	H	=O	OH	H
9-8-27	H	H	H	H	OH



9-8-28



9-8-29 R = β-Me
9-8-30 R = α -Me

Table 9-8-8: ^{1}H NMR spectroscopic data of prezizaane-type sesquiterpenoids **9-8-21**~**9-8-24**.

H	9-8-21	9-8-22	9-8-23	9-8-24
1	2.55 qdd(7.0, 3.5, 1.0)	2.59 qd(7.4, 7.4)	2.64 m	
2	α 2.07 dddd(12.0, 11.8, 3.5, 3.3) β 1.35 dddd(12.0, 9.5, 5.5, 1.0)	4.40 ddd(8.0, 7.4, 3.8)	α 1.75 ddd(13.2, 9.0, 4.2) β 2.04 ddd(13.2, 9.6, 9.3)	α 2.70 dd(15.5, 8.0) β 1.93 dd(15.5, 8.0)
3	α 2.60 ddd(13.5, 11.8, 5.5) β 1.70 ddd(13.5, 9.5, 3.3)	α 2.34 dd(15.1, 8.0) β 2.05 dd(15.1, 3.8)	4.80 dd(9.3, 4.2)	4.51 dd(8.0, 2.7)
6		2.92 q(6.9)		2.95 q(6.9)
8α	2.65 dd(15.0, 1.9)	2.69 d(15.9, 1.9)	3.07 d(16.2)	3.00 dd(16.8, 1.8)
8β	2.41 d(15.0)	2.39 d(15.9)	2.18 d(16.2)	2.22 d(16.8)
10	α 2.31 d(15.8) β 3.00 dd(15.8, 1.9)	α 2.49 d(15.4) β 2.78 dd(15.4, 1.9)	4.27 s	α 2.51 d(14.3) β 3.57 dd(14.3, 1.8)
12	1.30 s	1.15 d(6.9)	1.31 s	1.10 d(6.9)
13	1.14 s	1.08 s	1.21 s	1.23 s
14α	3.93 d(13.9)	3.90 d(14.0)	3.90 d(13.4)	5.46 d(13.4)
14β	4.44 d(13.9)	4.24 d(14.0)	5.05 d(13.4)	3.78 d(13.4)
15	0.91 d(7.0)	0.93 d(7.4)	0.95 d(7.1)	1.25 s

Table 9-8-9: ^{1}H NMR spectroscopic data of prezizaane-type sesquiterpenoids **9-8-25**~**9-8-28**.

H	9-8-25	9-8-26	9-8-27	9-8-28
1	2.56 qd(7.4, 7.4)	3.01 qdd(19.0, 12.3, 7.1)	2.50 m	
2	4.32 dd(7.4, 6.9)	α 2.82 dd(12.3, 9.3) β 1.89 dd(19.0, 9.3)	2.12 m 1.60 m	1.88~1.96 m
3	4.25 d(6.9)		2.54 m 1.60 m	α 1.85 ddd(14.0, 9.7, 3.3) β 2.39 ddd(14.0, 11.8, 7.4)
6	2.88 q(6.9)		2.88 q(7.0)	
7				4.33 dd(3.4, 2.5)
8α	2.59 dd(16.2, 1.6)	2.83 d(15.8)	2.27 d(16.5)	2.65 ddd(14.5, 2.7, 2.5)
8β	2.27 d(16.2)	3.38 dd(15.8, 2.2)	2.74 d(16.5)	1.74 dd(14.5, 3.4)

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Table 9-8-9 (continued)

H	9-8-25	9-8-26	9-8-27	9-8-28
10	*α* 2.31 d(14.8) *β* 3.29 dd(14.8, 1.6)	*α* 2.78 d(14.9) *β* 2.84 dd(14.9, 2.2)	4.44 d(4.8)	*α* 2.46 dd(19.5, 2.7) *β* 2.76 d(19.5)
12	1.10 d(6.9)	1.70 s	1.19 d(7.0)	1.25 s
13	1.26 s	1.65 s	1.12 s	1.25 s
14	*α* 5.39 d(13.2) *β* 3.80 d(13.2)	*α* 4.60 d(14.0) *β* 4.08 d(14.0)	3.86 d(13.2) 4.88 d(13.2)	*α* 3.49 d(12.2) *β* 3.55 d(12.2)
15	0.92 d(7.4)	0.82 d(7.1)	1.03 d(7.0)	1.23 s

Table 9-8-10: ^{1}H NMR spectroscopic data of prezizaane-type sesquiterpenoids **9-8-29** and **9-8-30**.

H	9-8-29	9-8-30
1	2.41 q(7.4)	2.81 q(7.4)
3	6.01 s	6.01 s
6	1.94 qd(7.4, 2.4)	1.85 qd(7.4, 2.8)
7	4.65 ddd(4.4, 2.4, 2.2)	4.68 ddd(3.8, 2.8, 2.2)
8*α*	1.87 ddd(13.7, 2.4, 2.2)	1.80 ddd(13.5, 2.2, 2.2)
8*β*	2.45 dd(13.7, 7.4)	2.31 dd(13.5, 3.8)
10*α*	2.88 d(18.9)	2.89 d(19.0)
10*β*	2.44 dd(18.9, 2.6)	2.81 dd(19.0, 2.2)
12	1.20 d(7.4)	1.22 d(7.4)
13	1.34 s	1.36 s
14*α*	3.46 d(11.5)	3.48 d(11.5)
14*β*	3.54 d(11.5)	3.63 d(11.5)
15	1.09 d(7.4)	1.10 d(7.7)

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9.9 Cadinane-, copaane-, copacamphane-, cyclocopacamphane-, cubebane-, oplopane-, and picrotoxane-type sesquiterpenoids

Table 9-9-1: Compounds, MFs, and test solvents of cadinane-type sesquiterpenoids **9-9-1**~**9-9-45**.

No.	Compounds	MFs	Test solvents	References
9-9-1	strobilol E	$C_{15}H_{22}O_4$	CD_3OD	[82]
9-9-2	strobilol F	$C_{15}H_{22}O_3$	$CDCl_3$	[82]
9-9-3	strobilol G	$C_{15}H_{20}O_4$	CD_3OD	[82]
9-9-4	strobilol H	$C_{15}H_{18}O_3$	$CDCl_3$	[82]
9-9-5	strobilol I	$C_{25}H_{40}O_6$	$CDCl_3$	[82]
9-9-6	strobilol J	$C_{25}H_{40}O_5$	$CDCl_3$	[82]
9-9-7	strobilol K	$C_{25}H_{42}O_7$	CD_3OD	[82]
9-9-8	stereumin A	$C_{15}H_{22}O_4$	–	[83]
9-9-9	stereumin B	$C_{15}H_{22}O_4$	–	[83]
9-9-10	strobilol A	$C_{15}H_{22}O_5$	CD_3OD	[84]
9-9-11	comosone I	$C_{15}H_{22}O_2$	$CDCl_3$	[85]
9-9-12	comosone II	$C_{15}H_{20}O$	$CDCl_3$	[85]
9-9-13	(–)-(1*R*,2*S*,6*R*,10*S*)-2*α*-acetoxyamorpha-4,7(11)-dien-8-one	$C_{17}H_{24}O_3$	C_6D_6	[86]
9-9-14	(–)-(1*R*,2*R*,3*S*,6*R*,10*S*)-2*α*,3*α*-diacetoxyamorpha-4,7(11)-dien-8-one	$C_{19}H_{26}O_5$	$CDCl_3$	[86]
9-9-15	(–)-(1*R*,2*R*,3*R*,6*R*,9*S*,10*R*)-2*α*,3*α*-diacetoxy-9*α*-hydroxy-amorpha-4,7(11)-dien-8-one	$C_{19}H_{26}O_6$	$CDCl_3$	[86]
9-9-16	(–)-(1*R*,3*R*,6*S*,10*S*)-3*α*-hydroxyamorpha-4,7(11)-diene	$C_{15}H_{24}O$	C_6D_6	[87]
9-9-17	(–)-(1*R*,3*R*,6*S*,10*S*)-3*α*-acetoxyamorpha-4,7(11)-diene	$C_{17}H_{26}O_2$	C_6D_6	[87]
9-9-18	(–)-(1*R*,6*S*,10*S*)-amorpha-4,7(11)-dien-3-one	$C_{15}H_{22}O$	C_6D_6	[87]
9-9-19	(–)-(1*R*,2*S*,6*R*,10*S*)-2*α*-hydroxyamorpha-4,7(11)-diene	$C_{15}H_{24}O$	C_6D_6	[87]
9-9-20	(–)-(1*R*,2*R*,6*R*,10*S*)-2*β*-acetoxyamorpha-4,7(11)-diene	$C_{17}H_{26}O_2$	C_6D_6	[87]
9-9-21	axiplyn A	$C_{16}H_{25}NO_3S$	$CDCl_3$	[88]
9-9-22	axiplyn B	$C_{16}H_{25}NO_4S$	$CDCl_3$	[88]
9-9-23	axiplyn C	$C_{16}H_{25}NOS$	C_6D_6	[88]
9-9-24	axiplyn D	$C_{16}H_{25}NO_3S$	C_6D_6	[88]
9-9-25	axiplyn E	$C_{16}H_{25}NO_3S$	C_6D_6	[88]
9-9-26	axinisothiocyanate A	$C_{16}H_{25}NO_2S$	$CDCl_3$	[89]
9-9-27	axinisothiocyanate B	$C_{16}H_{25}NO_2S$	$CDCl_3$	[89]
9-9-28	axinisothiocyanate C	$C_{16}H_{25}NO_2S$	$CDCl_3$	[89]
9-9-29	axinisothiocyanate D	$C_{16}H_{25}NO_2S$	$CDCl_3$	[89]
9-9-30	axinisothiocyanate E	$C_{16}H_{25}NO_2S$	$CDCl_3$	[89]
9-9-31	axinisothiocyanate F	$C_{16}H_{25}NO_2S$	C_5D_5N	[89]
9-9-32	axinisothiocyanate G	$C_{16}H_{25}NO_2S$	C_5D_5N	[89]

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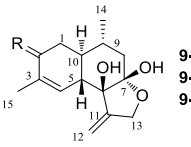
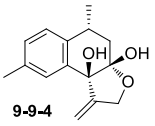
Table 9-9-1 (continued)

No.	Compounds	MFs	Test solvents	References
9-9-33	axinisothiocyanate H	$C_{16}H_{25}NO_3S$	$CDCl_3$	[89]
9-9-34	axinisothiocyanate I	$C_{16}H_{25}NO_3S$	$CDCl_3$	[89]
9-9-35	axinisothiocyanate J	$C_{16}H_{25}NOS$	$CDCl_3$	[89]
9-9-36	populene A	$C_{15}H_{18}O_3$	$CDCl_3$	[90]
9-9-37	populene B	$C_{15}H_{18}O_3$	$CDCl_3$	[90]
9-9-38	populene C	$C_{18}H_{20}O_3$	$CDCl_3$	[90]
9-9-39	populene D	$C_{18}H_{24}O_3$	$CDCl_3$	[90]
9-9-40	populene E	$C_{15}H_{18}O_4$	$CDCl_3$	[90]
9-9-41	populene F	$C_{15}H_{20}O_4$	$CDCl_3$	[90]
9-9-42	populene G	$C_{15}H_{18}O_5$	$CDCl_3$	[90]
9-9-43	populene H	$C_{15}H_{18}O_5$	$CDCl_3$	[90]
9-9-44	13-hydroxy-7-*O*-(6′-*O*-sulfate-*β*-D-glucopyranosyl)-desoxyhemigossypol	$C_{21}H_{26}O_{12}S$	CD_3OD	[91]
9-9-45	13,15-dihydroxy-7-*O*-(6′-*O*-sulfate-*β*-D-glucopyranosyl)-desoxyhemigossypol	$C_{21}H_{26}O_{13}S$	CD_3OD	[91]



9-9-1 R = *β*-OH,H
9-9-2 R = H_2
9-9-3 R = O



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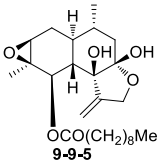

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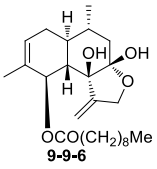

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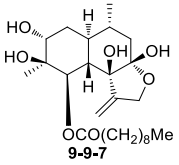

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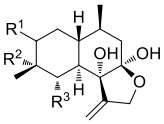
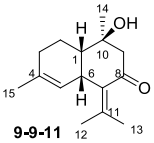


	R^1	R^2	R^3	
9-9-8	*β*-OH	H	H	Δ^3
9-9-9	H	H	OH	Δ^2
9-9-10	2*α*,3*α*-epoxy		OH	



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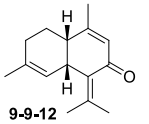

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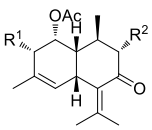
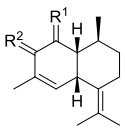
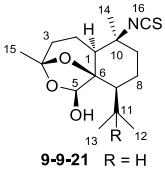


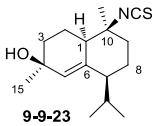
	R^1	R^2
9-9-13	H	H
9-9-14	OAc	H
9-9-15	OAc	OH



	R^1	R^2
9-9-16	H_2	*α*-OH,H
9-9-17	H_2	*α*-OAc,H
9-9-18	H_2	O
9-9-19	*α*-OH,H	H_2
9-9-20	*β*-OAc,H	H_2



9-9-21 R = H
9-9-22 R = OH



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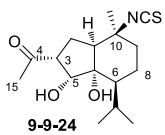
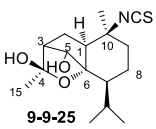
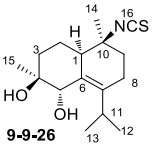


9-9-24



9-9-25



9-9-26

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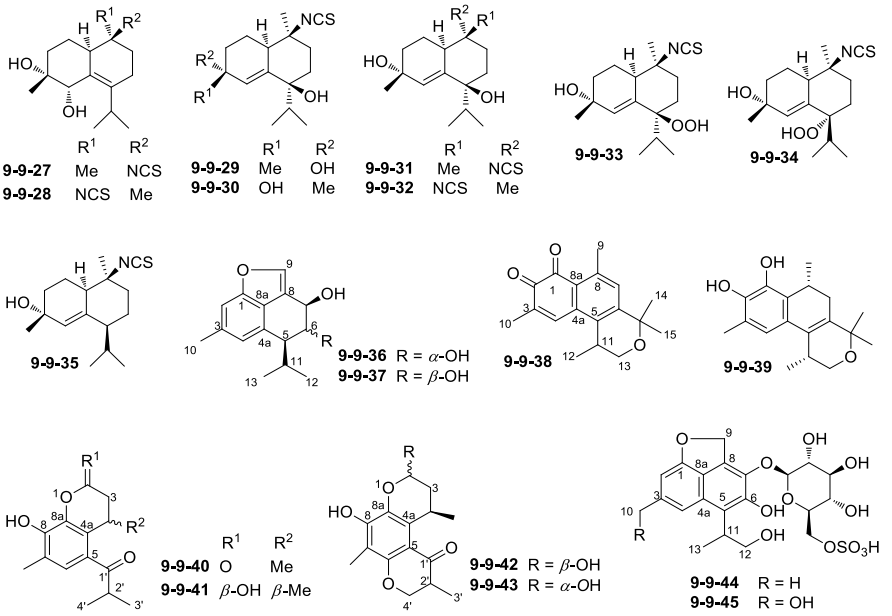

Table 9-9-2: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-1**~**9-9-5**.

H	9-9-1	9-9-2	9-9-3	9-9-4	9-9-5
1	1.02~1.11 m	2.06 dd(16.1, 13.4)	2.09 dd(16.4, 13.9)	7.11 d(7.9)	1.54~1.67 (ov)
	2.25~2.80(ov)	2.74 dd(16.1, 6.4)	2.58~2.67 (ov)		2.21 ddd(15.8, 7.5, 4.6)
2	4.07 br s	1.23~1.27 m 1.58~1.67(ov)		7.10 dd(7.9, 2.1)	3.07 d(4.6)
4	5.86 br s	7.15 br s	7.28 br s	7.38 br s	6.00 d(10.9)
5	2.25~2.80(ov)	2.65 dt(9.7, 2.4)	2.58~2.67 (ov)		2.40 dd(12.0, 10.9)
8	1.21~1.32 m	1.31~1.40 m	1.34 dd(14.0, 11.6)	1.93 dd(13.9, 5.0)	1.10~1.22 (ov)
	1.80 dd(13.8, 3.3)	1.97 dd(14.5, 3.3)	1.84 dd(14.0, 3.2)	2.24 dd(13.9, 6.6)	1.80 dd(12.5, 3.8)
9	1.42~1.46 m	1.58~1.67 (ov)	1.58~1.65 (ov)	3.12~3.17 m	1.48~1.52 (ov)
10	1.10~1.19 m	1.31~1.40 (ov)	1.58~1.65 (ov)		1.10~1.22 (ov)
12	5.03 t(2.4)	5.16 t(2.4)	5.10 t(2.6)	5.24 t(2.4)	5.06 br s
	5.37 t(2.4)	5.34 t(2.4)	5.22 t(2.6)	5.58 t(2.4)	5.44 br s
13	4.13 dd(13.2, 2.4)	4.24 dt(13.3, 2.4)	4.18 dt(13.5, 2.6)	4.29 dt(12.8, 2.4)	4.13 dt(12.5, 2.2)
	4.50 dd(13.2, 2.4)	4.60 dt(13.3, 2.4)	4.55 dt(13.5, 2.6)	4.54 dt(12.8, 2.4)	4.55 dt(12.5, 2.2)
14	0.90 d(7.1)	0.90 d(6.5)	0.89 d(6.2)	1.36 d(7.2)	0.88 d(6.4)

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Table 9-9-2 (continued)

H	9-9-1	9-9-2	9-9-3	9-9-4	9-9-5
15	1.77 br s	1.85 br d(2.4)	1.78 br s	2.33 s	1.25 s
2′					2.44~2.49 (ov)
3′					1.54~1.67 (ov)
4′~9′					1.25~1.29 (ov)
10′					0.87 t(6.4)

Table 9-9-3: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-6**~**9-9-10**.

H	9-9-6	9-9-7	9-9-8	9-9-9	9-9-10
1	1.68~1.73 m	1.58~1.65 (ov)	1.45 m, 2.16 br s	1.71 m,	*α* 1.41 dd (15.9, 9.8)
	2.26~2.29 m	1.78~1.84 (ov)		2.29 br d(17.4)	*β* 2.22 ddd (15.7, 7.6, 4.9)
2	5.82 br d(6.6)	3.59 t(3.0)	4.04 br s	5.54 br s	3.07 d(4.9)
4	6.01 d(6.6)	5.72 d(12.3)	6.05 br s	4.89 d(8.7)	4.60 d(10.8)
5	2.05 dd(12.5, 6.6)	2.27 t(12.3)	2.19 m	1.94 dd(3.2, 9.3)	1.92 dd(12.5, 10.8)
8	1.20~1.35 (ov)	1.35~1.39 m	1.39 m, 1.93 m	1.87 dd(3.7, 10.2)	1.26 t(13.6)
	1.89 dd(13.9, 3.8)	1.78~1.84 (ov)		1.31 m	1.66 dd(12.5, 3.5)
9	1.50~1.54 m	1.47~1.53 (ov)	1.50 m	1.50 m	1.35 m
10	1.20~1.35 (ov)	1.47~1.53 (ov)	1.36 dt(3.5, 11.4)	1.37 m	1.13 m
12	5.14 t(2.3),	5.11 t(2.7),	5.14 d(1.6),	5.15 s	5.14 t(2.2)
	5.22 t(2.3)	5.56 t(2.7)	5.57 d(2.1)	5.37 s	5.52 t(2.2)
13	4.19 dt(12.5, 2.3)	4.17 dt(12.5, 2.7)	4.63 dd(2.2, 12.0)	4.65 d(12.5)	4.14 dt(12.6, 2.2)
	4.62 dt(12.5, 2.3)	4.46 dt(12.5, 2.7)	4.27 dd(1.5, 13.0)	4.18 d(12.6)	4.52 dt(12.6, 2.2)
14	0.88 d(6.6)	0.88 d(7.2)	1.01 d(6.1)	0.89 s	0.87 d(6.4)
15	1.64 br s	1.15 s	1.91 s	1.77 s	1.38 s
2′	2.35 t(7.6)	2.35~2.39 m			
3′	1.59~1.64 (ov)	1.58~1.65 (ov)			
4′–9′	1.20~1.34 (ov)	1.24~1.32 (ov)			
10′	0.87 t(7.0)	0.90 t(6.0)			

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Table 9-9-4: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-11**~**9-9-15**.

H	9-9-11	9-9-12	9-9-13	9-9-14	9-9-15
1	1.96 m	2.75 m	1.94 m	2.02 m	2.23 dt(11.4, 4.2)
2	1.22 m, 1.74 m	1.83 m, 2.20 m	5.19 ddd(3.7, 6.6, 12.1)	5.19 m	5.22 dd(3.6, 4.2)
3	1.92 m	1.82 m	1.97 m	5.43 br d(3.5)	5.48 d(3.6)
5	5.33 br s	4.92 br s	4.85 br s	5.19 m	5.16 br s
6	3.74 br s	3.76 br s	3.53 br s	3.66 ddq(2.0, 6.0, 2.0)	3.69 m
9	*α* 2.50 d(18.3)	5.90 s	*α* 2.39 dd(4.8, 14.5)	*α* 2.37 dd(4.4, 14.9)	2.58 dd(2.9, 11.4)
	β 2.35 dd(18.3, 1.6)		*β* 1.94 dd(8.8, 14.5)	*β* 2.01 dd(10.7, 14.9)	
10			2.02 m	2.51dddq(4.4, 10.0, 10.7, 6.6)	2.36 tq(11.4, 6.1)
12	1.92 s	2.06 s	2.11 s	1.95 s	1.97 s
13	1.92 s	1.87 s	1.45 s	1.78 s	1.85 s
14	1.34 s	1.93 s	0.90 (6.6)	1.00 d(6.6)	1.29 d(6.1)
15	1.65 s	1.58 s	1.39 br s	1.59 br s	1.63 br s
OAc			1.71 s	1.98 s(1-OAc) 2.05 s(2-OAc)	2.05 s(1-OAc) 2.11 s(2-OAc)

Table 9-9-5: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-16**~**9-9-20**.

H	9-9-16	9-9-17	9-9-18	9-9-19	9-9-20
1	1.24~1.28 m	1.14~1.20 m	1.33~1.40 m	1.31~1.35 m	1.56~1.62 m
2	1.48~1.53 m	1.52~1.61 m	2.12 dd(4.7, 16.1)	3.78~3.82 m	5.49 s
	2.09~2.15 m	2.29 dd(1.9, 15.5)	2.72 dd(2.5, 16.1)		
3	3.68 s	5.33 br d(5.0)		1.94~2.09 m	1.95~2.08 m
5	5.16 s	5.24 br s	5.91 s	4.97 s	5.18 s
6	3.30 br s	3.25 s	3.52 br s	3.40 s	3.83 s
8	1.80~1.88 m	1.75~1.84 m	1.41~1.58 m	1.70~1.82 m	1.75~1.83 m
	2.52~2.57 m	2.54 dd(1.6, 13.9)	2.41 br d(13.2)	2.49 br d(13.9)	2.52 br d(13.6)
9	0.88~0.97 m	0.91 dt(3.5, 13.6)	0.73~0.81 m	0.98~1.05 m	0.87~0.94 m
	1.60~1.65 m	1.52~1.61 m	1.41~1.58 m	1.56~1.60 m	1.46~1.51 m
10	1.99~2.05 m	2.02~2.11 m	1.41~1.58 m	1.70~1.82 m	1.21~1.32 m
12	1.67 d(0.9)	1.65 br s	1.59 s	1.67 s	1.67 s
13	1.68 d(2.2)	1.65 br s	1.59 s	1.70 d(1.9)	1.75 s
14	1.01 d(6.6)	0.86 d(6.3)	0.72 d(6.3)	1.21 d(6.6)	0.86 d(6.6)
15	1.73 br s	1.65 br s	1.82 s	1.56 br s	1.54 br s
OAc		1.74 s			1.71 s

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Table 9-9-6: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-21**~**9-9-25**.

H	9-9-21	9-9-22	9-9-23	9-9-24	9-9-25
1	1.41 m	1.59 m	1.37 m	1.36 m	1.84 m
2	1.76 m	1.75 m	1.28 m	1.40 m	1.27 m
		1.83 m	1.83 m	2.10 dt(14.2, 8.6)	1.47 m
3	1.59 m	1.63 m	1.05 dt(13.6, 3.6)	3.37 q(8.6)	1.75 t(5.7)
	1.75 m	1.84 m	1.90 m		
5	5.82 d(7.7)	5.75 s	5.71 s	4.57 t(8.6)	3.97 t(5.2)
7	1.42 m	1.94 dd(10.7, 3.5)	1.34 m	1.34 m	1.48 m
8	1.57 m, 1.80 m	1.74 m	1.34 m	1.20 m	1.22 m
9	1.60 m	1.51 m	0.96 m	0.80 m	0.80 m
	2.11 dd(13.3, 4.1)	2.06 dt(11.0, 2.6)	1.53 m	1.50 m	1.50 m
11	2.24 br sept(6.7)		1.99 d sept(6.6, 3.1)	2.22 br sept(6.6)	2.51 d sept (6.7, 2.2)
12	0.92 d(6.7)	1.32 s	0.90 d(6.6)	0.90 d(6.6)	0.91 d(6.7)
13	1.06 d(6.7)	1.28 s	0.83 d(6.6)	0.85 d(6.6)	0.77 d(6.7)
14	1.45 s	1.47 s	0.74 s	0.85 s	0.82 s
15	1.51 s	1.54 s	1.46 s	1.78 s	1.09 s
4-OH			8.08 s		5.40 s
5-OH	2.47 d(7.7)			3.27 d(9.0)	2.71 br d
6-OH				3.55 s	

Table 9-9-7: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-26**~**9-9-30**.

H	9-9-26	9-9-27	9-9-28	9-9-29	9-9-30
1	2.39 br d(12.5)	2.42 br d(12.5)	2.66 br d(12.7)	2.08 m	2.08 m
2	ax 150 m	ax 1.37 m	ax 1.02 m	ax 1.72 m	1.94 m
	eq 1.87 dddd (13.4, 4.5, 4.5, 2.7)	eq 1.92 dddd (13.1, 4.4, 4.4, 2.8)	eq 1.75 dddd (12.4, 4.4, 4.4, 2.9)	eq 1.99 dddd (13.4, 5.7, 5.7, 3.4)	
3	ax 1.92 ddd (13.7, 13.4, 4.5)	ax 1.98 ddd (13.1, 13.1, 4.4)	ax 1.97 ddd (13.3, 13.3, 4.4)	ax 1.51 ddd (12.3, 12.3, 3.4)	1.89 m
	eq 1.60 m	eq 1.63 m	eq 1.64 dddd (13.3, 4.0, 2.9, 1.0)	eq 1.92 m	1.39 m
5	4.47 s	4.52 s	4.55 s	5.94 dd(1.5, 1.5)	6.05 dd (1.4, 1.4)
8	ax 2.24 dddd (18.1, 9.4, 5.3, 2.7)	ax 2.22 dddd (18.3, 10.3, 5.3, 3.0)	ax 2.22 dddd (18.1, 10.1, 5.8, 2.0)	ax 1.63 ddd (14.0, 14.0, 3.4)	2.11 m
	eq 2.08 dddd (18.1, 5.3, 5.1, 1.5)	eq 2.07 dddd (18.3, 5.3, 3.8, 1.6)	eq 2.08 dddd (18.1, 5.5, 4.1, 1.3)	eq 2.08 m	1.68 m
9	ax 1.63 ddd (13.1, 9.4, 5.3)	ax 1.63 ddd (13.0, 10.3, 5.3)	ax 1.58 ddd (13.1, 10.1, 5.5)	ax 1.69 m	1.94 m
	eq 1.99 ddd (13.1, 5.3, 5.1)	eq 1.98 m	eq 1.80 dddd (13.1, 5.8, 4.1, 1.0)	eq 1.92 m	1.68 m

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Table 9-9-7 (continued)

H	9-9-26	9-9-27	9-9-28	9-9-29	9-9-30
11	3.07 sept(6.8)	3.04 sept(6.7)	3.00 sept(6.8)	1.90 m	1.89 m
12	1.01 d(6.8)	1.02 d(6.7)	1.06 d(6.8)	0.77 d(6.9)	0.71 d(6.8)
13	1.04 d(6.8)	1.02 d(6.7)	0.99 d(6.8)	0.96 d(6.9)	0.98 d(6.8)
14	1.43 s	1.42 s	1.34 s	1.41 s	1.41 s
15	1.31 s	1.20 s	1.12 s	1.41 s	1.32 s

Table 9-9-8: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-31**~**9-9-35**.

H	9-9-31	9-9-32	9-9-33	9-9-34	9-9-35
1	2.49 ddd(7.0, 7.0, 1.8)		2.08 ddd(9.2, 6.6, 2.0)	2.42 ddd(9.5, 6.3, 2.1)	2.00 m
2	ax 1.69 dddd (13.9, 9.6, 7.0, 4.4)	ax 2.19 ddd(14.0, 14.0, 3.4)	ax 1.72 dddd (13.5, 13.5, 9.2, 3.3)	ax 1.70 dddd (13.5, 12.9, 9.5, 3.2)	ax 1.69 m,
	eq 2.09 dddd (13.9, 7.0, 7.0, 4.4)	eq 2.09 ddd(14.0, 4.4, 3.8)	eq 2.02 m	eq 2.05 dddd (13.5, 6.3, 5.0, 3.5)	eq 1.97 m
3	1.85 m	ax 2.37 m	ax 1.56 m	ax 1.60 ddd (12.9, 12.9, 3.5)	ax 1.53 ddd (12.4, 12.4, 3.2)
	1.82 m	eq 2.00 dddd (12.3, 4.4, 3.4, 1.5)	eq 1.97 m	eq 1.96 dddd (12.9, 5.0, 3.2, 1.2)	eq 1.92 dddd (12.4, 5.5, 3.4, 1.0)
5	6.56 d(1.8)	5.95 dd(1.8, 1.5)	5.87 dd(2.0, 1.7)	5.92 br s	5.57 d(1.0)
7		2.45 dddd(12.9, 4.5, 3.4, 1.8)			1.69 m
8	ax 1.56 ddd (13.9, 13.9, 3.6)	ax 1.48 dddd(13.1, 13.1, 12.9, 3.5)	ax 2.51 ddd (14.2, 14.2, 4.3)	1.85 m, 1.74 m	ax 1.44 m,
	eq 2.14 ddd (13.9, 3.6, 3.6)	eq 1.59 dddd (13.1, 4.5, 4.0, 3.0)	eq 1.95 m		eq 1.73 m
9	ax 1.94 ddd (13.9, 13.3, 3.6)	ax 2.35 ddd(13.5, 13.1, 4.0)	ax 1.86 ddd (14.2, 14.2, 3.6)	1.85 m, 1.74 m	ax 1.61 ddd (13.5, 13.2, 3.7)
	eq 1.76 ddd (13.3, 3.6, 3.6)	eq 1.72 ddd(13.5, 3.5, 3.0)	eq 2.02 m		eq 2.05 ddd (13.5, 3.2, 3.2)
11	2.00 sept(6.8)	1.97 sept d(6.7, 3.4)	1.95 sept(6.9)	2.64 sept(6.9)	2.15 sept d (6.8, 3.3)
12	0.96 d(6.8)	0.80 d(6.7)	0.86 d(6.9)	0.99 d(6.9)	0.98 d(6.8)
13	1.09 d(6.8)	0.86 d(6.7)	1.01 d(6.9)	1.00 d(6.9)	0.92 d(6.8)

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Table 9-9-8 (continued)

H	9-9-31	9-9-32	9-9-33	9-9-34	9-9-35
14	1.25 s	1.46 s	1.39 s	1.37 s	1.38 s
15	1.43 s	1.71 s	1.46 s	1.44 s	1.41 s
OH	5.60 s	6.88 s			
OOH			7.21 s	7.05 s	

Table 9-9-9: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-36**~**9-9-39**.

H	9-9-36	9-9-37	9-9-38	9-9-39
2	7.10 br s	7.14 br s		
4	7.02 br s	6.91 br s	7.52 d(1.2)	6.65 s
5	*β* 3.02 dd(7.8, 3.9)	*β* 2.90 dd(8.7, 3.3)		
6	*α* 4.01 dd(7.8, 7.8)	*β* 4.38 dd(3.3, 3.3)		
7	*β* 4.90 dd(7.8, 0.9)	*β* 5.08 m	6.95 s	*α* 2.36 dd(15.3, 5.1) *β* 2.00 d(15.3)
8				3.19 br dq(6.9, 6.9)
9	7.50 d(0.9)	7.57 d(1.5)	2.62 s	1.04 d(6.9)
10	2.48 s	2.48 s	2.09 d(1.2)	2.25 s
11	2.58 m	1.63 m	*α* 3.01 br q(6.9)	*α* 2.68 m
12	1.16 d(7.2)	1.12 d(6.6)	1.40 d(6.9)	1.14 d(6.9)
13	1.18 d(7.2)	0.94 d(6.6)	*α* 3.97 dd(11.7, 2.4) *β* 3.79 dd(11.7, 1.2)	3.90 dd(11.1, 3.0) 3.66 dd(11.1, 2.4)
14			1.53 s	1.26 s
15			1.57 s	1.41 s

Table 9-9-10: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-40**~**9-9-43**.

H	9-9-40	9-9-41	9-9-42	9-9-43
2		*β* 5.65 dd(9.0, 3.0)	*β* 5.56 dd(9.9, 2.7)	*α* 5.81 dd(7.5, 4.5)
3	2.72 d(3.6)	*α* 1.87 ddd(13.5, 9.0, 5.1) *β* 2.07 td(13.5, 3.0)	*α* 1.84 ddd(13.5, 9.9, 5.4) *β* 2.04 ddd(13.5, 13.5, 2.7)	2.00 m
4	3.88 tq(7.2, 3.6)	*β* 3.84 m	*β* 4.09 m	4.10 m
5				
6	7.40 s	7.18 s		
2′	3.47 sept(6.9)	3.45 sept(6.9)	2.75 dq(6.9, 5.1)	2.75 m
3′	1.21 d(6.9)	1.17 d(6.9)	1.16 d(6.9)	1.17 d(6.5)
4′	1.14 d(6.9)	1.15 d(6.9)	4.03 dd(11.1, 11.1) 4.43 dd(11.1, 5.1)	4.05 dd(11.5, 11.5) 4.45 dd(11.5, 5.5)
4-Me	1.31 d(7.2)	1.25 d(6.9)	1.28 d(6.9)	1.32 d(7.0)
7-Me	2.30 s	2.23 s	2.09 s	2.11 s

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Table 9-9-11: ^{1}H NMR spectroscopic data of cadinane-type sesquiterpenoids **9-9-44** and **9-9-45**.

H	7-9-44	7-9-45	H	7-9-44	7-9-45
2	6.34 d(1.5)	6.52 d(1.5)	1′	4.71 d(7.5)	4.74 d(7.5)
4	7.06 d(1.5)	7.28 d(1.5)	2′	3.61 dd(9.5, 7.5)	3.61 dd(9.5, 7.5)
11	5.90 d(15.3)	5.86 d(15.3)	3′	3.59 t(9.5)	3.58 t(9.5)
	5.82 d(15.3)	5.94 d(15.3)	4′	3.54 t(9.5)	3.53 t(9.5)
12	3.73 br s	3.75 br s	5′	3.70 m	3.71 m
13	3.98 m, 4.03 m	4.00 m, 4.05 m	6′	4.43 dd(12.2, 4.5)	4.44 dd(12.2, 4.5)
14	1.46 d(6.9)	1.53 d(6.9)		4.21 dd(12.2, 4.5)	4.21 dd(12.2, 4.5)
15	2.84 s	4.69 s			

Table 9-9-12: Compounds, MFs, and test solvents of copaane-, copacamphane-, cyclocopacamphane-type sesquiterpenoids **9-9-46**~**9-9-53**.

No.	Compounds	MFs	Test solvents	References
9-9-46	cervicol	$C_{15}H_{24}O$	$CDCl_3$	[92]
9-9-47	isolemnalol	$C_{15}H_{24}O$	$CDCl_3$	[92]
9-9-48	dendronobilin K	$C_{15}H_{24}O_4$	CD_3OD	[93]
9-9-49	dendronobilin A	$C_{15}H_{24}O_3$	CD_3OD	[94]
9-9-50	dendronobilin N	$C_{15}H_{24}O_4$	CD_3OD	[93]
9-9-51	dendronobilin I	$C_{15}H_{24}O_3$	CD_3OD	[94]
9-9-52	dendronobiloside E	$C_{21}H_{34}O_8$	C_5D_5N	[95]
9-9-53	dendrobane A	$C_{15}H_{24}O_3$	C_5D_5N	[95]

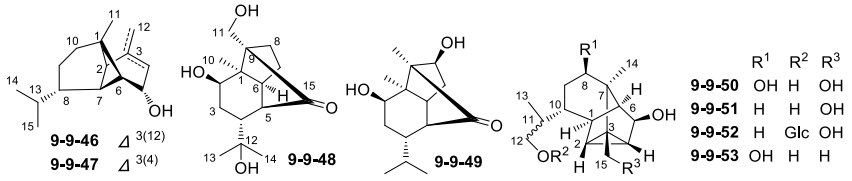

Table 9-9-13: ^{1}H NMR spectroscopic data of copaane-, copacamphane-, cyclocopacamphane-type sesquiterpenoids **9-9-46**~**9-9-50**.

H	9-9-46	9-9-47	9-9-48	9-9-49	9-9-50
1					1.77 m
2	2.57 d(5.4)	2.09 d(5.4)	4.05 dd(11.0, 6.7)	3.44 t(3.8)	1.31 m
3			*α* 2.03 m	*α* 1.73~1.79 m	
			β 1.47 m	*β* 1.44~1.51 m	
4	2.38 ddt(16.0, 8.0, 3.0)	5.42 br s	1.80 m	1.33~1.36 m	1.11 m
	2.82 dd(8.0, 16.0)				
5	4.20 dt(8.0, 3.0)	4.27 br s	2.24 m	2.21 dd(4.0, 1.3)	3.81 m

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Table 9-9-13 (continued)

H	9-9-46	9-9-47	9-9-48	9-9-49	9-9-50
6	1.73 m	1.77 m	2.62 d(4.5)	2.23 d(4.8)	1.37 m
7	2.24 s	1.85 s	*α* 1.95 m *β* 1.28 m	*α* 2.44~2.51 m *β* 1.09 dd(13.6, 3.4)	
8	1.62 m	1.59 m	*α* 1.77 m, *β* 1.16 m	4.20 dd(9.6, 3.4)	3.44 m
9	1.68 m	1.68 m			*α* 1.67 m, *β* 1.75 m
10	1.69 m	1.73 m	1.17 s	1.06 s	1.51 m
11	0.68 s	0.82 s	3.94 d(11.9) 3.45 d(11.9)	0.95 s	1.54 m
12	4.66 s, 4.72 s	1.74 br s		2.05~2.11 m	3.57 dd(10.7, 4.0) 3.40 m
13	1.55 m	1.63 m	1.23 s	0.96 d(5.0)	0.95 d(6.5)
14	0.89 d(6.6)	0.88 d(6.6)	1.22 s	0.88 d(5.0)	1.39 s
15	0.89 d(6.6)	0.89 d(6.6)			3.23 d(12.1), 4.11 d(12.1)

Table 9-9-14: ^{1}H NMR spectroscopic data of copaane-, copacamphane-, cyclocopacamphane-type sesquiterpenoids **9-9-51**~**9-9-53**.

H	9-9-51	9-9-52	9-9-53	H	9-9-51	9-9-52	9-9-53
1	1.80 br s	1.88 m	2.09 br s	13	0.92 d(6.8)	1.04 d(6.8)	1.20 d(6.2)
2	1.15~1.17 m	1.32 br d (5.7)	1.06 br d (5.7)	14	1.24 s	1.70 s	2.08 s
4	1.23~1.25 m	1.60 br d (5.7)	1.28 br d (5.7)	15	3.75 br s	4.12 s	1.56 s
5	3.74 br s	4.09 br s	4.25 br s	Glu-1		4.80 d(7.8)	
6	1.26~1.27 m	1.46 m	1.52 br s	Glu-2		4.00 m	
8	*α* 1.41~1.44 m *β* 1.68~1.72 m	1.42 m 1.86 m	3.90 m	Glu-3 Glu-4		4.20 m 4.18 m	
9	1.44~1.47 m	1.40 m, 1.64 m	1.86 m, 2.20 m	Glu-5		3.90 m	
10	1.35~1.40 m	1.47 m	1.79 m	Glu-6		4.34 dd(5.2, 11.7)	
11	1.46~1.49 m	1.78 m	1.78 m			4.50 dd(2.0, 11.7)	
12	3.57 dd(10.7, 4.2) 3.38 dd(10.7, 6.5)	3.44dd (7.8, 9.0) 4.20 m	3.78 dd (5.9, 10.5) 3.96 m				

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Table 9-9-15: Compounds, MFs, and test solvents of cubebane and oplopane-type sesquiterpenoids **9-9-54**~**9-9-62**.

No.	Compounds	MFs	Test solvents	References
9-9-54	(1*S**,2*S**,5*S**,6*S**,7*R**,8*S**)-13-isothiocyanatocubebane	$C_{16}H_{25}NS$	$CDCl_3$	[96]
9-9-55	cubebenone	$C_{15}H_{22}O$	$CDCl_3$	[97]
9-9-56	6-*epi*-*α*-cubebene	$C_{15}H_{24}$	C_6D_6	[98]
9-9-57	6-*epi*-*β*-cubebene	$C_{15}H_{24}$	C_6D_6	[98]
9-9-58	tephroside A	$C_{19}H_{30}O_9$	CD_3OD	[99]
9-9-59	tephroside B	$C_{19}H_{30}O_8$	CD_3OD	[99]
9-9-60	(–)-(1*S*,6*S*,9*R*)-4-acetyl-1-hydroxy-6-isopropyl-9-methylbicyclo[4.3.0]non-4-en-3-one	$C_{15}H_{22}O_3$	CD_3COCD_3	[100]
9-9-61	pulioplopanone A	$C_{15}H_{24}O_2$	$CDCl_3$	[101]
9-9-62	pulioplopanone B	$C_{15}H_{26}O_3$	$CDCl_3$	[101]

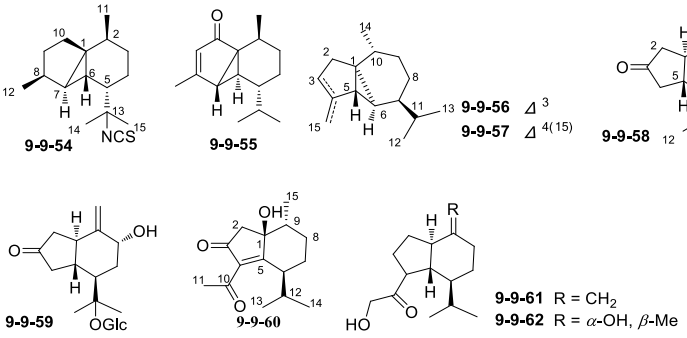

Table 9-9-16: ^{1}H NMR spectroscopic data of cubebane and oplopane-type sesquiterpenoids **9-9-54**~**9-9-57**.

H	9-9-54	9-9-55	9-9-56	9-9-57
2	1.81 dq(6.6, 6.9)	2.44 sept(6)	2.26~2.35 m	1.63 dd(8.2, 12.0)
			2.62~2.70 m	1.73~1.82 m
3	0.90 m, 1.62 m	0.64 br q(12), 1.74 m	4.98 d(1.5)	1.86~1.96 m
				2.05 dd(9.1, 16.7)
4	0.92 m, 1.52 m	0.88 qd(2, 14), 1.41 m		
5	1.92 m	1.07 m	1.26~1.30 m	1.44~1.49 m
6	0.83 d(4.2)	1.31 t(3)	0.55~0.59 m	1.08~1.12 m
7	1.06 d(4.2)	1.89 d(3)	1.37~1.46 m	1.36~1.44 m
8	2.26 m		0.64~0.72 m	0.63~0.72 m
			1.37~1.46 m	1.36~1.44 m

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Table 9-9-16 (continued)

H	9-9-54	9-9-55	9-9-56	9-9-57
9	0.72 m, 1.54 m	5.31 s	0.89~1.04 m 1.46~1.53 m	0.80~0.90 m 1.44~1.49 m
10	1.71 m, 1.72 m		1.82~1.92 m	1.73~1.82 m
11	1.01 d(6.9)	0.89 d(6)	1.37~1.46 m	1.36~1.44 m
12	1.00 d(6.6)	2.10 s	0.93 d(6.1)	1.01 d(6.0)
13		1.54 octer(7)	1.02 d(5.9)	0.91 d(6.3)
14	1.41 s	0.84 d(7)	1.07 d(7.1)	1.01 d(6.0)
15	1.41 s	0.89 d(7)	1.79 dd(2.0, 4.0)	4.80 s, 4.99 s

Table 9-9-17: ^{1}H NMR spectroscopic data of cubebane and oplopane-type sesquiterpenoids **9-9-58**~**9-9-62**.

H	9-9-58	9-9-59	9-9-60	9-9-61	9-9-62
1	3.10 m	2.83 m		1.95 m	1.50 m
2	*α* 2.29 dd(17.7, 6.5) *β* 2.14 m	*α* 2.25 dd(17.8, 6.5) *β* 2.14 dd(17.8, 13.7)	2.39 d(18.5) 2.68 d(18.5)	*α* 1.73 m *β* 1.83 m	*α* 1.50 m *β* 1.86 m
3				*α* 1.95 m, *β* 1.60 m	*α*1.96 m, *β* 1.60 m
4	*α*2.22 dd(17.8, 12.3) *β* 2.55 dd(17.8, 6.4)	*α* 2.44 dd(18.6, 12.4) *β* 2.73 dd(18.6, 6.5)		2.66 ddd(4.0, 5.8, 9.7)	2.59 ddd (5.0, 6.3, 10.6)
5	1.58 m	1.63 m		1.86 m	1.92 m
6	2.14 m	2.30 ddd (13.6, 13.6, 3.0)	2.92 ddd (10.5, 5.5, 2.5)	1.25 m	1.10 m
7	3.85 dd(9.2, 2.8)	*α* 1.39 ddd (13.6, 13.6, 3.0) *β* 2.11 ddd (13.6, 3.0, 3.0)	1.84 dddd (14.0, 4.0, 4.0, 2.5) 1.71 dddd (14.0, 14.0, 5.5, 4.0)	*α* 1.70 m *β* 1.10 dq (4.2, 12.9)	*α* 1.60 m *β* 1.10 m
8	4.32 d(2.8)	4.38 br d(3.0)	2.42 dddd (14.0, 14.0, 4.0, 4.0) 1.23 dddd (14.0, 4.0, 4.0, 2.5)	*α* 2.01 m *β* 2.37 dt(4.0, 6.0)	1.80 br d (15.6) 1.41 m
9			2.32 m		
10	4.81 s, 5.13 s	4.68 s, 4.94 s			
11			2.34 s	4.31 s	4.30 t(4.3)

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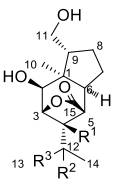
Table 9-9-17 (continued)

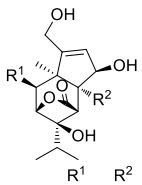
H	9-9-58	9-9-59	9-9-60	9-9-61	9-9-62
12	1.28 s	1.15 s	2.52 m	1.33 dt(2.8, 6.9)	1.29 m
13	1.24 s	1.28 s	0.85 d(6.5)	0.89 d(6.8)	0.89 d(6.7)
14			0.96 d(6.5)	0.61 d(6.8)	0.66 d(6.7)
15			0.84 d(7.0)	4.57 d(1.0), 4.68 d(1.0)	1.21 s
1′	4.36 d(7.7)	4.51 d(7.7)			
2′	3.28 dd(8.5, 7.7)	3.13 dd(9.0, 7.7)			
3′	3.37 t(8.5)	3.33 m			
4′	3.35 m	3.24 m			
5′	3.13 m	3.24 m			
6′	3.70 dd(11.9, 2.1)	3.82 d(12.0)			
	3.63 dd(11.9, 4.9)	3.62 dd(12.0, 4.6)			
1-OH			4.50 s		

Table 9-9-18: Compounds, MFs, and test solvents of picrotoxane-type sesquiterpenoids **9-9-63**~**9-9-72**.

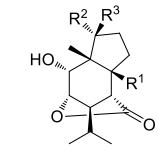
No.	Compounds	MFs	Test solvents	References
9-9-63	dendronobilin L	$C_{15}H_{24}O_6$	CD_3OD	[93]
9-9-64	dendronobilin M	$C_{15}H_{24}O_6$	CD_3OD	[93]
9-9-65	dendronobilin B	$C_{15}H_{24}O_5$	CD_3OD	[94]
9-9-66	dendronobilin D	$C_{15}H_{24}O_5$	CD_3OD	[94]
9-9-67	dendronobilin E	$C_{15}H_{24}O_5$	CD_3OD	[94]
9-9-68	picrodendrin α	$C_{15}H_{22}O_6$	C_5D_5N	[102]
9-9-69	picrodendrin β	$C_{16}H_{24}O_7$	C_5D_5N	[102]
9-9-70	dendrobiumane B	$C_{15}H_{24}O_4$	$CDCl_3$	[103]
9-9-71	dendrobiumane D	$C_{15}H_{24}O_5$	$CDCl_3$	[103]
9-9-72	dendrobiumane C	$C_{15}H_{22}O_4$	$CDCl_3$	[103]



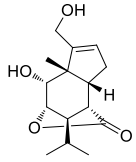
	R^1	R^2	R^3
9-9-63	OH	OH	Me
9-9-64	H	OH	CH_2OH
9-9-65	OH	H	Me
9-9-66	H	H	β-CH_2OH
9-9-67	H	H	α-CH_2OH



	R^1	R^2
9-9-68	OH	H
9-9-69	OMe	OH



	R^1	R^2	R^3
9-9-70	H	H	CH_2OH
9-9-71	OH	Me	OH



9-9-72

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Table 9-9-19: ^{1}H NMR spectroscopic data of picrotoxane-type sesquiterpenoids **9-9-63**~**9-9-67**.

H	9-9-63	9-9-64	9-9-65	9-9-66	9-9-67
2	4.55 d(1.6)	4.39 d(1.5)	3.74 d(1.5)	3.70 d(1.5)	3.89 d(1.5)
3	4.47 t(1.5)	4.65 m	4.39 t(1.4)	4.55 d(5.6)	4.69~4.71 m
4				2.28~2.30 m	2.28~2.31 m
5	2.38 dd(3.8, 1.4)	2.47 m, 2.49 m	2.27~2.29 m	2.46 t(3.8)	2.31~2.34 m
6	2.94 m	2.95 m	2.11~2.16 m	2.32~2.35 m	2.21 dt(9.4, 2.4)
7*α*	1.98 m	2.00 m	2.07~2.10 m	2.03~2.12 m	2.04~2.14 m
7*β*	1.78 m	1.77 m	1.83~1.85 m	1.83~1.88 m	1.78~1.84 m
8*α*	1.22 m	1.23 m	1.25~1.34 m	1.23~1.33 m	1.25~1.33 m
8*β*	1.87 m	1.87 m	1.91~1.93 m	1.89~1.93 m	1.90~1.96 m
9	2.7 m	2.65 m	2.64~2.72 m	2.62~2.67 m	2.62~2.66 m
10	1.10 s	1.13 s	1.15 s	1.16 s	1.16 s
11	3.56 dd(10.7, 8.9)	3.54 dd(10.6, 9.4)	3.58 dd(10.7, 8.7)	3.57 dd(10.9, 8.8)	3.57 dd(10.8, 8.8)
	3.37 dd(10.7, 4.9)	3.38 m	3.39 dd(10.7, 5.3)	3.39 dd(10.9, 5.5)	3.39 dd(10.9, 5.2)
12			1.88~1.91 m	1.76~1.84 m	1.83~1.89 m
13	1.28 s	3.37 m, 3.44 d(10.9)	0.96 d(6.7)	3.50 dd(11.1, 4.8)	3.51 dd(5.7, 2.5)
				3.40 dd(11.1, 5.8)	
14	1.29 s	1.27 s	0.91 d(6.7)	1.01 d(6.6)	0.94 d(6.6)

Table 9-9-20: ^{1}H NMR spectroscopic data of picrotoxane-type sesquiterpenoids **9-9-68**~**9-9-72**.

H	9-9-68	9-9-69	9-9-70	9-9-71	9-9-72
2	4.96 d(3.7)	3.78 s	3.70 br s	3.92 d(1.9)	3.67 br d(10.6)
3	5.09 dd(3.7, 1.1)	5.05 s	4.59 br d(5.2)	4.56 dd(5.2, 1.9)	4.59 br d(5.6)
4			2.08 m	2.14 m	2.06 m
5	3.04 dd(4.4, 1.1)	3.14 d(1.1)	2.31 dd(3.8, 3.7)	2.66 d(4.1)	2.26 dd(3.7, 3.6)
6	2.93 d(4.4)		2.16 m		2.32 m
7	5.46 d(2.2)	5.05 s	*α* 1.85 m	*α* 1.43 m	*α*2.62 br dd(17.3, 7.0)
			β 2.05 m	*β* 2.01 m	*β* 2.33 dd(17.3, 2.9)
8	6.40 d(2.2)	6.58 d(2.2)	*α*1.19 m, *β* 1.94 m	*α* 2.46 ddd (11.2, 11.2, 7.7) *β* 1.47 m	5.62 br s
9			2.68 m		
10	2.06 s	1.67 s	1.18 s	1.36 s	1.28 s
11	4.63 d(15.0)	4.72 br d(15.4)	3.47 dd(11.0, 10.2)	1.56 s	4.04 m
	4.79 d(15.0)	5.06 d(15.4)	3.62 dd(11.0, 4.1)		4.27 d(12.2)
12	3.00 sept(6.6)	2.92 sept(6.6)	1.72 m	2.00 m	1.75 m

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Table 9-9-20 (continued)

H	9-9-68	9-9-69	9-9-70	9-9-71	9-9-72
13	1.50 d(6.6)	1.20 d(6.6)	0.93 d(6.6)	0.99 d(6.2)	0.96 d(6.5)
14	1.21 d(6.6)	1.45 d(6.6)	0.98 d(6.4)	0.92 d(6.5)	0.99 d(6.5)
OH					5.95 d(10.6, 2-OH) 2.55 m(11-OH)

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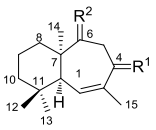
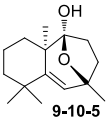
9.10 Himachalane- and longipinane-type sesquiterpenoids

Table 9-10-1: Compounds, MFs, and test solvents of himachalane-type sesquiterpenoids **9-10-1**~**9-10-10**.

No.	Compounds	MFs	Test solvents	References
9-10-1	tsangane A	$C_{15}H_{26}O_2$	$CDCl_3$	[104]
9-10-2	tsangane B	$C_{15}H_{24}O_2$	$CDCl_3$	[104]
9-10-3	tsangane C	$C_{15}H_{24}O_2$	$CDCl_3$	[104]
9-10-4	tsangane D	$C_{15}H_{24}O$	$CDCl_3$	[104]
9-10-5	tsangane E	$C_{15}H_{24}O_2$	$CDCl_3$	[104]
9-10-6	2*α*,6*α*-epoxyhimachalan-3*β*-ol	$C_{15}H_{26}O_2$	CD_3COCD_3	[105]
9-10-7	2*α*,6*α*-epoxy-3-himachalene	$C_{15}H_{24}O$	$CDCl_3$	[105]
9-10-8	2-himachalen-6-ol	$C_{15}H_{26}O$	$CDCl_3$	[105]
9-10-9	3-himachalen-6-ol	$C_{15}H_{26}O$	$CDCl_3$	[105]
9-10-10	hugonianene B	$C_{16}H_{28}O_2$	$CDCl_3$	[106]



	R^1	R^2
9-10-1	*β*-OH,H	*α*-OH,H
9-10-2	O	*α*-OH,H
9-10-3	*β*-OH,H	O
9-10-4	H_2	O



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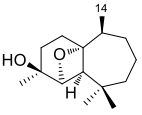
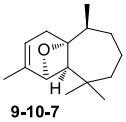
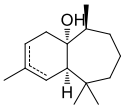


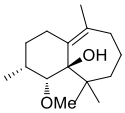
9-10-6



9-10-7



7-10-8 Δ^{2}
7-10-9 $\Delta^{3(4)}$



9-10-10

Table 9-10-2: ^{1}H NMR spectroscopic data of himachalane-type sesquiterpenoids **9-10-1**~**9-10-5**.

H	9-10-1	9-10-2	9-10-3	9-10-4	9-10-5
1	2.12 d(5.6)	2.16 d(6.6)	2.96 d(6.4)	2.78 d(5.2)	
2	5.41 d(5.6)	6.32 dd(6.6, 1.4)	5.53 dd(6.4, 1.4)	5.36 d(5.2)	5.40 s
4	4.13 br d		4.16 dd(10.1, 7.2)	*α* 2.44 m, *β* 2.15 m	1.77 m
5	*α* 1.70 m	*α* 2.93 dd(16.4, 6.7)	*α*3.65 dd(10.9, 10.1)	*α* 3.46 td(11.4, 6.5)	2.50 m
	β 2.00 m	*β* 2.86 dd(16.4, 2.3)	*β* 2.72 dd(10.9, 7.2)	*β* 2.23 ddd(11.4, 6.1, 3.7)	1.69 m
6	3.83 d(10.7)	3.61 br m			
8*α*	1.90 m	1.52 m	1.40 m	1.46 m	1.69 m
8*β*	1.14 m	1.18 m	1.32 m	1.38 m	1.55 m

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Table 9-10-2 (continued)

H	9-10-1	9-10-2	9-10-3	9-10-4	9-10-5
9*α*	1.53 m	1.73 m	1.67 m	1.63 m	1.83 m
9*β*	1.44 m	1.54 m	1.55 m	1.51 m	1.59 m
10*α*	1.45 m	1.52 m	1.51 m	1.48 m	1.54 m
10*β*	1.15 m	1.12 m	1.15 m	1.16 m	1.21 m
12	0.86 s	0.86 s	0.95 s	0.92 s	1.02 s
13	0.98 s	1.06 s	0.99 s	0.97 s	1.15 s
14	0.81 s	1.05 s	1.10 s	1.12 s	1.27 s
15	1.82 s	1.86 s	1.82 s	1.68 s	1.37 s

Table 9-10-3: ^{1}H NMR spectroscopic data of himachalane-type sesquiterpenoids **9-10-6**~**9-10-10**.

H	9-10-6	9-10-7	9-10-8	9-10-9	9-10-10
1	1.78 s	1.67 s	1.90 br s	1.60 m	
2	2.95 s	3.78 s	5.41 br s	*α* 1.86 m, *β* 2.00 m	3.65 dd(5.1, 1.1)
4	1.81 m	5.38 br s	*α* 1.97 m, *β* 1.74 m	5.32 br m	1.62 m
5	1.54 m	*α* 2.05 m, *β* 2.12 m	*α* 1.57 m, *β* 2.00 m	*α* 1.80 br m, *β* 2.33 br m	1.8 dm, 2.71 dm(13)
7	2.01 m	2.05 m	2.03 m	1.82 m	
8	1.68 m, 1.33 m	1.67 m	*α* 1.51 m, *β* 1.32 m	1.84 m, 1.60 m	2.0 m, 2.20 m
9	1.28 m, 1.56 m	1.52 m, 1.67 m	*α* 1.55 m	1.82 m	1.35 m, 1.75 m
10	1.30 m, 1.58 m	1.52 m, 1.65 m	*α* 1.56 m, *β* 1.44 m	1.76 m	0.80 m
12	1.06 s	1.10 s	0.85 s	1.24 s	0.90 s
13	1.26 s	0.63 s	1.07 s	1.30 s	0.95 s
14	0.98 d(7.2)	0.95 d(6.8)	0.99 d(6.8)	0.81 d(6.8)	1.55 s
15	1.27 s	1.84 s	1.69 s	1.59 s	0.63 d(6.5)
OCH_3					3.16 s

Table 9-10-4: Compounds, MFs, and test solvents of longipinane-type sesquiterpenoids **9-10-11**~**9-10-20**.

No.	Compounds	MFs	Test solvents	References
9-10-11	methyl longipin-9-en-14-oate	$C_{16}H_{24}O_2$	$CDCl_3$	[107]
9-10-12	longipin-9-ene-12,15-diol	$C_{15}H_{24}O_2$	$CDCl_3$	[107]
9-10-13	15-acetoxylongipin-9-en-12-ol	$C_{17}H_{26}O_3$	$CDCl_3$	[107]
9-10-14	15-acetoxylongipin-9-en-14-ol	$C_{17}H_{26}O_3$	$CDCl_3$	[107]

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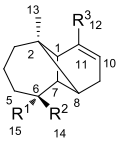
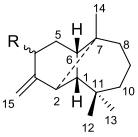
Table 9-10-4 (continued)

No.	Compounds	MFs	Test solvents	References
9-10-15	14-acetoxylongipin-9-en-15-ol	$C_{17}H_{26}O_3$	$CDCl_3$	[107]
9-10-16	longipin-9-ene-12,14,15-triol	$C_{15}H_{24}O_3$	CD_3COCD_3	[107]
9-10-17	longipin-9-ene-14,15-diol	$C_{15}H_{24}O_2$	$CDCl_3$	[107]
9-10-18	(–)-4-*epi*-marsupellol	$C_{15}H_{24}O$	C_6D_6	[108]
9-10-19	(–)-4-*epi*-marsupellol acetate	$C_{17}H_{26}O_2$	C_6D_6	[108]
9-10-20	(–)-marsupellol acetate	$C_{17}H_{26}O_2$	C_6D_6	[108]



	R^1	R^2	R^3
9-10-11	Me	CO_2Me	Me
9-10-12	CH_2OH	Me	CH_2OH
9-10-13	CH_2OAc	Me	CH_2OH
9-10-14	CH_2OAc	CH_2OH	Me
9-10-15	CH_2OH	CH_2OAc	Me
9-10-16	CH_2OH	CH_2OH	CH_2OH
9-10-17	CH_2OH	CH_2OH	Me



9-10-18 R = α-OH
9-10-19 R = α-OAc
9-10-20 R = β-OAc

Table 9-10-5: ^{1}H NMR spectroscopic data of longipinane-type sesquiterpenoids **9-10-11**~**9-10-15**.

H	9-10-11	9-10-12	9-10-13	9-10-14	9-10-15
1	1.99~2.15 m	2.16 m	2.16 m	1.96~2.36 m	1.96~2.36 m
3	1.49~1.64 m	1.20~1.68 m	1.22~1.67 m	1.22~1.62 m	1.22~1.62 m
4	1.49~1.64 m	1.20~1.68 m	1.22~1.67 m	1.22~1.62 m	1.22~1.62 m
5	1.99~2.15 m, 1.33 m	1.20~1.68 m	1.22~1.67 m	1.22~1.62 m	1.22~1.62 m
7	1.99~2.15 m	1.66 s	1.54 s	1.75 s	1.72 s
8	1.97 d(6.0)	2.14~2.38 m	2.25~2.32 m	1.96~2.36 m	1.96~2.36 m
9	2.25 m	2.14~2.38 m	2.25~2.32 m	1.96~2.36 m	1.96~2.36 m
10	5.20 m	5.45 m	5.42 m	5.20 m	5.20 m
12	1.67 q(2.0)	3.99 d(12.0) 3.93 d(12.0)	3.93 br s	1.61 t(1.9)	1.61 t(1.9)
13	0.84 s	0.81 s①	0.81 s①	0.81 s	0.80 s
14		0.83 s①	0.83 s①	4.01 br s① 3.32 d(10.8)	3.41 d(11.6) 3.26 d(11.6)
15	1.16 s	3.42 d(10.8) 3.40 d(10.8)	3.98 d(10.7) 3.74 d(10.7)	4.00 d(11.2)① 3.85 d(11.2)	4.00 d(11.2) 3.85 d(11.2)
OMe	3.62 s				
OAc			2.03 s	2.03 s	2.02 s

① Assignments may be exchanged in the same column.

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Table 9-10-6: ^{1}H NMR spectroscopic data of longipinane-type sesquiterpenoids **9-10-16**~**9-10-20**.

H	9-10-16	9-10-17	9-10-18	9-10-19	9-10-20
1	2.12~2.28 m	2.08 m	1.28~1.33 m	1.48 br s	1.77~1.81 m
2			2.60 br d(6.0)	2.61 d(6.3)	2.54 d(5.7)
3	1.25~1.65 m	1.25~1.62 m			
4	1.25~1.65 m	1.25~1.62 m	4.44~4.47 m	5.99~6.03 m	5.90 dd(1.3, 8.8)
5	1.25~1.65 m	1.25~1.62 m	1.71 ddd	1.78 ddd	1.77~1.81 m
			(1.9, 6.3, 11.7)	(1.9, 6.0, 13.6)	2.41 ddd
			2.24~2.29 m	2.56~2.59 m	(2.2, 8.8, 14.8)
6			1.88~1.91 m	1.86 br t(5.0)	1.82~1.85 m
7	1.83 s	1.69 s			
8	2.12~2.28 m	1.96 d(5.5)	1.43~1.47 m	1.42~1.45 m	1.40 br t(5.7)
9	2.12~2.28 m	2.20 m	1.43~1.47 m	1.42~1.45 m	1.44~1.48 m
10	5.77 m	5.16 m	1.28~1.33 m	1.27~1.31 m	1.29~1.32 m
12	3.87 br s	1.62 q(1.9)	0.85 s	0.83 s	0.89 s
13	0.81 s	0.81 s	0.78 s	0.78 s	0.92 s
14	3.33~3.52 m	3.47 d(10.8)	0.82 s	0.87 s	0.60 s
		3.40 d(10.8)			
15	3.33~3.52 m	3.57 d(10.8)	4.82 br s	4.85 d(1.3)	4.86 s
		3.49 d(10.8)	5.10 t(1.9)	5.02 dd(1.9, 0.6)	5.17 s
OAc				1.75 s	1.70 s

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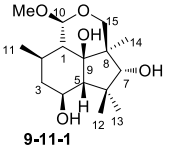
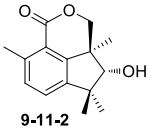
9.11 Botryane-, caryophyllane-, fascicularone-, modhephene-, silphinane-, subergane-, and suberosane-type sesquiterpenoids

Table 9-11-1: Compounds, MFs, and test solvents of botryane-type sesquiterpenoids **9-11-1**~**9-11-20**.

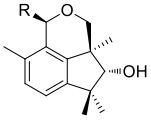
No.	Compounds	MFs	Test solvents	References
9-11-1	7-hydroxy-10-methoxydeacetyldihydrobotrydial	$C_{16}H_{28}O_5$	CD_3OD	[109]
9-11-2	7-hydroxy-10-oxodehydrodihydrobotrydial	$C_{15}H_{18}O_3$	$CDCl_3$	[109]
9-11-3	7,10-dihydroxydehydrodihydrobotrydial	$C_{15}H_{20}O_3$	$CDCl_3$	[109]
9-11-4	7-hydroxy-10-methoxydehydrodihydrobotrydial	$C_{16}H_{22}O_3$	$CDCl_3$	[109]
9-11-5	7-hydroxy-10-ethoxydehydrodihydrobotrydial	$C_{17}H_{24}O_3$	$CDCl_3$	[109]
9-11-6	7-hydroxy-10-dehydroxydehydrodihydrobotrydial	$C_{15}H_{20}O_2$	$CDCl_3$	[109]
9-11-7	7-hydroxydeacetylbotryenalol	$C_{15}H_{24}O_4$	CD_3OD	[109]
9-11-8	7,10-dihydroxydeacetyldihydrobotrydial-1(10)-ene	$C_{15}H_{24}O_4$	$CDCl_3$	[109]
9-11-9	4,10-didehydroxy-7-hydroxydeacetyldihydrobotrydial-1(10),5(9)-diene	$C_{15}H_{22}O_2$	$CDCl_3$	[109]
9-11-10	7-hydroxy-10-dehydroxydeacetyldihydrobotrydial-1(10),5(9)-diene	$C_{15}H_{22}O_3$	$CDCl_3$	[109]
9-11-11	15α-methoxy-*O*-methyldihydrobotrydial	$C_{19}H_{32}O_6$	$CDCl_3$	[110]
9-11-12	secobotrytriendiol	$C_{15}H_{24}O_2$	$CDCl_3$	[110]
9-11-13	dihydrobotrydialone	$C_{17}H_{26}O_6$	$CDCl_3$	[110]
9-11-14	dehydrobotrydienol	$C_{15}H_{22}O_2$	$CDCl_3$	[110]
9-11-15	11-hydroxydehydrobotrydienol	$C_{15}H_{22}O_3$	$CDCl_3$	[110]
9-11-16	12-hydroxydehydrobotrydienol	$C_{15}H_{22}O_3$	$CDCl_3$	[110]
9-11-17	norbotrydialone acetate	$C_{16}H_{22}O_4$	$CDCl_3$	[111]
9-11-18	10-oxodihydrobotry-1(9),4(5)-diendial	$C_{15}H_{20}O_2$	$CDCl_3$	[111]
9-11-19	10-oxodehydrodihydrobotrydial	$C_{15}H_{18}O_2$	$CDCl_3$	[111]
9-11-20	4β-acetoxytetrahydrobotryslactone	$C_{20}H_{30}O_6$	$CDCl_3$	[111]



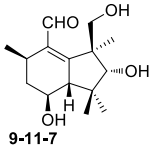
9-11-1



9-11-2



9-11-3 R = OH
9-11-4 R = OMe
9-11-5 R = OEt
9-11-6 R = H



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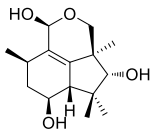
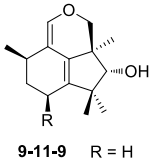
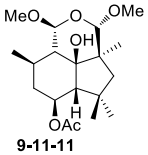


9-11-8



9-11-9 R = H
9-11-10 R = OH



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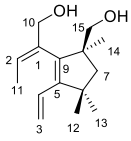

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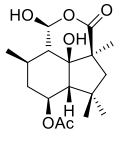

9-11-13

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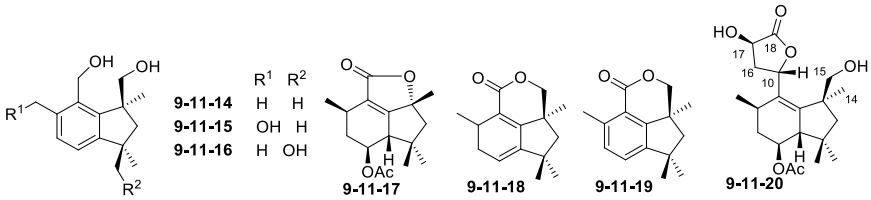

Table 9-11-2: ^{1}H NMR spectroscopic data of botryane-type sesquiterpenoids **9-11-1**~**9-11-5**.

H	9-11-1	9-11-2	9-11-3	9-11-4	9-11-5
1	1.47 d(12.4)				
2	1.78 m				
3	*α* 1.89 m, *β* 1.10 m	7.20 d(7.7)	7.04 d(8.0)	7.04 d(8.0)	7.03 d(8.0)
4	3.88 td(4.8, 10.1)	7.29 d(7.7)	7.08 d(8.0)	7.07 d(8.0)	7.08 d(8.0)
5	1.61 d(10.1)				
7	3.96 s	3.90 s	3.55 s	3.58 s	3.80 s
10	4.85 s		5.28 s	5.35 s	5.69 s
11	0.99 d(6.3)	2.60 s	2.32 s	2.30 s	2.32 s
12	1.19 s	1.36 s	1.35 s	1.35 s	1.35 s
13	1.29 s	1.32 s	1.28 s	1.29 s	1.31 s
14	1.13 s	1.46 s	1.39 s	1.39 s	1.39 s
15	3.24 d(10.4)	4.15 d(10.1)	3.72 d(10.1)	3.55 d(10.0)	3.73 d(10.0)
	4.04 d(10.4)	4.50 d(10.1)	3.82 d(10.1)	3.80 d(10.0)	3.84 d(10.0)
OMe	3.39 s			3.56 s	
$O\underline{CH_2}CH_3$					4.05 q(5.0)
$OCH_2\underline{CH_3}$					1.29 t(5.0)

Table 9-11-3: ^{1}H NMR spectroscopic data of botryane-type sesquiterpenoids **9-11-6**~**9-11-10**.

H	9-11-6	9-11-7	9-11-8	9-11-9	9-11-10
2		2.84 m	2.65 m	2.45 m	2.50 m
3	7.01 d(7.8)	*α* 2.07 m, *β* 1.40 m	*α* 2.25 m, *β* 1.45 m	*α* 1.80 m, *β* 1.45 m	*α* 1.95 m, *β* 1.46 m
4	7.07 d(7.8)	3.64 m	3.69 m	2.05 m	3.78 m
5		2.20 dd(3.2, 8.9)	2.10 dd(12.1, 4.2)		
7	3.73 s	3.66 s	3.60 s	3.57 s	3.48 s
10	*α* 4.61 d(15.8)	10.27 s	5.22 s	6.15 s	6.22 s
	β 4.94 d(15.8)				
11	2.17 s	1.10 d(6.7)	0.90 d(7.2)	1.12 d(6.1)	1.00 d(6.5)
12	1.37 s	0.86 s	1.17 s	1.10 s	1.11 s
13	1.32 s	1.29 s	1.31 s	1.25 s	1.05 s
14	1.41 s	1.27 s	1.24 s	1.10 s	1.10 s
15*α*	3.26 d(9.8)	3.40 d(10.0)	3.46 d(9.1)	3.43 d(9.8)	3.50 d(9.9)
15*β*	4.09 d(9.8)	3.58 d(10.0)	3.95 d(9.1)	4.09 d(9.8)	4.11 d(9.9)

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Table 9-11-4: ^{1}H NMR spectroscopic data of botryane-type sesquiterpenoids **9-11-11**~**9-11-15**.

H	9-11-11	9-11-12	9-11-13	9-11-14	9-11-15
1	1.54 dd(13.4, 1.4)		1.46 dd(1.7, 8.5)		
2	1.80 m	5.73 d(6.8)	2.13 m		
3	*α* 2.04 ddd(4.9, 3.3, 12.3)	5.06 dd(1.7, 11.8)	*α* 2.10 m	7.12 d(7.7)	7.21 d(7.6)
	β 1.05 m	5.40 dd(1.7, 18.3)	*β* 1.37 d(11.7)		
4	5.10 ddd(4.9, 11.3, 10.9)	6.20 dd(11.8, 18.3)	4.85 ddd(11.7, 11.7, 3.2)	7.02 d(7.7)	7.09 d(7.6)
5	1.89 d(10.9)		1.34 d(3.2)		
7*α*	1.24 d(12.8)	1.62 d(13.0)	1.61 d(14.6)	1.78 d(13.2)	1.79 d(13.1)
7*β*	2.00 d(12.8)	2.08 d(13.0)	1.86 d(14.6)	2.21 d(13.2)	2.25 d(13.1)
10	4.95 d(1.4)	4.12 d(12.9)	5.07 d(8.5)	4.72 d(11.4)	4.76 d(12.4)
		4.29 d(12.9)		4.78 d(11.4)	4.80 d(12.4)
11	0.94 d(6.3)	1.52 dd(6.8, 1.2)	1.20 d(6.8)	2.42 s	4.56 d(11.8)
					4.96 d(11.8)
12	1.24 s①	1.34 s①	0.99 s①	1.29 s	1.31 s①
13	1.08 s①	1.33 s①	1.14 s①	1.29 s	1.30 s①
14	1.11 s	0.98 s	1.43 s	1.38 s	1.38 s
15	4.86 s	3.27 d(11.2)		3.63 d(11.3)	3.59 d(11.7)
		3.56 d(11.2)		3.92 d(11.3)	3.94 d(11.7)
OAc	2.01 s		2.03 s		
OMe	3.45 s(10-OMe)				
	3.49 s(15-OMe)				
OH	3.64 s				

① Assignments may be exchanged in the same column.

Table 9-11-5: 1H NMR spectroscopic data of botryane-type sesquiterpenoids **9-11-16**~**9-11-20**.

H	9-11-16	9-11-17	9-11-18	9-11-19	9-11-20
2		2.65 m	2.79 ddq(9.8, 1.2, 7.1)		2.48 m
3	7.14 d(7.7)	*α*2.17 ddd(3.4, 4.9, 12.6)	*α*2.24 ddd(1.2, 17.6, 6.4)	7.20 d(7.8)	1.59~1.74 m
		β 1.36 m	*β* 2.60 ddd(9.8, 17.6, 2.8)		
4	6.97 d(7.7)	4.75 ddd(11.7, 3.4, 8.1)	5.72 dd(2.8, 6.4)	7.14 d(7.8)	5.09 dd(9.8, 4.9)
5		2.71 dd(3.0, 8.1)			2.25 br d(4.9)
7*α*	1.69 d(13.7)	1.49 d(13.2)	1.53 d(13.1)	1.84 d(13.0)	1.39 d(12.8)
7*β*	2.48 d(13.7)	1.87 d(13.2)	1.72 d(13.1)	1.96 d(13.0)	1.78 d(12.8)
10	4.66 d(11.7)				5.88 dd(7.6, 7.6)
	4.72 d(11.7)				

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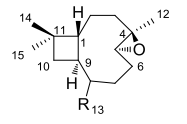
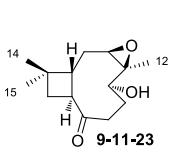
Table 9-11-5 (continued)

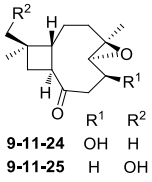
H	9-11-16	9-11-17	9-11-18	9-11-19	9-11-20
11	2.41 s	1.19 d(6.8)	0.87 d(7.1)	2.61 s	1.08 d(7.0)
12	3.52 d(10.7) 3.66 d(10.7)	1.33 s	1.27 s	1.44 s	1.05 s
13	1.23 s	0.99 s	1.17 s	1.31 s	0.89 s
14	1.30 s	1.58 s	1.35 s	1.50 s	1.41 s
15			*α* 3.98 d(10.0) *β* 4.21 d(10.0)	*α*4.12 d(10.1) *β* 4.35 d(10.1)	3.38 d(10.5) 3.43 d(10.5)
16					*α* 2.48ddd(7.7, 7.6, 13.9) *β* 2.31ddd(3.7, 7.6, 13.9)
17					4.51 dd(3.7, 7.7)
OAc		2.05 s			2.02 s

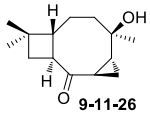
Table 9-11-6: Compounds, MFs, and test solvents of caryophyllane-type sesquiterpenoids **9-11-21**~**9-11-30**.

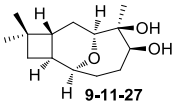
No.	Compounds	MFs	Test solvents	References
9-11-21	rumphellolide A	$C_{15}H_{24}O_3$	$CDCl_3$	[112]
9-11-22	rumphellolide B	$C_{15}H_{24}O_3$	$CDCl_3$	[112]
9-11-23	rumphellolide C	$C_{14}H_{22}O_3$	$CDCl_3$	[112]
9-11-24	rumphellolide D	$C_{14}H_{22}O_3$	$CDCl_3$	[112]
9-11-25	rumphellolide E	$C_{14}H_{22}O_3$	$CDCl_3$	[112]
9-11-26	rumphellolide F	$C_{14}H_{22}O_2$	$CDCl_3$	[112]
9-11-27	rumphellolide G	$C_{14}H_{24}O_3$	$CDCl_3$	[113]
9-11-28	rumphellatin D	$C_{15}H_{23}ClO_3$	$CDCl_3$	[114]
9-11-29	artarborol	$C_{14}H_{24}O_2$	C_6D_6	[115]
9-11-30	rumphellatin A	$C_{14}H_{23}ClO_2$	$CDCl_3$	[116]

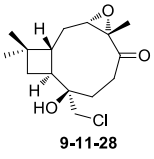


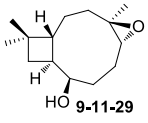












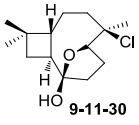


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Table 9-11-7: ^{1}H NMR spectroscopic data of caryophyllane-type sesquiterpenoids **9-11-21**~**9-11-25**.

H	9-11-21	9-11-22	9-11-23	9-11-24	9-11-25
1	1.91 br t(9.6)	1.92 br t(9.6)	2.17 m	1.97 br t(9.6)	2.28 m
2*α*	1.72 m	1.72 m	2.22 m	1.69 m	1.68 m
2*β*	1.46 m	1.46 m	2.01 m	1.53 m	1.58 m
3*α*	2.09 m	2.10 m	3.12 dd(4.8, 4.8)	2.14 dt(12.8, 3.6)	2.15 dt(13.2, 4.0)
3*β*	1.02 m	1.03 m		1.00 dt(12.8, 4.8)	0.99 td(13.2, 4.8)
5	2.93 dd(11.2, 4.0)	2.93 dd(11.2, 4.0)	3.51 dd(10.4, 4.4)	2.68 d(8.0)	2.71 dd(10.0, 4.8)
6*α*	1.21 m	1.21 m	2.40 m	3.74 ddd(8.0, 4.8, 4.8)	1.48 m
6*β*	2.26 m	2.25 m	2.50 m		2.41 m
7*α*	2.11 m	2.12 m	2.04 m	2.85 dd(12.0, 4.8)	2.56 d(5.6)
7*β*	1.79 m	1.79 m	1.87 m	2.72 dd(12.0, 4.8)	2.58 dd(5.6, 1.6)
8	2.56 dt(6.4, 6.0)	2.58 m			
9	2.51 m	2.52 m	2.95 td(9.6, 7.6)	3.05 td(9.6, 8.0)	3.09 td(9.2, 8.4)
10*α*	1.51 dd(10.4, 8.0)	1.52 dd(10.8, 8.0)	2.00 m	2.09 br t(10.0)	1.58 dd(11.2, 7.6)
10*β*	1.42 d(10.4)	1.41 d(10.8)	1.57 m	1.68 m	2.24 dd(11.2, 9.6)
12	1.29 s	1.30 s	1.31 s	1.30 s	1.32 s
14	0.96 s	0.97 s	1.02 s	1.04 s	3.39 s
15	0.98 s	0.98 s	1.08 s	1.04 s	1.08 s

Table 9-11-8: ^{1}H NMR spectroscopic data of caryophyllane-type sesquiterpenoids **9-11-26**~**9-11-30**.

H	9-11-26	9-11-27	9-11-28	9-11-29	9-11-30
1	1.81 m	2.08 ddd (10.8, 10.8, 7.6)	2.20 ddd (12.8, 8.0, 1.6)	1.81 t(9.5)	1.42 br t(10.5)
2	*α* 1.85 m, *β* 1.52 m	*α* 1.56 m, *β* 2.10 m	*α* 1.13 ddd (14.8, 12.8, 9.2) *β* 2.15 ddd (14.8, 4.8, 1.6)	1.37 td(14.5, 3.5, 3.5) 1.12 (ov)	*α* 1.30 m *β* 1.53 dt(10.5, 4.5)
3	*α* 2.00 ddd (13.6, 6.4, 1.6) *β* 1.67 br t(13.6)	3.90 m	3.02 dd(9.2, 4.8)	1.94 td(13.0, 3.5, 3.5) 0.96 dt(13.0, 13.0, 3.5)	2.06 dd(6.0, 6.0)
5	1.01 m	4.17 m		3.10 dd(9.0, 5.0)	4.50 dd(8.5, 7.5)
6	*α* 0.82 ddd (7.2, 6.8, 5.6) *β* 1.37 ddd (8.8, 6.4, 5.6)	*α* 1.65 m *β* 1.71 m	2.30 m 2.75 m	1.22 (ov) 2.16 m	*α* 2.37 m *β* 2.12 m

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Table 9-11-8 (continued)

H	9-11-26	9-11-27	9-11-28	9-11-29	9-11-30
7	1.73 m	*α* 1.95 m	2.38 m	1.20 (ov)	*α* 1.85 dt(13.5, 11.0)
		β 1.62 m	2.82 dd(9.6, 3.2)	1.62 m	*β* 2.42 dd(13.5, 8.0)
8		4.00 ddd(10.4, 4.4, 4.4)		3.36 dd(9.5, 1.5)	
9	3.15 td(10.4, 7.6)	2.21 dddd(10.8, 10.4, 7.6, 4.4)	1.85 ddd(8.0, 8.0, 8.0)	1.68 dq(9.5, 1.5)	2.15 m
10	*α* 1.48 dd(10.8, 7.6)	*α* 1.49 dd(10.4, 7.6)	*α* 1.60 dd(10.4, 8.0)	1.47 d(9.5)	*α* 1.64 dd(10.5, 6.0)
	β 1.91 br t(10.8)	*β* 1.22 dd(10.4, 10.4)	*β* 1.92 dd(10.4, 8.0)		*β* 1.35 br t (10.5)
12	0.98 s	1.29 s	1.65 s	1.10 s	1.71 s
13		1.04 s	3.49 br s	0.86 s	1.02 s
14	0.98 s	1.03 s	1.04 s	0.91 s	0.99 s
15	1.04 s		0.93 s		
8-OH					2.35 s

Table 9-11-9: Compounds, MFs, and test solvents of fascicularone-type sesquiterpenoids **9-11-31**~**9-11-37**.

No.	Compounds	MFs	Test solvents	References
9-11-31	fascicularone B	$C_{15}H_{22}O_4$	$CDCl_3$	[117]
9-11-32	fascicularone I	$C_{15}H_{22}O_5$	$CDCl_3$	[118]
9-11-33	fascicularone H	$C_{15}H_{24}O_5$	CD_3OD	[118]
9-11-34	fascicularone A	$C_{14}H_{20}O_4$	$CDCl_3$	[117]
9-11-35	5,6-*O*-isopropylidene fascicularone A	$C_{17}H_{24}O_4$	$CDCl_3$	[117]
9-11-36	fascicularone J	$C_{15}H_{22}O_4$	$CDCl_3$	[118]
9-11-37	fascicularone K	$C_{15}H_{22}O_5$	CD_3OD	[118]

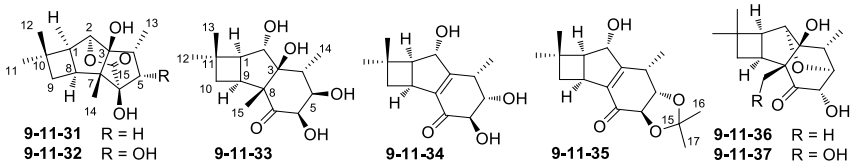

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Table 9-11-10: ^{1}H NMR spectroscopic data of fascicularone-type sesquiterpenoids **9-11-31**~**9-11-34**.

H	9-11-31	9-11-32	9-11-33	9-11-34
1	2.50 br d(7.3)	2.55 br d(7.8)	2.12(ov)	2.46 d(6.3)
2	4.58 br s	4.57 br s	4.21 d(2.4)	4.78 br s
4	2.32 m	2.49 m	2.40 m	3.03 m
5	1.43 dd(11.7, 2.9) 2.35 t(11.7)	4.31 d(11.7)	3.74 t(4.9)	3.97 dd(11.2, 5.4)
6			4.00 d(4.9)	4.28 d(11.2)
8	2.83 ddd(9.2, 7.3, 6.8)	2.81 q(7.8)		
9	1.60 ddd(11.7, 9.2, 2.0) 2.24 dd(11.7, 6.8)	α 1.62 ddd(11.7, 7.8, 2.0) β 2.20 dd(11.7, 7.8)	3.10 q(8.3)	3.41 m
10			α 1.53 ddd(10.5, 8.3, 2.4) β 2.12(ov)	1.36 dd(12.2, 4.4) 2.13 dd(12.2, 9.3)
11	1.20 s	1.20 s		
12	1.08 s	1.08 s	1.05 s	1.20 s
13	1.29 d(6.8)	1.26 d(7.3)	1.21 s	0.90 s
14	1.09 s	1.09 s	1.05 d(7.3)	1.40 d(6.8)
15			1.20 s	
OH	2.02 br s(3-OH) 3.26 br s(6-OH)			

Table 9-11-11: ^{1}H NMR spectroscopic data of fascicularone-type sesquiterpenoids **9-11-35**~**9-11-37**.

H	9-11-35	9-11-36	9-11-37
1	2.47 d(6.8)	2.21~2.25 m(ov)	2.18 br d(7.1)
2	4.78 br s	4.45 s	4.44 s
4	3.19 m	2.16 q(7.8)	2.63 q(7.1)
5	4.13 dd(11.2, 5.4)	4.11 s	4.00 d(1.9)
6	4.49 d(11.2)	3.76 s	3.70 d(1.9)
9	3.41 m	3.08 q(7.3)	2.89 m
10	1.49 m 2.16 dd(12.2, 9.3)	α 1.63 ddd(11.7, 7.3, 2.9) β 2.21~2.25 m(ov)	α 1.50 td(10.3, 2.8) β 2.40 t(10.3)
11			
12	1.21 s	1.16 s	1.13 s
13	0.93 s	0.97 s	0.99 s
14	1.41 d(7.3)	1.35 d(7.8)	1.30 d(7.1)
15		1.14 s	3.81 d(10.6), 4.02 d(10.6)
16	1.52 s		
17	1.48 s		

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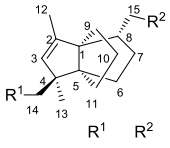
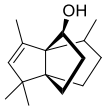
Table 9-11-12: Compounds, MFs, and test solvents of modhephene-type sesquiterpenoids **9-11-38**~**9-11-47**.

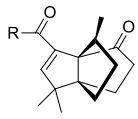
No.	Compounds	MFs	Test solvents	References
9-11-38	8-acetoxymodhephene	$C_{17}H_{26}O_2$	$CDCl_3$	[119]
9-11-39	14-hydroxymodhephene	$C_{15}H_{24}O$	$CDCl_3$	[120]
9-11-40	14-acetoxymodhephene	$C_{17}H_{26}O_2$	$CDCl_3$	[120]
9-11-41	6,6,8,9-tetramethyltricyclo[3.3.3.0]undec-7-en-2-ol	$C_{15}H_{24}O$	$CDCl_3$	[121]
9-11-42	pulicaral	$C_{15}H_{20}O_2$	$CDCl_3$	[122]
9-11-43	pulicaric acid	$C_{15}H_{20}O_3$	$CDCl_3$	[122]
9-11-44	pulicaric acid methyl ester	$C_{16}H_{22}O_3$	$CDCl_3$	[122]
9-11-45	13-acetoxymodhephens	$C_{17}H_{26}O_2$	C_6D_6	[123]
9-11-46	–	$C_{15}H_{24}O$	$CDCl_3$	[123]
9-11-47	–	$C_{22}H_{26}N_2O_6$	$CDCl_3$-C_6D_6(1:2)	[123]



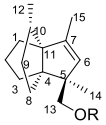
	R^1	R^2
9-11-38	H	OAc
9-11-39	OH	H
9-11-40	OAc	H



9-11-41



9-11-42 R = H
9-11-43 R = OH
9-11-44 R = OMe



9-11-45 R = Ac
9-11-46 R = H
9-11-47 R = $COC_6H_3(NO_2)_2$

Table 9-11-13: ^{1}H NMR spectroscopic data of modhephene-type sesquiterpenoids **9-11-38**~**9-11-42**.

H	9-11-38	9-11-39	9-11-40	9-11-41	9-11-42
2					
3	4.88 m	4.76 q(1.4)	4.78 q(1.4)	4.81 s	6.43 s
6		1.90 m	1.58 m		1.66 m
7	1.20~1.40 m			1.54 m, 1.75 m	1.52 m, 2.00 m
8	1.90~2.00 m			1.8 m	2.28 dq
9	1.20~1.25			4.23 t(3.2)	
10	1.30~1.40			1.50 m, 1.80 m	2.45 m
11		1.07 m, 2.05 m	1.56 m, 2.09 m	1.30 m, 2.05 m	1.60 m, 2.13 m
12	1.58 d(1.6)	1.67 d(1.4)	1.63 d(1.4)	1.67 d(1.5)	9.73 s
13	0.99 s	1.00 s	1.03 s	0.96 s	1.16 s
14	0.99 s	3.38 d(10.8) 3.44 d(10.8)	3.80 d(10.8) 3.97 d(10.8)	0.95 s	1.06 s
15	4.01~4.24 d(11.0)	1.00 d(6.5)	1.00 d(6.5)	1.30 d(6.7)	1.15 d
17	2.07 s		2.04 s		
OH		1.95 br s			

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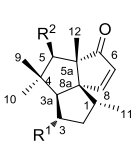
Table 9-11-14: ^{1}H NMR spectroscopic data of modhephene-type sesquiterpenoids **9-11-43**~**9-11-47**.

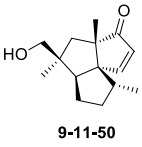
H	9-11-43	9-11-44	9-11-45	9-11-46	9-11-47
1			2.02 br d(13.0)	2.16 br d(13.0)	1.95 br d(13.0)
3	6.45 s	6.45 s	1.81 ddd (7.0, 7.0, 14.0)		1.82 ddd (7.0, 7.0, 14.0)
6	1.70 m	1.70 m	4.78 q(1.0)	4.82 q(7.0, 7.0, 14.0)	4.75 q(1.0)
7	1.48 m, 2.07 m	1.48 m, 2.07 m			
8	2.30 m	2.30 m	1.53 m		
10	2.56 m	2.56 m			
11	1.60 m, 2.18 m	1.60 m, 2.18 m			
12	8.70 br s	8.70 br s	0.94 d(6.5)	0.99 d(6.5)	0.92 d(6.5)
13	1.10 s	1.10 s	3.99 d(11.0)	3.42 d(11.0)	4.17 d(11.0)
			4.04 d(11.0)	3.58 d(11.0)	4.23 d(11.0)
14	1.04 s	1.04 s	1.05 s	1.05 s	1.07 s
15	1.06 d	1.06 d	1.55 d(1.0)	1.62 d(1.0)	1.54 d(1.0)
OMe		3.76 s			
RCO			2.05 s		8.71 d(2.0) 8.55 dd(2.0, 2.0)

Table 9-11-15: Compounds, MFs, and test solvents of silphinane-type sesquiterpenoids **9-11-48**~**9-11-57**.

No.	Compounds	MFs	Test solvents	References
9-11-48	phomalairdenone B	$C_{15}H_{22}O_2$	CD_2Cl_2	[124]
9-11-49	phomalairdenone C	$C_{15}H_{22}O_2$	C_6D_6	[124]
9-11-50	phomalairdenone D	$C_{15}H_{22}O_2$	C_6D_6	[124]
9-11-51	phomalairdenol A	$C_{15}H_{24}O_2$	CD_2Cl_2	[124]
9-11-52	phomalairdenol B	$C_{15}H_{24}O_2$	C_6D_6	[124]
9-11-53	phomalairdenol C	$C_{15}H_{24}O_2$	C_6D_6	[124]
9-11-54	phomalairdenol D	$C_{15}H_{24}O$	C_6D_6	[124]
9-11-55	5α-senecioyloxysilphinen-3-one	$C_{20}H_{28}O_3$	$CDCl_3$	[125]
9-11-56	5α-tigloyloxysilphinen-3-one	$C_{20}H_{28}O_3$	$CDCl_3$	[125]
9-11-57	3β-hydroxy-5α-angeloyloxysilphinene	$C_{20}H_{30}O_3$	$CDCl_3$	[125]



	R^1	R^2
9-11-48	OH	H
9-11-49	H	OH



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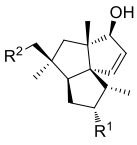
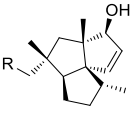
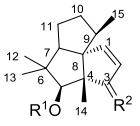


	R^1	R^2
9-11-51	OH	H
9-11-52	H	OH



9-11-53	R = OH
9-11-54	R = H



	R^1	R^2
9-11-55	Sen	O
9-11-56	Tig	O
9-11-57	Ang	α-OH,H

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Table 9-11-16: ^{1}H NMR spectroscopic data of silphinane-type sesquiterpenoids **9-11-48**~**9-11-54**.

H	9-11-48	9-11-49	9-11-50	9-11-51	9-11-52	9-11-53	9-11-54
1	2.18 m	2.23 m	1.70 m	1.67	1.88 m	1.86	1.91 m
2	1.52 m	1.96 m	1.30 m	3.52 ddd(10, 10, 6)	1.23 m	1.40	1.34 m
	2.18 m	2.02 m	1.82 m		1.85 m	1.90	1.84 m
3	4.03 m	1.77 m	1.30 m	1.86 ddd(11, 8, 6)	1.27 m	1.36 m	1.34 m
		1.99 m	1.70 m	1.34 ddd(11, 11, 10)	1.65 m	1.57 m	1.60 m
3a	1.80 d(8.5)	1.69 m	1.82 m	1.70 m	1.95 dd(10, 8)	2.02 dd(9, 9)	1.94 dd(9, 9)
5	1.52 d(14)	3.64 s	2.13 d(13)	1.63 d(13)	1.72 d(13)	1.79 d(13)	1.62 d(13)
	1.98 d(14)		1.32 d(13)	1.57 d(13)	1.55 d(13)	1.46 d(13)	1.73 d(13)
6				4.24 br s	4.37 d(2)	4.21 d(2)	4.31 d(2)
7	6.04 d(6)	6.01 d(6)	5.99 d(6)	5.58 dd(6, 2)	5.50 dd(6, 2)	5.61 dd(6, 2)	5.61 dd(6, 2)
8	7.75 d(6)	7.58 d(6)	7.05 d(6)	5.54 d(6)	5.71 d(6)	5.70 d(6)	5.74 d(6)
9	1.09 s	0.95 s	3.25 d(10)	0.99 s	3.36 d(10)	1.07 s	1.03 s
			3.08 d(10)		3.30 d(10)		
10	0.82 s	0.89 s	0.99 s	1.01 s	1.10 s	3.17 d(10)	1.04 s
						3.11 d(10)	
11	0.96 d(6)	0.88 d(7)	0.77 d(7)	0.93 d(7)	0.90 d(7)	0.90 d(7)	0.90 d(7)
12	1.04 s	1.18 s	1.60 s	1.16 s	1.10 s	1.19 s	1.18 s

Table 9-11-17: ^{1}H NMR spectroscopic data of silphinane-type sesquiterpenoids **9-11-55**~**9-11-57**.

H	9-11-55	9-11-56	9-11-57
1	7.58 d(5.7)	7.56 d(5.7)	5.84 dd(5.7, 1.4)
2	6.01 d(5.7)	5.99 d(5.7)	5.62 dd(5.7, 2.0)
3			5.17 br d
5β	5.10 s	5.09 s	5.12 br s
7α	2.13 dd(10.8, 8.0)	2.10 dd(11.0, 7.9)	1.86 dd(11.4, 7.7)
9	2.20 m	2.17 m	1.98 m
10α	1.35 dddd(11.9, 11.9, 7.0, 5.2)	1.34 dddd(12.0, 12.0, 6.5, 5.0)	1.17 m
10β	1.96 m	1.93 m	1.81 m
11α	1.77 m	1.76 m	1.66 m
11β	1.45 dddd(11.5, 11.5, 5.6)	1.43 dddd(12.2, 12.2, 6.5, 5.0)	1.32 dddd(12.2, 6.0, 5.4)
12	0.83 s	0.82 s	0.91 s
13	0.92 s	0.90 s	0.92 s
14	1.19 s	1.14 s	1.02 s
15	0.92 d(6.8)	0.91 d(6.2)	0.87 d(7.0)
2′	5.79 br s		
3′		6.99 qq(7.0, 1.4)	6.07 dq(7.2, 1.4)
4′	1.92 s	1.80 dq(7.0, 1.2)	2.03 dd(7.2, 1.4)
5′	2.19 s	1.85 quint(1.2)	1.94 quint(1.4)

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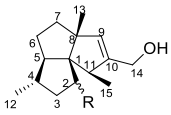
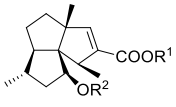
Table 9-11-18: Compounds, MFs, and test solvents of subergane-type sesquiterpenoids **9-11-58**~**9-11-66**.

No.	Compounds	MFs	Test solvents	References
9-11-58	subergorgiol	$C_{15}H_{24}O$	$CDCl_3$	[126]
9-11-59①	–	$C_{15}H_{24}O_2$	$CDCl_3$	[127]
9-11-60①	–	$C_{15}H_{24}O_2$	$CDCl_3$	[127]
9-11-61	2β-acetoxysubergorgic acid	$C_{17}H_{24}O_4$	$CDCl_3$	[126]
9-11-62	2β-acetoxy methyl ester of subergorgic acid	$C_{18}H_{26}O_4$	$CDCl_3$	[126]
9-11-63	2β-hydroxysubergorgic acid	$C_{15}H_{22}O_3$	$CDCl_3$	[126]
9-11-64	2β-hydroxy methyl ester of subergorgic acid	$C_{16}H_{24}O_3$	–	[128]
9-11-65	subergorgic acid methyl ester	$C_{16}H_{22}O_3$	$CDCl_3$	[126]
9-11-66	subergorgic acid	$C_{15}H_{20}O_3$	$CDCl_3$	[126]

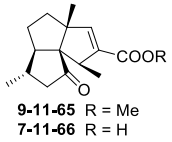
① Synthetic compounds.



9-11-58 R = H
9-11-59 R = α-OH
9-11-60 R = β-OH



	R^1	R^2
9-11-61	H	Ac
9-11-62	Me	Ac
9-11-63	H	H
9-11-64	Me	H



9-11-65 R = Me
7-11-66 R = H

Table 9-11-19: ^{1}H NMR spectroscopic data of subergane-type sesquiterpenoids **9-11-58**~**9-11-62**.

H	9-11-58	9-11-59	9-11-60	9-11-61	9-11-62
2	α 1.75 ddd(13.0, 5.5, 2.0) β 1.26 td(12.5, 5.5)	4.18 m	4.36 br s	α 5.37 br d(2.5)	5.34 d(2.7)
3	α 1.08 dd(11.0, 5.5) β 1.69 dd(11.5, 5.5, 2.5)	1.93 ddd(15, 10, 4)		α 1.43 td(12.0, 3.3) β 1.94 m	α 1.42 dd(12.5, 3.3) β 1.91 dd(13.6, 4.0)
4	1.33 m			1.86 m	1.90 dd(9.9, 2.2)
5	1.49 m			1.71 dd(17.0, 7.5)	1.71 m
6α	1.51 m			1.43 m	1.37 m
6β	1.21 dd(11.0, 5.5)			1.61 m	1.61 m
7α	1.59 dd(11.0, 5.5)			1.83 m	1.78 dd(12.1, 6.7)
7β	1.44 dd(11.0, 6.0)			1.94 m	1.95 dd(12.1, 3.8)
9	5.27 s	5.14 s	5.25 s	6.56 s	6.40 s
11	2.52 q(7.5)	2.76 q(7)	2.36 q(7)	2.77 q(7.0)	2.75 q(7.1)

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Table 9-11-19 (continued)

H	9-11-58	9-11-59	9-11-60	9-11-61	9-11-62
12	0.99 d(7.0)	1.13 d(6.6)	1.04 d(6.4)	1.04 d(6.4)	1.01 d(6.4)
13	1.00 s	1.15 s	1.33 s	1.22 s	1.16 s
14	4.19 q(14.0)	4.18 m	4.15 ABq(13.4)		
15	0.97 d(7.0)	1.30 d(7)	1.05 d(7)	1.18 d(7.1)	1.13 d(7.1)
OAc				2.06 s	2.03 s
OMe					3.71 s

Table 9-11-20: ^{1}H NMR spectroscopic data of subergane-type sesquiterpenoids **9-11-63**~**9-11-66**.

H	9-11-63	9-11-64	9-11-65	9-11-66
2	4.38 br s			
3	*α* 1.46 dd(12.5, 3.3)	2.35 dd(16, 7)	*α* 2.02 dd(16.6, 6.8)	*α* 2.02 dd(16.7, 12.5)
	β 1.81 m	1.95 dd(18, 4)	*β* 2.36 dd(16.6, 4.2)	*β* 2.35 dd(16.7, 6.7)
4	1.94 m		1.65 m	1.64 m
5	1.65 m	2.07 dd(9, 2)	2.08 m	2.08 m
6	*α* 1.35 m, *β* 1.61 m	1.65 m, 1.63 m	*α* 1.63 m, *β* 1.65 m	*α* 1.64 m, *β* 1.64 m
7	*α* 1.78 m, *β* 1.97 m	1.55 m, 1.78 dd(11, 5)	*α* 1.55 m, *β* 1.78 m	*α* 1.62 m, *β* 1.80 m
8		6.3 s		
9	6.59 s		6.24 s	6.41 s
11	2.69 q(7.1)	3.02 q(7)	3.02 q(7.0)	3.00 q(7.1)
12	1.05 d(6.6)	1.10 d(7.5)	1.11 d(6.2)	1.10 d(6.4)
13	1.40 s	1.20 s	1.20 s	1.20 s
15	1.14 d(7.1)	1.10 d(7)	1.12 d(6.2)	1.11 d(7.1)
OMe		3.72 s	3.73 s	

Table 9-11-21: Compounds, MFs, and test solvents of suberosane-type sesquiterpenoids **9-11-67**~**9-11-76**.

No.	Compounds	MFs	Test solvents	References
9-11-67	suberosenol A	$C_{15}H_{24}O$	$CDCl_3$	[129]
9-11-68	suberosenol B	$C_{15}H_{24}O$	$CDCl_3$	[129]
9-11-69	suberosenol A acetate	$C_{17}H_{26}O_2$	$CDCl_3$	[129]
9-11-70	suberosenol B acetate	$C_{17}H_{26}O_2$	$CDCl_3$	[129]
9-11-71	suberosanone	$C_{15}H_{24}O$	$CDCl_3$	[129]
9-11-72	suberosenone	$C_{15}H_{22}O$	$CDCl_3$	[130]
9-11-73	(+)-5(6)-dihydro-6-methoxyterrecyclic acid A	$C_{16}H_{24}O_4$	$CDCl_3$	[131]
9-11-74	(+)-5(6)-dihydro-6-hydroxyterrecyclic acid A	$C_{15}H_{22}O_4$	$CDCl_3$	[131]
9-11-75	isishippuric acid A	$C_{15}H_{24}O_3$	$CDCl_3$	[132]
9-11-76	isishippuric acid B	$C_{14}H_{22}O_4$	$CDCl_3$	[132]

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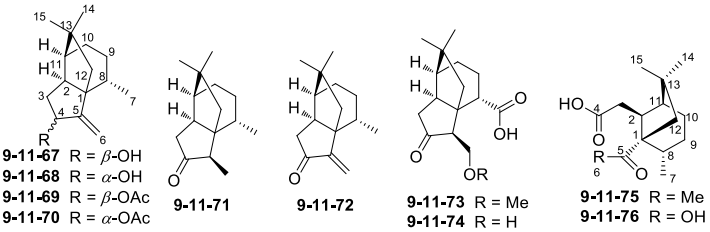

Table 9-11-22: ^{1}H NMR spectroscopic data of suberosane-type sesquiterpenoids **9-11-67**~**9-11-71**.

H	9-11-67	9-11-68	9-11-69	9-11-70	9-11-71
2	1.97 dt(14.0, 7.0)	2.39 dd(11.5, 7.5)	1.97 dt(14.0, 6.5)	2.35 dd(12.0, 7.5)	2.38 m
3α	2.14 dt(11.0, 7.0)	1.79 ddd(13.5, 7.5, 4.5)	2.22 dt(11.0, 6.5)	1.82 dd(13.5, 7.5)	2.48 dd(7.0, 1.5)
3β	1.80 m	2.08 ddd(13.5, 6.5, 4.5)	1.90 m	2.14 dd(13.5, 5.5)	2.35 dd(7.0, 3.0)
4	4.30 m	4.57 dd(5.5, 4.5)	5.35 m	5.57 d(5.5)	
5					2.39 q(7.0)
6	4.79 d(2.5) 5.06 d(2.5)	4.79 s 5.06 s	4.79 d(2.5) 4.96 d(2.5)	4.86 s 5.28 s	0.90 d(7.0)
7	0.88 d(7.0)	0.96 d(7.0)	0.90 d(7.0)	0.92 d(7.0)	1.04 d(7.0)
8	1.96 m	2.01 m	1.99 m	2.00 m	1.89 q(7.0)
9α	1.23 m	1.29 m	1.26 m	1.28 m	1.33 dd(7.0, 7.0)
9β	2.02 m	1.99 m	1.97 m	2.05 m	2.06 m
10α	1.49 d(14.0, 2.5)	1.51 m	1.49 m	1.52 m	1.62 ddd(13.5, 6.5, 2.5)
10β	1.61 br d(14.0)	1.62 m	1.62 m	1.61 m	1.68 m
11	1.78 m	1.79 m	1.78 m	1.79 m	1.79 br t(3.0)
12α	1.77 d(14.0)	1.59 d(14.0)	1.77 d(14.0)	1.62 d(14.5)	1.34 d(14.5)
12β	1.82 d(14.0)	1.67 d(14.0)	1.87 d(14.0)	1.69 d(14.5)	1.40 d(14.5)
14	1.11 s	1.11 s	1.11 s	1.11 s	1.04 s
15	1.20 s	1.17 s	1.20 s	1.17 s	1.09 s
OAc			2.12 s	2.01 s	

Table 9-11-23: ^{1}H NMR spectroscopic data of suberosane-type sesquiterpenoids **9-11-72**~**9-11-76**.

H	9-11-72	9-11-73	9-11-74	9-11-75	9-11-76
2	2.30 ddd(11.5, 9.5, 0.5)	2.61 dd(12.0, 6.8)	2.76 dd(11.9, 7.5)	2.54 dd(8.0, 4.0)	3.16 dd(7.0, 7.0)
3	α 2.44 dd(19.5, 9.5)	2.52 ddd(19.0, 12.0, 1.0)	2.57 dd(20.3, 11.9)	2.27 dd(16.0, 4.0)	3.65 dd(16.0, 7.0)
	β 2.64 dd(19.5, 12.0)	2.34 dd(19.9, 6.8)	2.39 dd(20.3, 7.5)	2.76 dd(16.0, 8.0)	2.73 dd(16.0, 7.0)

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Table 9-11-23 (continued)

H	9-11-72	9-11-73	9-11-74	9-11-75	9-11-76
5		2.94 dd(9.8, 3.6)	2.85 t(6.7)		
6	4.97 d(0.8)	3.44 t(9.8)	3.71 dd(11.0, 7.0)	2.04 s	
	5.95 d(0.8)	3.93 dd(9.8, 3.6)	4.01 dd(11.0, 6.7)		
7	0.88 d(7.0)			0.92 d(7.0)	1.36 d(7.0)
8	2.12 m	2.90 d(7.3)	2.88 t(3.0)	2.06 m	2.40 m
9	*α* 1.32 ddd(14.0, 6.5, 1.0)	1.85 m	1.76~1.92 m	*α* 1.36 dd(14.0, 5.5)	*α* 1.25 m
	β 2.06 m	1.97 t(6.3)		*β* 2.09 dd(14.0, 7.0)	*β* 2.09 dd(7.0, 7.0)
10	*α* 1.59 m	1.76 m	1.76~1.92 m	*α* 1.68 m	*α* 1.78 m
	β 1.67 m	1.92 m			*β* 1.61 m
11	1.87 ddd(3.5, 3.0, 0.5)	1.83 m	1.76~1.92 m	1.65 br d	1.86 br s
12	1.69 d(14.5)	1.46 d(14.6)	1.51 s	*α* 1.79 d(13.5)	*α* 1.96 d(14.0)
	1.79 d(14.0)	1.55 d(14.6)		*β* 1.96 d(13.5)	*β* 2.45 d(14.0)
14	1.15 s	1.10 s	1.12 s	1.18 s	1.17 s
15	1.19 s	1.15 s	1.15 s	1.14 s	1.27 s
OMe		3.41 s			

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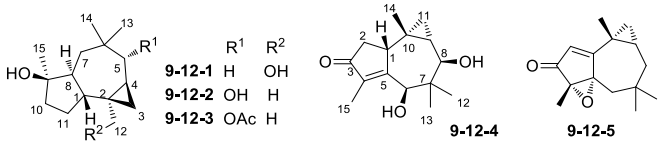
9.12 Africanane-, capnellane-, hirsutane-, humulane-, illudalane-, illudane-, proilludane-, and tremulane-type sesquiterpenoids

Table 9-12-1: Compounds, MFs, and test solvents of africanane-type sesquiterpenoids **9-12-1**~**9-12-9**.

No.	Compounds	MFs	Test solvents	References
9-12-1	pyxidatol C	$C_{15}H_{26}O_2$	CD_3COCD_3	[133]
9-12-2	omphadiol	$C_{15}H_{26}O_2$	CD_3COCD_3	[133]
9-12-3	*rel*-(1a*S*,2*R*,4a*S*,5*R*,7a*R*,7b*S*)-decahydro-5-hydroxy-3,3,5,7b-tetramethyl-1*H*-cycloprop[*e*]azulen-2-yl acetate	$C_{17}H_{28}O_3$	$CDCl_3$	[133]
9-12-4	–	$C_{15}H_{22}O_3$	$CDCl_3$	[134]
9-12-5	caespitenone	$C_{15}H_{20}O_2$	$CDCl_3$	[135]
9-12-6	–	$C_{15}H_{22}O_3$	$CDCl_3$	[134]
9-12-7	–	$C_{15}H_{22}O_3$	$CDCl_3$	[134]
9-12-8	–	$C_{15}H_{20}O_3$	$CDCl_3$	[134]
9-12-9	–	$C_{14}H_{20}O_2$	$CDCl_3$	[134]



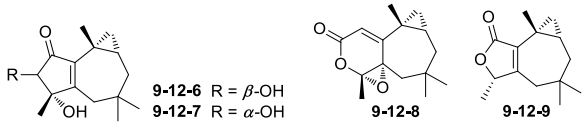


Table 9-12-2: ^{1}H NMR spectroscopic data of africanane-type sesquiterpenoids **9-12-1**~**9-12-5**.

H	9-12-1	9-12-2	9-12-3	9-12-4	9-12-5
1	1.70 (ov)	1.45 (ov)	1.56 (ov)	3.07 dd(7, 1)	
2				2.56 d(18.0) 2.41 dd(18, 7)	5.92 s
3*α*	0.70 dd(8.5, 3.8)	0.62 dd(8.2, 4.0)	0.67~0.68 m		
3*β*	0.14 t(3.8)	0.34 t(4.4)	0.61 (ov)		
4	0.73~0.78 m	0.51~0.55 m	0.61 (ov)		
5	*α* 1.85 (ov)	3.05 dd(9.0, 4.2)	4.55 d(8.6)		

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Table 9-12-2 (continued)

H	9-12-1	9-12-2	9-12-3	9-12-4	9-12-5
6	*β* 1.11~1.14 m			4.41 dd(9.0, 1.5)	2.14 d(14.0), 1.50 d(14.0)
7*α*	1.42~1.45 m	1.42 (ov)	1.48 d(13.3)		
7*β*	1.17~1.24 m	1.25~1.29 m			
8	*α* 1.98 (ov)	*α* 1.59 (ov)	*α* 1.60 (ov)	*α* 4.21 td(4, 1.5)	1.94 dd(15.0, 4.2) 1.24 m
9				0.75 ddd(9.0, 5.0, 4.5)	1.10 m
10*α*	1.72 (ov)	1.65 (ov)	1.68 (ov)		
10*β*	1.61~1.64 m	1.58 (ov)	1.31 (ov)		
11	*α* 1.96 (ov) *β* 1.82 (ov)	*α* 1.77~1.80 m *β* 1.64 (ov)	*α* 1.82~1.88 m *β* 1.68 (ov)	*α* 0.84 dd(5.5, 4.0) *β* 0.70 dd(9.0, 4.0)	1.05 m 0.57 t(4.4)
12	3.61 dd(11.2, 5.0) 3.49 dd(11.2, 5.0)	0.98 s	1.00 s	1.46 s	1.13 s
13	1.07 s	0.97 s	0.91 s	0.90 s	1.01 s
14	0.88 s	0.94 s	1.04 s	0.81 s	1.24 s
15	1.19 s	1.21 s	1.27 s	1.76 s	1.45 s
OAc			2.07 s		
OH	2.80 s(9-OH) 3.42 t(5.0, 12-OH)	3.40 d(4.2, 5-OH) 2.90 s(9-OH)		4.27 d(9, 6-OH) 2.30 d(4, 8-OH)	

Table 9-12-3: ^{1}H NMR spectroscopic data of africanane-type sesquiterpenoids **9-12-6**~**9-12-9**.

H	9-12-6	9-12-7	9-12-8	9-12-9
2			6.02 s	
3	3.80 d(5.5)	4.16 s		
4				4.73 q(7)
6*α*	2.35 d(15)	2.40 d(15)	1.25 d(14)	2.07 d(17.5)
6*β*	2.60 d(15)	2.54 d(15)	2.52 d(14)	2.34 dt(17.5, 1)
8*α*	0.69 dd(14.5, 11)	0.67 dd(11, 14)	0.50 dd(15, 12)	0.87~0.96 (ov)
8*β*	1.83 dd(14.5, 5)	1.83 dd(5, 14)	1.87 dd(15, 4)	2.04 ddd(13, 4, 1)
9	0.85 m	0.85 m	0.99 dddd(12, 8, 5, 4)	0.87~0.96 (ov)
11*α*	0.31 t(4.5)	0.22 t(4.4)	0.46 t(5)	0.38 t(4)
11*β*	0.76 dd(8, 4.5)	0.72 dd(4.4, 8)	0.89 dd(8, 5)	0.87~0.96 (ov)
12	1.12 s	1.18 s	1.07 s	1.20 s
13	1.00 s	0.95 s	0.95 s	0.98 s
14	1.19 s	1.15 s	1.36 s	1.30 s
15	1.45 s	1.30 s	1.80 s	1.34 d(7)
OH	4.58 d(5.5, 3-OH) 3.72 s(4-OH)			

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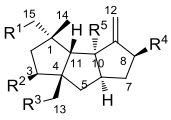
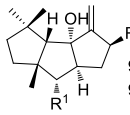
Table 9-12-4: Compounds, MFs, and test solvents of capnellane-type sesquiterpenoids **9-12-10**~**9-12-19**.

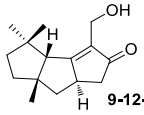
No.	Compounds	MFs	Test solvents	References
9-12-10	$\Delta^{9(12)}$-capnellene-8β,15-diol	$C_{15}H_{24}O_2$	$CDCl_3$	[136]
9-12-11	$\Delta^{9(12)}$-capnellene-8β,10α,13-triol	$C_{15}H_{24}O_3$	$CDCl_3$	[136]
9-12-12	8β,10α-diacetoxy-$\Delta^{9(12)}$-capnellene	$C_{19}H_{28}O_4$	$CDCl_3$	[136]
9-12-13	8β-acetoxy-$\Delta^{9(12)}$-capnellene	$C_{17}H_{26}O_2$	$CDCl_3$	[136]
9-12-14	capnellene-8β-ol	$C_{15}H_{24}O$	$CDCl_3$	[137]
9-12-15	3β-acetoxy-$\Delta^{9(12)}$-capnellene-8β,10α-diol	$C_{17}H_{26}O_4$	$CDCl_3$	[138]
9-12-16	8β-acetoxy-$\Delta^{9(12)}$-capnellene-5α,10α-diol	$C_{17}H_{26}O_4$	$CDCl_3$	[138]
9-12-17	5α-acetoxy-$\Delta^{9(12)}$-capnellene-8β,10α-diol	$C_{17}H_{26}O_4$	$CDCl_3$	[138]
9-12-18	$\Delta^{9(10)}$-capnellene-12-ol-8-one	$C_{15}H_{22}O_2$	$CDCl_3$	[136]
9-12-19	3β-acetoxycapnellene-8β,10α,14β-triol	$C_{17}H_{26}O_5$	$CDCl_3$	[137]



	R^1	R^2	R^3	R^4	R^5
9-12-10	OH	H	H	OH	H
9-12-11	H	H	OH	OH	OH
9-12-12	H	H	H	OAc	OAc
9-12-13	H	H	H	OAc	H
9-12-14	H	H	H	OH	H
9-12-15	H	OAc	H	OH	OH



	R^1	R^2
9-12-16	OH	OAc
9-12-17	OAc	OH



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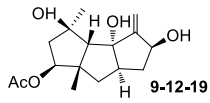

9-12-19

Table 9-12-5: ^{1}H NMR spectroscopic data of capnellane-type sesquiterpenoids **9-12-10**~**9-12-14**.

H	9-12-10	9-12-11	9-12-12	9-12-13	9-12-14
2	1.41 m, 1.58 m	1.46 m	1.45 m	1.44 m	1.51
3	1.42 m	1.69 m	1.54 m, 1.64 m	1.53 m	2.09 m, 1.45 m
5	1.49 m	1.60 m	1.26 dd(9.5, 13.8)	1.45 m	1.79 dd(13.8, 8.4)
	1.80 dd(8.1, 12.8)	1.88 dd(10.1, 14.2)	1.83 dd(9.5, 13.8)	1.77 m	1.51 dd(13.8, 4.8)
6	2.43 m	2.67 m	2.27 m	2.48 m	2.22 ddt(7.6, 3.5, 4.2)
7	1.39 m	1.59 m	1.47 m	1.54 m	2.13 dd(8.4, 4.2)
	2.25 m	2.28 m	2.51 m	2.25 m	1.39 m
8	4.51 t(5.2)	4.78 m	5.72 m	5.53 t(3.4)	4.74 tt(8.0, 4.2)
10	2.86 m			2.71 m	2.36 ddd(4.6, 2.8, 1.6)
11	1.89 d(3.2)	2.02 s	2.34 s	1.78 m	1.75 d(3.3)
12	5.00 s	5.41 s	5.45 d(2.2)	4.99 s	5.05 t(2.5)
	5.14 s	5.43 s	5.51 d(2.2)	5.08 s	4.96 t(2.4)
13	1.23 s	3.35 m	1.09 s	1.19 s	1.24 s

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Table 9-12-5 (continued)

H	9-12-10	9-12-11	9-12-12	9-12-13	9-12-14
14	1.15 s	1.21 s	1.11 s	1.06 s	1.02 s
15	3.48 d(10.8) 3.58 d(10.8)	1.29 s	1.12 s	0.98 s	0.82 s
OAc			2.07 s(8-OAc) 1.95 s(10-OAc)	2.09 s(8-OAc)	

Table 9-12-6: ^{1}H NMR spectroscopic data of capnellane-type sesquiterpenoids **9-12-15**~**9-12-19**.

H	9-12-15	9-12-16	9-12-17	9-12-18	9-12-19
2	–	–	–	1.56 m 1.66 m	1.68 dd(11.2, 5.6) 1.55 t(11.2)
3	5.1 dd(8, 12.5)	–	–	1.78 m	5.08 dd(10.6, 5.6)
5		3.5 d(5)	4.6 d(6.5)	1.03 dd(4.5, 12.3) 2.09 dd(8.0, 12.3)	2.25 m 1.20 m
6	–	–	–	3.02 m	2.52 m
7	–	–	–	2.05 dd(2.0, 18.4) 2.64 dd(6.5, 18.4)	2.35 m 1.42 dt(14.4, 4.0)
8	4.8 m	5.68 m	4.8 m		4.75 m
11	–	–	–	2.47 s	2.30 s
12	5.36	5.27	5.38	4.32 dd(1.7, 13.4) 4.37 dd(1.7, 13.4)	5.30 t(2.5)
13	0.98①	1.20①	1.12①	1.24 s	0.82 s
14	1.24①	1.20①	1.12①	1.21 s	3.55 d(9.4) 3.42 d(9.4)
15	1.32①	1.25①	1.21①	0.87 s	1.31 s
OAc	1.95①	2.05 s	2.03①		1.99 s

① Assignments may be exchanged in each column.

Table 9-12-7: Compounds, MFs, and test solvents of hirsutane-type sesquiterpenoids **9-12-20**~**9-12-29**.

No.	Compounds	MFs	Test solvents	References
9-12-20	creolophin A	$C_{14}H_{16}O_5$	CD_3CN	[139]
9-12-21	creolophin D	$C_{14}H_{16}O_4$	$CDCl_3$	[139]
9-12-22	creolophin E	$C_{14}H_{14}O_5$	$CDCl_3$	[139]
9-12-23	creolophin B	$C_{15}H_{20}O_5$	CD_3CN	[139]
9-12-24	creolophin C	$C_{14}H_{16}O_3$	$CDCl_3$	[139]
9-12-25	connatusin A	$C_{15}H_{22}O_4$	$CDCl_3$	[140]
9-12-26	connatusin B	$C_{15}H_{22}O_4$	$CDCl_3$	[140]
9-12-27	hirsutenol A	$C_{15}H_{20}O_3$	CD_3OD	[141]
9-12-28	hirsutenol B	$C_{15}H_{22}O_3$	CD_3OD	[141]
9-12-29	hirsutenol C	$C_{15}H_{22}O_3$	CD_3OD	[141]

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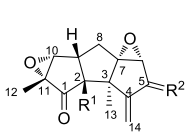
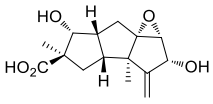


	R^1	R^2
9-12-20	OH	α-OH,H
9-12-21	H	α-OH,H
9-12-22	OH	O



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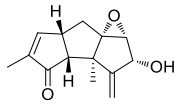

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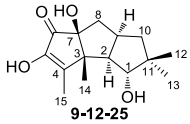

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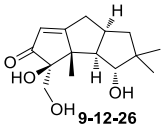

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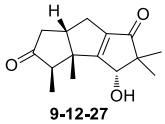

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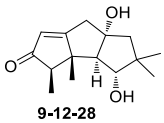
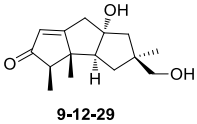


9-12-28



9-12-29

Table 9-12-8: ^{1}H NMR spectroscopic data of hirsutane-type sesquiterpenoids **9-12-20**~**9-12-24**.

H	9-12-20	9-12-21	9-12-22	9-12-23	9-12-24
1				1.48 dd(12.5, 9.8) 1.94 dd(12.5, 8.6)	
2		2.48 d(11.1)		2.20~2.30	2.56 d(7.0)
5	4.48 q(2.0)	4.54 br s		4.59 q(2.0)	4.64 br s
6	3.44 d(1.8)	3.47 d(2.3)	3.47 br s	3.32 d(1.6)	3.54 d(2.2)
8	2.29 dd(12.7, 8.8)	2.42 dd(12.9, 8.8)	2.60 ddd(13.3, 8.9, 0.8)	2.20~2.30 m	2.05 dd(13.1, 8.5)
	2.01 dd(12.7, 8.8)	1.87 dd(12.9, 8.8)	2.17 dd(13.3, 8.9)		2.01 dd(13.1, 9.2)
9	2.66 dt(8.8, 2.5)	2.92 ddt(11.1, 2.3, 8.8)	2.80 ddt(8.9, 2.4, 0.8)	2.61 m	3.32 m
10	3.83 d(2.5)	3.69 d(2.3)	3.78 d(2.4)	4.02 d(5.1)	7.25 dq(2.8, 1.4)
12	1.45 s	1.44 s	1.52 s	1.28 s	1.75 dd(2.0, 1.4)
13	1.03 s	1.11 s	1.21 s	1.00 s	0.96 s
14	5.34 d(2.3)	5.36 d(2.2)	6.30 s	5.09 d(12.0)	5.42 d(2.4)
	5.13 d(2.3)	5.30 dd(2.2, 0.7)	5.52 d(0.6)	4.95 d(2.5)	5.35 dd(2.4, 0.8)

Table 9-12-9: ^{1}H NMR spectroscopic data of hirsutane-type sesquiterpenoids **9-12-25**~**9-12-29**.

H	9-12-25	9-12-26	9-12-27	9-12-28	9-12-29
1	3.90 d(10.2)	3.80 d(7.8)	4.45 t(2.3)	3.66 d(10.0)	1.73 dd(13.0, 10.0) 1.54 ddd(13.0, 9.0, 1.7)
2	2.28 dd(10.2, 9.9)	2.51 dd(12.0, 7.8)		2.25 d(10.0)	2.41 t(9.6)
4			2.38 br q	2.41 q(7.3)	2.38 q(7.4)
6		5.78 d(2.1)	2.57 dd(19.3, 9.7) 2.40 dd(19.3, 4.0)	5.79 s	5.79 d(1.8)

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Table 9-12-9 (continued)

H	9-12-25	9-12-26	9-12-27	9-12-28	9-12-29
7			2.95 m		
8	*α* 2.37 dd(13.8, 8.7)	*α* 2.83 dd(15.6, 7.2)	2.75 ddd(16.4, 9.1, 2.5)	2.72 s	2.84 dd(15.8, 1.8)
	β 1.59 dd(13.8, 9.9)	*β* 2.30 ddd(15.6, 7.8, 2.1)	2.22 ddd(16.4, 7.3, 2.0)		2.76 d(15.8)
9	2.13 m	2.72 m			
10	*α* 1.80 dd(13.8, 8.7)	*α* 1.90 dd(12.6, 7.5)		1.87 d(13.8)	1.87 d(13.9)
	β 1.29 m	*β* 1.90 m		1.71 d(13.8)	1.72 br d(13.9)
12	1.11 s	1.09 s	1.12 br s	1.11 s	3.35 s
13	0.91 s	0.98 s	1.04 s	1.04 s	1.17 s
14	1.31 s	1.18 s	1.18 s	1.07 s	0.95 s
15	1.99 s	3.67 d(12.0) 3.49 d(12.0)	1.12 br s	1.10 d(7.3)	1.05 d(7.4)
OH	5.99 br s(5-OH) 5.32 br s(7-OH)				

Table 9-12-10: Compounds, MFs, and test solvents of humulane-type sesquiterpenoids **9-12-30**~**9-12-39**.

No.	Compounds	MFs	Test solvents	References
9-12-30	mitissimol F	$C_{15}H_{22}O_5$	CD_3OD	[142]
9-12-31	mitissimol G	$C_{15}H_{24}O_5$	CD_3OD	[142]
9-12-32	mitissimol A	$C_{15}H_{22}O_2$	$CDCl_3$	[143]
9-12-33	mitissimol C	$C_{15}H_{22}O_3$	CD_3OD	[143]
9-12-34	mitissimol B	$C_{15}H_{22}O_3$	$CDCl_3$	[143]
9-12-35	hyemalol	$C_{15}H_{26}O$	$CDCl_3$	[144]
9-12-36	(2*R*,3*S*,5*R*)-2,3-epoxy-6,9-humuladien-5-ol-8-one	$C_{15}H_{22}O_3$	$CDCl_3$	[145]
9-12-37	(2*R*,3*R*,5*R*)-2,3-epoxy-6,9-humuladien-5-ol-8-one	$C_{15}H_{22}O_3$	$CDCl_3$	[145]
9-12-38	(5*R*)-2,6,9-humulatrien-5-ol-8-one	$C_{15}H_{22}O_2$	$CDCl_3$	[145]
9-12-39	2,9-humuladien-6-ol-8-one	$C_{15}H_{24}O_2$	$CDCl_3$	[146]

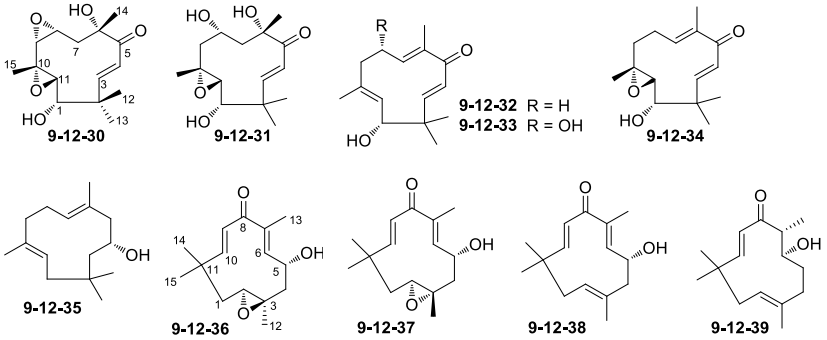

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Table 9-12-11: ^{1}H NMR spectroscopic data of humulane-type sesquiterpenoids **9-12-30**~**9-12-34**.

H	9-12-30	9-12-31	9-12-32	9-12-33	9-12-34
1	3.34 d(10.0)	3.62 d(9.5)	4.22 d(10.6)	4.19 d(10.7)	3.30 d(9.7)
3	6.20 d(16.1)	6.77 d(16.2)	5.69 d(16.4)	5.84 d(16.4)	5.93 d(16.4)
4	7.11 d(16.1)	7.58 d(16.2)	6.06 d(16.4)	6.07 d(16.5)	6.25 d(16.4)
7	2.52 dd(13.4, 9.2) 1.23 dd(13.4, 5.2)	2.67 br d(14.6) 2.57 dd(14.6, 6.8)	5.90 br d(10.6)	5.73 br d(10.0)	6.05 br d(8.7)
8	2.43 ddd(9.2, 5.2, 2.4)	3.80 dd(9.7, 6.8)	2.28 m, 2.47 m	4.61 ddd(10.4, 10.0, 5.5)	2.41 m
9	2.68 d(2.4)	2.54 d(13.1) 1.80 dd(13.1, 9.7)	2.23 m, 2.37 m	2.70 dd(11.4, 5.5) 2.12 dd(11.4, 10.4)	2.28 ddd(13.4, 3.9, 2.8) 1.38 td(13.4, 7.1)
11	2.81 d(10.0)	3.25 d(9.5)	5.25 br d(10.6)	5.30 br d(10.7)	2.75 d(9.7), 5.93 d(16.4)
12	1.22 s	1.43 s	1.14 s	1.11 s	1.16 s
13	1.13 s	1.32 s	1.14 s	1.13 s	1.24 s
14	1.40 s	2.05 s	1.79 br s	1.88 br s	1.85 br s
15	0.95 s	1.34 s	1.62 br s	1.65 br s	1.29 s

Table 9-12-12: ^{1}H NMR spectroscopic data of humulane-type sesquiterpenoids **9-12-35**~**9-12-39**.

H	9-12-35	9-12-36	9-12-37	9-12-38	9-12-39
1	1.91~1.99 m	1.43 t(13.0), 1.96 d(13.0)	1.44 t(13.0), 1.96 d(13.0)	1.90 m, 2.36 t(12.0)	α 2.22 t(12.6) β 1.88 dd(4.6, 12.6)
2		2.68 d(13.0)	2.76 d(13.0)	5.29 br d(11.0)	5.11 dd(12.6, 4.6)
3	1.06~1.96 m				
4	3.40 m	2.11 dd(13.0, 10.0) 1.69 dd(13.0, 5.0)	2.66 dd(13.0, 5.0) 1.26 d(13.0)	2.16 m, 2.75 m	α 2.10 q(6.3), β 1.96 m
5	2.05~2.13 m	4.40 td(10.0, 5.0)	4.60 m	4.64 m	α 1.16 m, β 1.31 m
6		5.63 d(10.0)	5.96 d(10.0)	5.82 d(10.0)	4.24 m
7	4.86 m				2.71 qd(6.8, 3.4)
8	2.11~2.25 m				
9	2.06~2.14 m	6.13 d(16.0)	6.16 d(16.0)	6.00 d(16.0)	6.11 d(16.1)
10		6.44 d(16.0)	6.36 d(16.0)	5.91 d(16.0)	6.17 d(16.1)
11	4.85 m				
12	0.90 s	1.38 s	1.23 s	1.57 s	1.38 s
13	1.07 s	2.01 s	2.00 s	1.92 s	1.04 d(6.8)
14	1.63 s	1.30 s	1.31 s	1.08 s	1.17 s
15	1.46 s	1.14 s	1.09 s	1.21 s	1.14 s

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Table 9-12-13: Compounds, MFs, and test solvents of illudalane-type sesquiterpenoids **9-12-40**~**9-12-49**.

No.	Compounds	MFs	Test solvents	References
9-12-40	alcyopterosin A	$C_{15}H_{21}Cl$	$CDCl_3$	[147]
9-12-41	alcyopterosin B	$C_{15}H_{21}NO_3$	$CDCl_3$	[147]
9-12-42	alcyopterosin D	$C_{15}H_{21}ClO$	$CDCl_3$	[147]
9-12-43	alcyopterosin G	$C_{15}H_{21}NO_4$	$CDCl_3$	[147]
9-12-44	alcyopterosin O	$C_{15}H_{22}O_2$	$CDCl_3$	[147]
9-12-45	alcyopterosin C	$C_{15}H_{19}NO_4$	$CDCl_3$	[147]
9-12-46	alcyopterosin J	$C_{15}H_{19}NO_5$	$CDCl_3$	[147]
9-12-47	alcyopterosin N	$C_{15}H_{20}O_2$	$CDCl_3$	[147]
9-12-48	alcyopterosin E	$C_{15}H_{17}NO_5$	$CDCl_3$	[147]
9-12-49	alcyopterosin L	$C_{15}H_{17}ClO_3$	$CDCl_3$	[147]

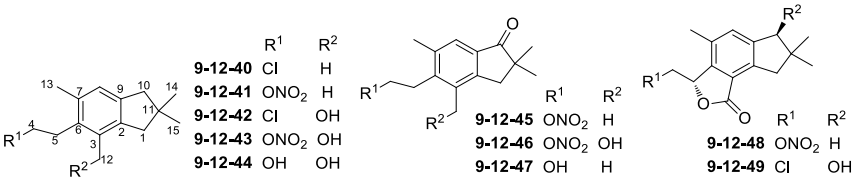

Table 9-12-14: ^{1}H NMR spectroscopic data of illudalane-type sesquiterpenoids **9-12-40**~**9-12-44**.

H	9-12-40	9-12-41	9-12-42	9-12-43	9-12-44
1	2.66 br s	2.65 br s	2.78 br s	2.79 s	2.81 s
4	3.54 t(8.0)	4.48 t(8.0)	3.64 t(8.0)	4.60 t(7.5)	3.85 t(6.0)
5	3.12 t(8.0)	3.06 t(8.0)	3.21 t(8.0)	3.17 t(7.5)	3.01 t(6.0)
8	6.86 br s	6.87 br s	6.87 br s	7.00 br s	6.98 br s
10	2.70 br s	2.69 br s	2.70 br s	2.70 br s	2.70 s
12	2.22 s	2.21 s	4.69 s	4.69 s	4.61 s
13	2.32 s	2.32 s	2.33 s	2.34 s	2.29 s
14	1.16 s	1.15 s	1.15 s	1.15 s	1.15 s
15	1.16 s	1.15 s	1.15 s	1.15 s	1.15 s

Table 9-12-15: ^{1}H NMR spectroscopic data of illudalane-type sesquiterpenoids **9-12-45**~**9-12-49**.

H	9-12-45	9-12-46	9-12-47	9-12-48	9-12-49
1	2.87 br s	3.04 br s	2.86 s	3.04 br s	2.92 d(17.0), 3.17 d(17.0)
4	4.53 t(7.5)	4.65 t(7.5)	3.81 t(7.0)	5.07 dd(12.6, 2.3)	4.18 dd(12.4, 2.2)
				4.58 dd(12.6, 6.6)	3.88 dd(12.4, 4.7)
5	3.18 t(7.5)	3.30 t(7.5)	3.06 t(7.0)	5.67 dd(6.6, 2.3)	5.70 dd(4.7, 2.2)

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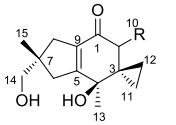
Table 9-12-15 (continued)

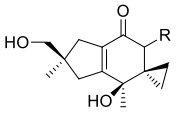
H	9-12-45	9-12-46	9-12-47	9-12-48	9-12-49
8	7.46 br s	7.58 br s	7.44 br s	7.27 br s	7.48 br s
10				2.75 br s	4.71 s
12	2.32 s	4.82 s	2.31 s		
13	2.42 s	2.45 s	2.41 s	2.41 s	2.40 s
14	1.23 s	1.23 s	1.23 s	1.19 s	1.20 s
15	1.23 s	1.23 s	1.23 s	1.16 s	1.08 s

Table 9-12-16: Compounds, MFs, and test solvents of illudane-type sesquiterpenoids **9-12-50**~**9-12-59**.

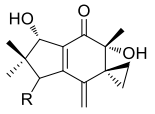
No.	Compounds	MFs	Test solvents	References
9-12-50	illudin I	$C_{15}H_{22}O_3$	–	[148]
9-12-51	illudin I_2	$C_{15}H_{22}O_3$	–	[148]
9-12-52	illudin J	$C_{15}H_{22}O_3$	–	[148]
9-12-53	illudin J_2	$C_{15}H_{22}O_3$	–	[148]
9-12-54	illudin F	$C_{15}H_{20}O_4$	$CDCl_3$	[149]
9-12-55	illudin G	$C_{15}H_{20}O_4$	$CDCl_3$	[149]
9-12-56	illudin H	$C_{15}H_{22}O_5$	CD_3COCD_3	[149]
9-12-57	illudin B	$C_{15}H_{22}O_5$	CD_3COCD_3	[149]
9-12-58	neoilludin A	$C_{15}H_{22}O_6$	CD_3OD	[150]
9-12-59	neoilludin B	$C_{15}H_{22}O_6$	CD_3OD	[150]



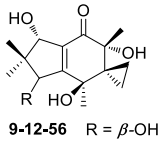
9-12-50 R = β-Me
9-12-51 R = α-Me



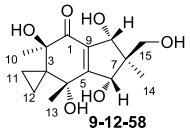
9-12-52 R = β-Me
9-12-53 R = α-Me



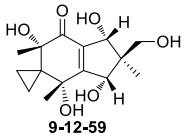
9-12-54 R = β-OH
9-12-55 R = α-OH



9-12-56 R = β-OH
9-12-57 R = α-OH



9-12-58



9-12-59

Table 9-12-17: ^{1}H NMR spectroscopic data of illudane-type sesquiterpenoids **9-12-50**~**9-12-54**.

H	9-12-50	9-12-51	9-12-52	9-12-53	9-12-54
2	2.69 q(7.0)	2.40 q(7.4)	2.73 q(7.0)	2.32 q(7.2)	
6α	2.69 br d(18.4)	2.72 br d(18.5)	2.31 br d(18.3)	2.32 br d(18.5)	4.59 d(6.4)

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Table 9-12-17 (continued)

H	9-12-50	9-12-51	9-12-52	9-12-53	9-12-54
6*β*	2.45 br d(18.4)	2.46 br d(18.5)	2.82 br d(18.3)	2.80 br d(18.5)	
8*α*	2.50 br d(16.6)	2.53 br d(16.3)	2.27 br d(16.3)	2.30 br d(16.5)	
8*β*	2.33 br d(16.6)	2.32 br d(16.3)	2.56 br d(7.0)	2.55 br d(16.5)	4.79 br s
10	0.91 d(6.9)	1.07 d(7.4)	0.90 d(7.0)	1.09 d(7.4)	1.33 s
11*α*	0.51 m	0.43 m	0.51 m	0.44 m	0.96 m
11*β*	0.55 m	0.57 m	0.56 m	0.58 m	1.11 m
12*α*	0.40 m	0.40 m	0.39 m	0.36 m	0.20 m
12*β*	0.69 m	0.84 m	0.66 m	0.85 m	1.04 m
13	1.43 s	1.32 s	1.44 s	1.34 s	5.28 s, 5.77 s
14	3.45 s, 3.46 s	3.45 s, 3.46 s	1.14 s	1.14 s	1.11 s
15	1.14 s	1.14 s	3.46 d(11), 3.49 d(11)	3.45 d(11), 3.49 d(11)	1.18 s

Table 9-12-18: ^{1}H NMR spectroscopic data of illudane-type sesquiterpenoids **9-12-55**~**9-12-59**.

H	9-12-55	9-12-56	9-12-57	9-12-58	9-12-59
6	4.58 m	4.39 s	4.94 d	5.05 d(1.1)	4.77 d(1.1)
8	4.79 s	4.37 s	4.29 d	4.47 d(1.1)	4.70 d(1.1)
10	1.33 s	1.54 s	1.45 s	1.47 s	1.54 s
11	*α* 0.20 m	0.65 m	*α* 0.60 m	0.63 ddd(10.6, 5.8, 4.4)	0.65 ddd(10.8, 6.0, 4.8)
	β 1.14 m	0.72 m	*β* 0.69 m	0.72 ddd(10.6, 6.3, 4.8)	0.71 ddd(10.8, 6.0, 4.4)
12	*α* 0.97 m	*α* 0.50 m	*α* 0.86 m	0.88 ddd(9.9, 6.3, 4.8)	0.83 ddd(9.2, 6.0, 4.8)
	β 1.06 m	*β* 0.84 m	*β* 0.48 m	0.53 ddd(9.9, 5.8, 4.8)	0.48 ddd(9.2, 6.0, 4.4)
13	5.28 s, 5.77 s	1.25 s	1.28 s	1.31 s	1.24 s
14	1.11 s	0.97 s	0.94 s	0.95 s	0.92 s
15	1.18 s	1.11 s	1.16 s	3.80 dd(11.1)	3.44 s
				3.67 dd(11.1)	

Table 9-12-19: Compounds, MFs, and test solvents of proilludane-type sesquiterpenoids **9-12-60**~**9-12-69**.

No.	Compounds	MFs	Test solvents	References
9-12-60	atlanticone C	$C_{15}H_{20}O_2$	$CDCl_3$	[151]
9-12-61	atlanticone D	$C_{15}H_{24}O_4$	$CDCl_3$	[151]
9-12-62	tsugicoline E	$C_{15}H_{24}O_5$	DMSO-d_6	[152]
9-12-63	–	$C_{23}H_{32}O_9$	$CDCl_3$	[152]
9-12-64	tsugicoline A	$C_{15}H_{22}O_4$	CD_3COCD_3	[153]
9-12-65	–	$C_{21}H_{28}O_7$	$CDCl_3$	[153]
9-12-66	tsugicoline B	$C_{15}H_{22}O_3$	$CDCl_3$	[153]
9-12-67	tsugicoline C	$C_{15}H_{24}O_4$	CD_3COCD_3	[153]
9-12-68	5-*epi*-tsugicoline C	$C_{15}H_{24}O_4$	CD_3COCD_3	[153]
9-12-69	tsugicoline D	$C_{15}H_{20}O_3$	CD_3COCD_3	[153]

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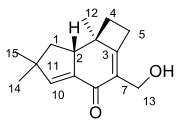
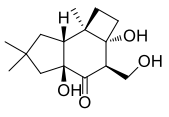
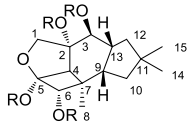
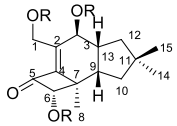
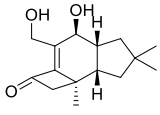
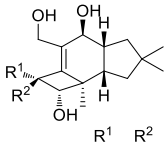

9-12-60


9-12-61


9-12-62 R = H
9-12-63 R = Ac


9-12-64 R = H
9-12-65 R = Ac


9-12-66


9-12-67 OH H
9-12-68 H OH

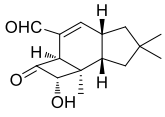

9-12-69

Table 9-12-20: ^{1}H NMR spectroscopic data of proilludane-type sesquiterpenoids **9-12-60**~**9-12-64**.

H	9-12-60	9-12-61	9-12-62	9-12-63	9-12-64
1	1.79 dd(12.8)	*α* 1.61 t	3.66 d(11.0)	4.55 d(10.8)	4.46 (16.0, 1.4)
	1.66 dd(12.8)	*β* 1.86 ddd(12.8, 2.8)	3.78 d(11.0)	4.16 d(10.8)	4.42 (16.0, 1.5)
2	3.43 dt(2.5, 8.0)	2.47 dd(7.5, 13.0)			
3			3.38 d(11.2)	5.72 br d(11.3)	4.23(8.7, 1.4, 1.5)
4	1.96~2.06 m	1.27~1.40 m	1.73 s	3.09 s	
5	*α* 3.15 dt(16.0, 9.3)	*α* 1.90~2.01 m			
	β 2.91 ddd(7.3, 3.7)	*β* 2.10 ddd(12.8, 8.6, 3.6)			
6			3.92 s	5.09 s	4.36 s
7		3.33 ddd(1.4)			
8			0.87 s	1.11 s④	1.00 s
9			1.99 m(13.0, 6.6, 6.5)	2.38 m②	2.54 ddd(10.4, 7.9, 11.5)
10	6.52 d(2.5)	*α* 1.95 br d(14.4)	*α* 1.24 dd(13.0, 12.5)	1.75 m③	*α*1.51 ddd(10.4, 12.4, 0.8)
		β 1.57 dd(14.4)	*β* 1.33 dd(13.0, 12.5)	1.55 m③	*β*1.55 ddd(7.9, 12.4, 1.8)
12	1.24 s①	1.23 s	*α* 1.79 dd(13.8, <0.5)	1.51 m③	*α*1.30 ddd(12.2, 10.4, 0.8)
			β 1.46 dd(13.8, 7.2)	1.38 m③	*β*1.86 ddd(12.2, 7.3, 1.8)
13	4.25 q	4.17 dd(11.4, 5.8)	1.96 m(11.2, 7.2, 6.5, <0.5)	2.36 m②	2.32 (8.7, 11.5, 10.4, 7.3)
		4.08 dd(7.2, 11.4)			

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Table 9-12-20 (continued)

H	9-12-60	9-12-61	9-12-62	9-12-63	9-12-64
14	1.21 s①	1.13 s	1.08 s	1.09 s④	1.13
15	1.10 s①	1.20 s	0.97 s	1.01 s④	1.01 (0.8, 0.8)
OAc				2.12 s, 2.09 s 2.08 s, 2.00 s	
OH					3.82, 4.57, 5.16

①~④Assignments bearing the same superscript may be exchanged in each column.

Table 9-12-21: ^{1}H NMR spectroscopic data of proilludane-type sesquiterpenoids **9-12-65**~**9-12-69**.

H	9-12-65	9-12-66	9-12-67	9-12-68	9-12-69
1	4.86 (16.0, 1.6) 4.72 (16.0, 1.6)	4.54 (17.6, 1.6) 4.50 (17.6, 1.9)	4.28 (13.4, 1.0) 4.26 (13.4, 1.2)	4.40 (1.1) 4.40 (1.1)	9.47
3	5.43 (9.2, 1.6, 1.6)	4.24 (9.1, 1.6, 1.9)	4.15 (8.5, 1.0, 1.2)	4.06 (1.1, 1.1, 8.9)	6.77 (2.0)
6	5.12	2.82	3.70	3.68	4.71
8	0.99	1.17	1.04	0.92	1.13
9	2.65(10.6, 7.6, 12.0)	2.48(10.2, 8.3, 11.9)	2.30(10.2, 8.2, 12.0)	2.30(10.6, 8.0, 11.8)	2.64(12.7, 6.9, 7.4)
10α	1.42(13.0, 10.6, 0.8)	1.46(12.6, 10.2, 0.8)	1.35(10.2, 12.6, 0.8)	1.36 (12.6, 10.6, 0.8)	1.07 (12.6, 12.6)
10β	1.67(13.0, 7.6, 2.0)	1.56(12.6, 1.8, 8.3)	1.39(8.2, 12.6, 1.6)	1.42 (12.6, 8.0, 1.7)	1.59 (12.6, 6.9)
12α	1.21(12.5, 10.5, 0.8)	1.22(12.3, 11.3, 0.8)	1.17(12.6, 10.2, 0.8)	1.20(12.6, 9.9, 0.8)	1.72dd(13.5, 2.3)
12β	1.65(12.5, 7.0, 2.0)	1.85(12.3, 7.2, 1.8)	1.78(12.6, 7.2, 1.6)	1.77(12.6, 7.5, 1.7)	2.10(13.5, 9.2)
13	2.48(9.2, 12.0, 10.5, 7.0)	2.44(9.1, 11.9, 11.3, 7.2)	2.25(8.5, 12.0, 10.2, 7.2)	2.19(8.9, 11.8, 9.9, 7.5)	3.16(7.4, 2.3, 9.2)
14	1.10	1.12	1.08	1.08	1.08
15	0.99 (0.8)	0.99	0.97	0.97	1.01
OAc	2.12 s, 2.14 s, 2.15 s				
OH		3.00, 3.80	3.97, 4.50, 3.95	4.13, 4.60, 5.15	5.14

Table 9-12-22: Compounds, MFs, and test solvents of tremulane-type sesquiterpenoids **9-12-70**~**9-12-79**.

No.	Compounds	MFs	Test solvents	References
9-12-70	11,12-dihydroxy-1-tremulen-5-one	$C_{15}H_{24}O_3$	$CDCl_3$	[154]
9-12-71	conocenol A	$C_{15}H_{26}O_3$	CD_3OD	[155]

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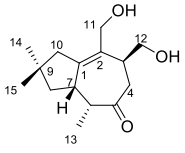
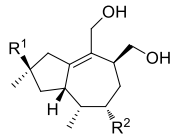
Table 9-12-22 (continued)

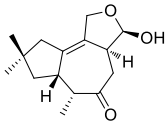
No.	Compounds	MFs	Test solvents	References
9-12-72	conocenol B	$C_{15}H_{26}O_3$	CD_3OD	[155]
9-12-73	11,12-epoxy-12β-hydroxy-1-tremulen-5-one	$C_{15}H_{22}O_3$	$CDCl_3$	[154]
9-12-74	2α,11-dihydroxy-1(10)-tremulen-5,12-olide	$C_{15}H_{22}O_4$	$CDCl_3$	[154]
9-12-75	conocenol C	$C_{16}H_{26}O_3$	$CDCl_3$	[155]
9-12-76	conocenol D	$C_{16}H_{26}O_3$	$CDCl_3$	[155]
9-12-77	10β,11-dihydroxy-5,6-*seco*-1,6(13)-tremuladien-5,12-olide	$C_{15}H_{22}O_4$	$CDCl_3$	[154]
9-12-78	conocenolide A	$C_{15}H_{22}O_3$	$CDCl_3$	[155]
9-12-79	conocenolide B	$C_{15}H_{22}O_3$	$CDCl_3$	[155]



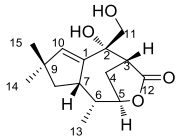
9-12-70



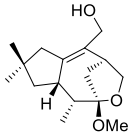
	R^1	R^2
9-12-71	CH_2OH	H
9-12-72	Me	OH



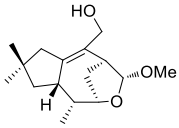
9-12-73



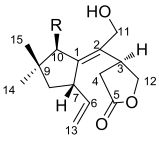
9-12-74



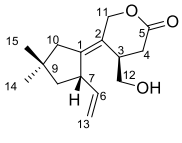
9-12-75



9-12-76



9-12-77 R = OH
9-12-78 R = H



9-12-79

Table 9-12-23: ^{1}H NMR spectroscopic data of tremulane-type sesquiterpenoids **9-12-70**~**9-12-74**.

H	9-12-70	9-12-71	9-12-72	9-12-73	9-12-74
3	2.77 m	2.56 m	2.64 m	2.90 m	2.89 m
4	2.57 m	1.75 m	1.73 ddd(12.8, 12.8, 3.6)	3.10 dd(13.7, 13.7)	2.26 m
	2.79 m		1.95 m	2.52 m	2.33 m
5		1.96 br t(13.6)	3.98 m		4.68 m
6	2.47 m	1.75 m	1.89 m	2.57 dd(7.3, 2.2)	2.00 m
7	3.05 m	3.04 br t(9.4)	2.92 br t(9.4)	3.48 m	3.00 m
8	1.57 ddd (11.0, 11.0, 1.8)	1.73 m 1.34 dd(12.8, 10.8)	1.59 ddd (12.0, 12.0, 2.0)	1.47 d(10.0)	1.90 dd(14.2, 10.8) 1.60 m
	1.46 dd(11.0, 11.0)		1.51 dd(12.0, 12.0)		

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Table 9-12-23 (continued)

H	9-12-70	9-12-71	9-12-72	9-12-73	9-12-74
10	2.37 dd(15.3, 1.8)	2.50 dd(16.0, 1.6)	2.31 dd(15.2, 2.0)	2.11 d(16.6)	5.82 s
	2.04 d(15.3)	1.88 br d(16.0)	1.99 br d(15.2)	1.98 br d(16.6)	
11	3.89 d(11.4)	3.94 d(11.2)	3.96 d(11.6)	4.31 d(12.7)	3.28 d(12.2)
	4.25 d(11.4)	4.09 d(11.2)	4.07 d(11.6)	4.49 d(12.7)	3.80 d(12.2)
12	3.59 dd(10.5, 5.5)	3.70 m	3.66 m	5.36 d(4.6)	
	3.49 dd(10.5, 8.1)				
13	1.01 d(7.0)	0.90 d(7.2)	0.82 d(6.8)	1.13 d(7.6)	0.92 d(7.3)
14	1.10 s	1.07 s	1.11 s	1.11 s	1.04 s
15	0.89 s	3.21 d(10.0), 3.23 d(10.0)	0.91 s	1.03 s	1.14 s

Table 9-12-24: ^{1}H NMR spectroscopic data of tremulane-type sesquiterpenoids **9-12-75**~**9-12-79**.

H	9-12-75	9-12-76	9-12-77	9-12-78	9-12-79
3	3.00 dd(7.2, 7.2)	2.74 d(7.6)	3.84 m	3.81 m	3.38 m
4	1.74 d(12.4), 2.04 m	1.82 d(12.4), 2.05 m	2.63 d(9.3)	2.57 m	2.76 dd(15.5, 4.5) 2.57 (ov)
5		4.60 dd(7.2, 7.2)			
6	2.08 m	2.06 m	5.78 m	5.69 m	5.63 m
7	3.22 m	3.24 m	3.33 m	3.37 m	3.44 m
8	1.47 d(10.2)	1.46 dd(12.0, 12.0)	1.71 m	1.80 m	1.80 m
		1.39 br t(12.0)		1.37 m	1.37 m
10	2.24 d(15.6)	2.25 dd(15.6, 2.0)	4.15 s	2.30 dd(15.5, 2.0)	2.14 d(13.6)
	1.97 br d(15.6)	1.95 br d(15.6)		2.19 br d(15.5)	2.10 d(13.6)
11	4.15 d(11.6)	4.15 d(11.6)	4.43 d(11.5)	4.26 (ov)	4.81 d(14.0)
	4.01 d(11.6)	4.03 d(11.6)	4.12 d(11.5)	4.16 d(12.0)	4.70 d(14.0)
12	4.31 dd(10.0, 6.8)	5.01 s	4.34 dd(8.8, 8.8)	4.36 dd(9.0, 9.0)	3.68 dd(10.0, 4.5)
	3.89 d(10.0)		4.04 dd(17.6, 8.8)	4.27 (ov)	3.35 dd(10.0, 8.5)
13	0.80 d(6.8)	0.74 d(7.0)	5.00 d(11.0), 5.03 d(18.7)	4.99 (ov)	5.05 (ov)
14	1.09 s	1.09 s	1.08 s	1.10 s	1.10 s
15	0.90 s	0.93 s	0.83 s	0.90 s	0.90 s
OMe	3.31 s	3.34 s			

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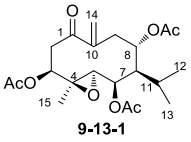
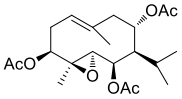
9.13 Germacrane-type sesquiterpenoids

Table 9-13-1: Compounds, MFs, and test solvents of germacrane-type sesquiterpenoids **9-13-1**~**9-13-15**.

No.	Compounds	MFs	Test solvents	References
9-13-1	3*β*,6*β*,8*α*-triacetoxy-4*β*,5*α*-epoxy-1-oxogermacr-10(14)-ene	$C_{21}H_{30}O_8$	$CDCl_3$	[156]
9-13-2	3*β*,6*β*,8*α*-triacetoxy-4*β*,5*α*-epoxygermacr-1(10)*E*-ene	$C_{21}H_{32}O_7$	$CDCl_3$	[156]
9-13-3	3*β*,6*β*,8*α*-triacetoxy-4*β*,5*α*:1*α*,10*β*-diepoxygermacrane	$C_{21}H_{32}O_8$	$CDCl_3$	[156]
9-13-4	6*β*-acetoxyglechomafuran	$C_{17}H_{22}O_5$	$CDCl_3$	[156]
9-13-5	pulicanaral A	$C_{19}H_{28}O_6$	$CDCl_3$	[157]
9-13-6	pulicanaral B	$C_{19}H_{28}O_7$	$CDCl_3$	[157]
9-13-7	pulicanaral C	$C_{17}H_{26}O_6$	$CDCl_3$	[157]
9-13-8	pulicanadiene A	$C_{19}H_{28}O_6$	C_6D_6	[157]
9-13-9	pulicanadiene B	$C_{19}H_{28}O_5$	C_6D_6	[157]
9-13-10	pulicanadiene C	$C_{19}H_{30}O_5$	C_6D_6	[157]
9-13-11	triacetoxy pulicanone	$C_{21}H_{30}O_7$	$CDCl_3$	[157]
9-13-12	–	$C_{21}H_{32}O_7$	$CDCl_3$	[157]
9-13-13	pulicanadienal A	$C_{15}H_{24}O_3$	$CDCl_3$	[157]
9-13-14	pulicanadienal B	$C_{17}H_{26}O_4$	$CDCl_3$	[157]
9-13-15	pulicanadienol	$C_{15}H_{26}O_3$	$CDCl_3$	[157]



9-13-1



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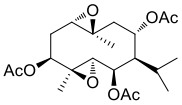

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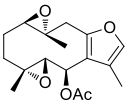

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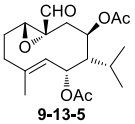

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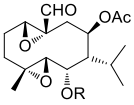
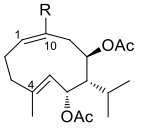
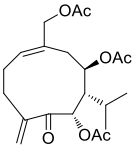


9-13-6 R = Ac
9-13-7 R = H



9-13-8 R = COOH
9-13-9 R = CHO
9-13-10 R = CH_2OH



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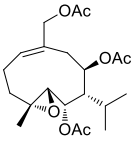

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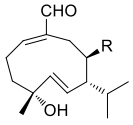
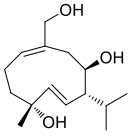


9-13-13 R = OH
9-13-14 R = OAc



9-13-15

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Table 9-13-2: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-1**~**9-13-5**.

H	9-13-1	9-13-2	9-13-3	9-13-4	9-13-5
1		5.35 m	3.13 d(10.6)	2.83 dd(10.8, 1.5)	3.34 d(11.6)
2	*α* 3.32 dd(13.6, 3.8)	*α* 2.52 m	*α* 2.08 m	*α* 2.14 m	1.75 m
	β 2.80 dd(13.6, 3.8)	*β* 2.25 dd(12.0, 3.0)	*β* 1.70 m	*β* 1.49 m	2.38 m
3	5.17 t(3.8)	5.05 t(3.0)	5.08 t(2.5)	*α* 1.32 m	2.33 m
				β 2.20 dt(12.7, 3.6)	2.44 m
5	3.07 d(7.2)	3.00 d(6.8)	3.19 d(6.8)	3.06 d(1.5)	5.43 d(7.2)
6	4.82 d(7.2)	4.83 d(6.8)	4.83 d(6.8)	6.50 br s	5.54 d(6.1)
7	1.47 br d(8.6)	1.32 br d(6.8)	1.47 br d(8.7)		1.58 br d(9.3)
8	5.41 dd(11.2, 2.8)	5.35 m	5.35 dd(12.0, 5.6)		5.40 dd(4.2, 12.6)
9	*α* 2.54 t(12.8)	*α* 1.99 m, *β* 2.52 m	*α* 1.70 m, *β* 2.08 m	*α* 2.70 d(16.3)	2.79 t(12.8)
	β 2.90 dd(11.4, 2.8)			*β* 3.39 d(16.1)	1.43 d(4.2)
11	1.81 m	1.80 m	1.70 m	7.02 s	1.96 m
12	1.13 d(6.4)	0.99 d(6.4)	1.00 d(6.4)	1.92 s	1.32 d(6.6)
13	0.85 d(6.4)	0.80 d(6.4)	0.82 d(6.4)	1.50 s	0.97 d(6.6)
14	5.99 s, 6.05 s	1.65 br s	1.32 s		9.28 s
15	1.37 s	1.10 s	1.20 s	1.38 s	1.45 s
OAc	2.06 s, 1.97 s	1.92 s, 1.95 s, 2.00 s	1.86 s, 1.91 s, 1.93 s	2.06 s	2.00 s, 2.08 s

Table 9-13-3: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-6**~**9-13-10**.

H	9-13-6	9-13-7	9-13-8	9-13-9	9-13-10
1	3.50 d(11.2)	3.45 d(11.5)	6.78 t(8.0)	5.86 t(8.4)	5.34 t(8.5)
2	1.70 m, 2.38 m	1.75 m, 2.40 m	2.10 m, 2.35 m	1.70 m, 1.80 m	1.70 m, 2.01 m
3	1.29 m	1.30 m	1.80 m	1.70 m	1.40 m
	2.22 ddd(3.5, 7.1, 13.8)	2.20 ddd(3.5, 7.0, 13.5)	2.10 m		
5	3.04 d(6.7)	3.03 d(6.7)	5.18 d(8.9)	5.11 d(8.6)	5.11 m
6	4.87 dd(1.0, 6.7)	3.51 dd(1.2, 6.7)	5.77 d(9.1)	6.02 dd(1.8, 8.8)	6.13 br d(5.9)
7	1.52 m	1.54 m	1.80 m	1.80 m	1.92 dd(3.3, 13.4)
8	5.44 dd(4.6, 12.1)	5.20 dd(4.6, 12.6)	5.63 br s	6.09 br s	5.76 t(9.2)
9	2.84 t(12.6)	3.01 t(12.6)	2.35 m	2.34 br s	2.50 m
	1.55 m	1.54 m	2.66 d(11.2)	2.61 dd(5.3, 14.0)	2.68 m
11	1.95 m	1.90 m	2.10 m	1.80 m	2.12 t(6.3)
12	1.29 d(6.7)	1.31 d(6.6)	1.06 d(5.6)	1.28 d(6.3)	1.13 d(6.8)
13	0.96 d(6.7)	0.99 d(6.6)	0.97 d(4.5)	1.09 d(6.3)	0.97 d(6.9)
14	9.38 s	9.40 s		9.26 s	4.12 d(17.8)
15	1.10 s	1.13 s	1.84 s	1.98 s	1.52 s
OAc	2.06 s	2.12 s	2.00 s, 2.05 s	1.72 s, 1.77 s	1.58 s, 1.78 s

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Table 9-13-4: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-11**~**9-13-15**.

H	9-13-11	9-13-12	9-13-13	9-13-14	9-13-15
1	5.59 dd(5.7, 11.4)	5.64 t(7.5)	6.58 dd(4.4, 11.9)	6.41 dd(5.8, 10.5)	5.36 dd(2.5, 9.0)
2	2.00 m	2.36 m	2.11 m, 2.64 q(12.0)	2.04 m, 2.53 m	1.80 m, 2.26 d(10.2)
3	2.07 m	1.25 m, 2.19 m	1.67 dd(11.0, 14.0)	1.74 m, 1.98 m	1.50 dd(10.8, 12.8)
	2.94 br d(12.7)		2.01 m		1.78 m
5		2.87 d(6.6)	5.00 d(15.3)	5.20 d(15.3)	5.17 d(15.3)
6	5.95 s	4.89 d(6.8)	5.22 dd(10.7, 15.3)	5.25 dd(10.0, 15.4)	5.22 dd(9.4, 15.3)
7	2.54 dd(3.4, 10.5)	1.63 d(9.2)	1.56 m	1.60 m	1.98 m
8	5.41 dt(3.5, 10.6)	5.46 dd(4.7, 12.1)	3.78 m	5.00 m	3.85 dd(3.3, 6.2)
9	2.32 dd(3.5, 8.9)	1.27 m, 2.63 m	2.38 dd(4.8, 15.3)	2.79 dd(3.4, 15.0)	2.10 m
	2.44 td(4.3, 12.6)		2.40 d(15.3)	2.51 dd(3.4, 15.0)	2.88 br d(14.9)
11	2.27 m	1.86 m	2.17 ddd(2.7, 6.8, 6.8)	2.16 m	2.01 m
12	1.12 d(6.9)	1.12 d(6.5)	0.81 d(6.9)	0.80 d(6.8)	0.87 d(6.4)
13	0.75 d(6.9)	0.92 d(6.6)	0.79 d(6.9)	0.79 d(6.8)	0.85 d(6.4)
14	4.51 s	4.62 d(12.3) 4.57 d(12.1)	9.39 s	9.42 s	4.03 d(12.0) 4.10 d(12.0)
15	5.66 s	1.17 s	1.32 s	1.34 s	1.29 s
OAc	2.03 s	2.00 s		2.12 s	
	2.19 s	2.07 s			
	2.04 s	2.09 s			

Table 9-13-5: Compounds, MFs, and test solvents of germacrane-type sesquiterpenoids **9-13-16**~**9-13-30**.

No.	Compounds	MFs	Test solvents	References
9-13-16	castanin C	$C_{17}H_{22}O_7$	CD_3COCD_3	[158]
9-13-17	castanin D	$C_{17}H_{22}O_7$	CD_3COCD_3	[158]
9-13-18	castanin E	$C_{15}H_{20}O_6$	CD_3COCD_3	[158]
9-13-19	castanin F	$C_{15}H_{20}O_6$	CD_3COCD_3	[158]
9-13-20	1*β*,10*α*:4*α*,5*β*-diepoxy-6*β*,8*β*-diacetoxy glechomanolide	$C_{19}H_{24}O_8$	CD_3COCD_3	[158]
9-13-21	1*β*,10*α*:4*α*,5*β*-diepoxy-6*β*,8*α*-diacetoxy glechomanolide	$C_{19}H_{24}O_8$	CD_3COCD_3	[158]
9-13-22	deacetyl herbolide A	$C_{15}H_{22}O_3$	$CDCl_3$	[159]
9-13-23	(*E*,*E*)-3*α*,9*β*-dihydroxy-6*βH*,11*βH*-13-norgermacra-1(10),4-dien-11,6-carbolactone	$C_{15}H_{22}O_4$	CD_3COCD_3	[159]

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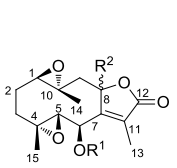
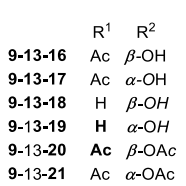
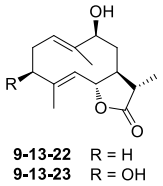
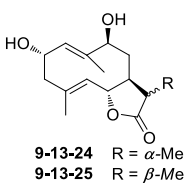
Table 9-13-5 (continued)

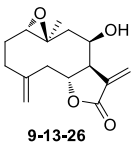
No.	Compounds	MFs	Test solvents	References
9-13-24	(*E,E*)-2*α*,9*β*-dihydroxy-6*βH*,11*βH*-13-norgermacra-1(10),4-dien-11,6-carbolactone	$C_{15}H_{22}O_4$	CD_3COCD_3	[159]
9-13-25	(*E,E*)-2*α*,9*β*-dihydroxy-6*βH*,11*αH*-13-norgermacra-1(10),4-diene-11,6-carbolactone	$C_{15}H_{22}O_4$	CD_3COCD_3	[159]
9-13-26	melanolepin C	$C_{15}H_{20}O_4$	CD_3OD	[160]
9-13-27	4,5-epoxy-13-methoxy-1(10)-germacren-12,6-olide	$C_{16}H_{24}O_4$	$CDCl_3$	[161]
9-13-28	4,5-epoxy-13-acetoxy-1(10)-germacren-12,6-olide	$C_{17}H_{24}O_5$	$CDCl_3$	[161]
9-13-29	eupalinolide C	$C_{22}H_{28}O_8$	$CDCl_3$	[162]
9-13-30	eupalinolide D	$C_{26}H_{32}O_{10}$	$CDCl_3$	[162]

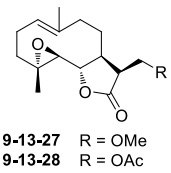












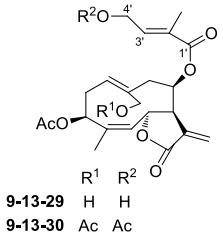


Table 9-13-6: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-16**~**9-13-21**.

H	9-13-16	9-13-17	9-13-18	9-13-19	9-13-20	9-13-21
1	2.94 m	2.94 m	2.95 m	2.95 m	2.95 dd(2.3, 11.1)	3.00 d(10.8)
2	1.49 m	1.49 m	1.47 m	1.47 m	1.59 m	1.53 m
	2.08 m	1.95 m	2.03 m	2.03 m	2.05 m	1.96 m
3	1.26 m	1.29 m	1.32 m	1.32 m	1.28 m	1.36 m
	2.12 m	2.12 m	2.20 m	2.20 m	2.11 m	2.22 m
5	3.03 br s	3.47 d(5.8)	3.93 br s	3.52 d(5.3)	3.12 br s	3.60 d(5.8)
6	6.26 br s	6.22 d(5.8)	5.52 br s	5.52 d(5.3)	6.70 br s	6.17 d(5.8)
9	1.52 m	1.97 m	1.47 m	2.02 m	1.59 d(14.9)	2.22 d(15.1)
	2.94 m	2.94 m	3.00 m	3.00 m	3.15 d(14.9)	3.27 d(15.1)

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Table 9-13-6 (continued)

H	9-13-16	9-13-17	9-13-18	9-13-19	9-13-20	9-13-21
13	1.88 br s	1.99 br s	1.84 br s	2.03 br s	2.00 br s	2.13 br s
14	1.56 br s	1.04 br s	1.66 br s	1.07 br s	1.62 br s	1.13 br s
15	1.59 br s	1.34 br s	1.61 br s	1.43 br s	1.55 br s	1.44 br s
OAc	2.05 br s	2.11 br s			2.09 br s	2.09 br s
					2.15 br s	2.17 br s

Table 9-13-7: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-22**~**9-13-26**.

H	9-13-22	9-13-23	9-13-24	9-13-25	9-13-26
1	4.95 m	5.07 ddq (11.8, 4.7, 1.4)	5.09 dq(9.7, 1.4)	5.09 dq(9.7, 1.4)	2.73 br d(12.4)
2	–	2.22~2.29 m	4.69 (ov)	4.69 m	2.15~2.20 m 1.70~1.73 m
3	–	4.19 m	2.58 dd(11.0, 5.6) 1.97 dd(11.0, 10.0)	2.57 dd(11.0, 5.6) 1.97 dd(11.0, 9.7)	2.11~2.16 m 1.60~1.66 m
5	4.47 (ov)	4.64 br d(9.9)	4.78 br d(10.2)	4.79 br d(10.2)	2.99~3.06 m 2.47 dd(13.7, 11.6)
6	4.47 (ov)	4.76 dd(9.9, 9.1)	4.69 (ov)	4.91 dd(10.2, 9.8)	4.26 ddd(11.5, 10.0, 3.2)
7	–	1.79 m	1.82 m	2.36 m	3.03 ddd(10.0, 6.8, 3.3)
8	–	1.89~1.97 m	1.91 m	1.81~1.92 m	4.14 dd(7.0, 3.6)
9	4.03 dd(10, 3)	4.03 m	4.06 m	4.06 m	2.78 dd(9.5, 2.9) 1.57~1.63 m
11		2.36 dq(12.3, 7.0)	2.35 dq(12.3, 7.0)	2.64 dq(7.8, 7.6)	
13	1.25 d(7.0)	1.19 d(7.0)	1.19 d(7.0)	1.18 d(7.6)	6.14 d(3.3) 5.95 d(3.3)
14	1.43 d(1.4)	1.49 d(1.4)	1.51 d(1.4)	1.49 d(1.4)	1.48 s
15	1.69 s	1.71 d(1.7)	1.74 d(1.4)	1.75 d(1.6)	4.98 br s 4.91 br s

Table 9-13-8: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-27**~**9-13-30**.

H	9-13-27	9-13-28	9-13-29	9-13-30
1	5.15 dd(12.0, 2.6)	5.80 br d(11.8)	5.25 dd(12.0, 5.5)	5.26 dd(12.0, 5.0)
2	–	–	2.42 m, 2.74 m	2.43 m, 2.77 m
3	3.60 dd(8.4, 3.0)		5.28 dd(12.0, 6.0)	5.30 dd(12.0, 6.0)
5	2.70 d(8.9)	2.63 dd(8.9, 2.2)	5.20 br d(10.0)	5.22 br d(10.5)
6	3.79 t(8.8)	3.78 dd(9.1, 9.0)	5.87 dd(12.0, 9.0)	5.82 dd(12.0, 9.0)

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Table 9-13-8 (continued)

H	9-13-27	9-13-28	9-13-29	9-13-30
7	–	–	2.99 m	2.98 m
8	–	–	5.37 m	5.47 m
9	–	–	2.30 m, 3.16 m	2.31 m, 3.15 m
13	4.12 d(6.0)	4.29 d(5.8)	6.36 d(3.0)	6.37 d(3.5)
			5.79 d(3.0)	5.82 d(3.5)
14	1.66 s	1.64 s	4.48 d(13.0)	4.98 d(13.0)
			4.10 d(13.0)	4.57 d(13.0)
15	1.20 s	1.18 s	1.84 br s	1.85 br s
3′			6.75 t(6.0)	6.68 t(6.0)
4′			4.28 d(6.0)	4.74 d(6.0)
5′			1.80 br s	1.84 br s
OMe	3.32 s			
OAc		2.00 s	2.10 s	2.06 s, 2.10 s, 2.15 s

Table 9-13-9: Compounds, MFs, and test solvents of germacrane-type sesquiterpenoids **9-13-31**~**9-13-40**.

No.	Compounds	MFs	Test solvents	References
9-13-31	eupaheliangolide A	$C_{20}H_{24}O_6$	$CDCl_3$	[163]
9-13-32	15-acetoxyheliangin	$C_{22}H_{28}O_8$	$CDCl_3$	[163]
9-13-33	3-*epi*-heliangin	$C_{20}H_{26}O_6$	$CDCl_3$	[163]
9-13-34	1*α*-methoxy-3*α*,15-dihydroxy-3,10-epoxy-8*β*-*O*-methyl-butanoyl-4,11(13)-gemacradien,6*α*,12-olide	$C_{21}H_{30}O_8$	$CDCl_3$	[164]
9-13-35	1*α*-methoxy-3*α*,15-dihydroxy-3,10-epoxy-8*β*-O-angelo-yl-4,11(13)-gemacradien,6*α*,12-olide	$C_{21}H_{28}O_8$	$CDCl_3$	[164]
9-13-36	1*α*,10*β*,15-trihydroxy-3-oxo-8*β*-*O*-methylbutanoyl-4,11(13)-gemacradien,6*α*,12-olide	$C_{20}H_{28}O_8$	$CDCl_3$	[164]
9-13-37	1-keto-3,10-epoxy-11*α*-methoxymethyl-8*β*-*O*-methacr-yloyl-15-hydroxy-2,4-germacradiene, 6*α*,12-olide	$C_{20}H_{24}O_8$	$CDCl_3$	[165]
9-13-38	1-keto-3,10-epoxy-8*β*-*O*-methacryloyl-4,15-dihydroxy-5-acetoxy-2,11-germacradiene, 6*α*,12-olide	$C_{21}H_{24}O_{10}$	$CDCl_3$	[165]
9-13-39	1*α*,3*α*,15-trih ydroxy-3,10-epoxy-8*β*-*O*-methacryloyl-4,11-germacradiene, 6*α*,12-olide	$C_{19}H_{24}O_8$	$CDCl_3$	[165]
9-13-40	3*β*-ethoxy-leptocarpin	$C_{22}H_{30}O_6$	$CDCl_3$	[165]

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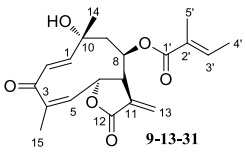
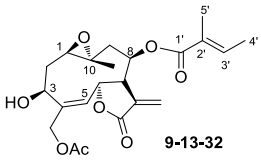


9-13-31



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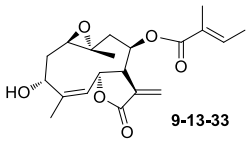

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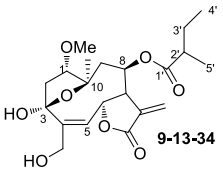

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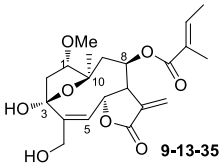

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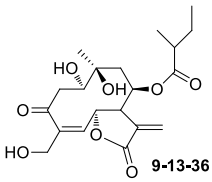
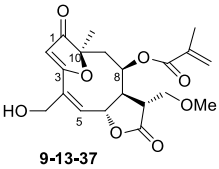


9-13-36



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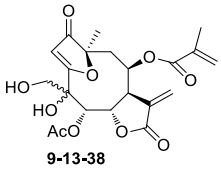

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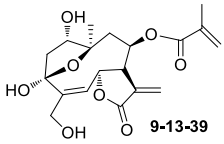
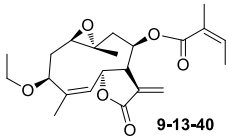


9-13-39



9-13-40

Table 9-13-10: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-31**~**9-13-35**.

H	9-13-31	9-13-32	9-13-33	9-13-34	9-13-35
1	6.94 d(17.1)	2.80 t(4.3)	2.58 dd(10.0, 5.5)	4.07 dd(6.7, 10.4)	4.05 m
2	6.23 d(17.1)	2.49 t(4.3)	2.37 ddd(12.3, 10.0, 5.0)	2.62 dd(6.7, 14)	2.62 dd
		1.78 m	1.69 m	2.08 dd(10.4, 14)	2.07 dd
3		4.60 m	4.99 dd(12.5, 5.5)		
5	5.85 d(9.0)	5.58 d(8.5)	5.31 d(11.0)	5.89 t(4.8)	5.93 br t(3.9)
6	5.45 d(9.0)	6.10 m	5.59 dd(11.0, 2.0)	5.46 br d(4.8)	5.49 br t(3.9)
7	3.57 m	2.90 m	2.90 br s	4.13 br s	4.16 br s
8	5.34 t(6.0)	5.19 br s	5.20 t(3.5)	5.60 m	5.62 m
9	2.52 dd(13.9, 6.0)	2.50 dd(14.3, 4.2)	2.81 dd(15.2, 4.5)	2.18 dd(10.2, 15)	–
	1.97 m	1.73 m	1.29 dd(15.2, 2.5)	1.75 dd(5.2, 15)	

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Table 9-13-10 (continued)

H	9-13-31	9-13-32	9-13-33	9-13-34	9-13-35
13	6.31 d(1.5) 5.79 d(1.5)	6.38 d(1.6) 5.80 d(1.6)	6.38 d(2.0) 5.78 d(2.0)	6.27 d(2.1) 5.63 d(1.8)	6.31 d(2.1) 5.67 d(1.8)
14	1.50 s	1.47 s	1.49 s	1.55 s	1.58 s
15	1.94 br s	6.66 d(10.5) 5.60 d(10.5)	1.81 s	4.22 br d(11.7) 4.12 d(11.7)	4.25 br d 4.15 br d
2′				2.26 m	
3′	6.71 q(6.9)	6.87 q(6.5)	6.84 dq(6.5, 1.5)	1.60 m 1.44 m	6.12 qq(1.5, 7.3)
4′	1.75 d(6.9)	1.80 d(6.5)	1.80 d(6.5)	0.86 dd(7)	1.98 dq(1.5, 7.3)
5′	1.69 s	1.53 s	1.88 d(1.5)	1.04 d(7)	1.79 dq(1.5)
OAc		2.11 s			
OMe				3.42 s	3.45 s

Table 9-13-11: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-36**~**9-13-40**.

H	9-13-36	9-13-37	9-13-38	9-13-39	9-13-40
1	4.52 m			4.04 dd(4.4, 8.1)	2.84 m (ov)
2	1.78 m, 2.02 m	5.68 br s	5.78 s	2.58 dd(4.4, 14.2) 2.43 d(14.2)	2.47 dt(5, 14.8) 1.75 m (ov)
3					4.51 br s
5	5.72 d(9.4)	6.19 dt(1.6, 3.6)	5.27 s	5.91 d(3.9)	5.40 d(10.9)
6	6.04 dd(3.2, 9.4)	5.11 m	4.82 d(5)	5.39 t(3.9)	6.65 dd(1, 10.9)
7	3.40 br s	3.30 ddd(5, 7, 12.8)	4.04 m(1, 2.5, 2.5, 5)	4.23 m	2.88 br s (ov)
8	5.43 ddd(3.7, 5.2, 10)	5.13 m	5.08 ddd(1, 3.6, 4.5)	5.66 dd(4.9, 10)	5.22 br s
9	2.52 dd(10, 15.1) 1.91 dd(5.2, 15.1)	2.46 dd(5.1, 15.2) 2.30 dd(3, 15.2)	2.65 dd(4.5, 15.9) 2.31 dd(3.6, 15.9)	2.03 dd(4.9, 14.4) 1.85 dd(10, 14.4)	2.82 dd(4.3, 11,ov) 1.34 dd(1, 11)
11		3.00 dt(4.6, 7)			
13	6.35 d(2.1) 5.80 d(1.8)	3.64 dd(4.6, 10.4) 3.66 dd(4.6, 10.4)	6.34 d(2.5) 5.71 d(2.5)	6.29 d(2.6) 5.46 d(2.1)	6.39 d(1.5) 5.78 d(1.2)
14	1.34 s	1.48 s	1.48 s	1.55 s	1.48 s
15	4.12 m	4.42 d(13.5)	4.17 m(12.2) 4.23 m(12.2)	4.14 dd(5, 13) 4.24 dd(5, 13)	1.83 br s
2′	2.31 m				
3′	1.45 m, 1.63 m	6.07 dq(1.1, 1.4) 5.68 t-like(1.3, 1.4)	5.60 s, 6.01 s	5.95 dq(1.1, 1.2) 5.53 t-like(1.1, 1.2)	6.12 qq(1.5, 7.3)

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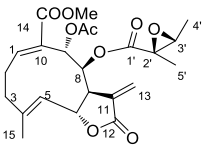
Table 9-13-11 (continued)

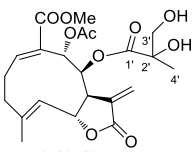
H	9-13-36	9-13-37	9-13-38	9-13-39	9-13-40
4′	0.90 d(7.0)	1.90 dd(1.1, 1.3)	1.87 s	1.83 dd(1.2, 1.2)	1.99 dq(1.5, 7.3)
5′	1.09 d(7.0)				1.87 dq(1.5)
OAc			2.11 s		
OMe		3.38 s			
OEt					1.25 t(7), 3.73 q(7)

Table 9-13-12: Compounds, MFs, and test solvents of germacrane-type sesquiterpenoids **9-13-41**~**9-13-55**.

No.	Compounds	MFs	Test solvents	References
9-13-41	–	$C_{23}H_{28}O_9$	$CDCl_3$	[166]
9-13-42	–	$C_{22}H_{28}O_{10}$	$CDCl_3$	[166]
9-13-43	–	$C_{22}H_{26}O_8$	$CDCl_3$	[166]
9-13-44	–	$C_{22}H_{26}O_9$	$CDCl_3$	[166]
9-13-45	–	$C_{23}H_{28}O_9$	$CDCl_3$	[166]
9-13-46	–	$C_{20}H_{24}O_7$	$CDCl_3$	[166]
9-13-47	–	$C_{21}H_{26}O_7$	$CDCl_3$	[166]
9-13-48	–	$C_{16}H_{20}O_6$	$CDCl_3$	[166]
9-13-49	–	$C_{19}H_{24}O_6$	$CDCl_3$	[167]
9-13-50	–	$C_{21}H_{26}O_7$	$CDCl_3$	[167]
9-13-51	–	$C_{22}H_{28}O_8$	$CDCl_3$	[167]
9-13-52	9*α*-acetyloxy-8*β*-angeloyloxy-14-hydroxyacanthospermolide	$C_{22}H_{28}O_7$	$CDCl_3$	[167]
9-13-53	9*α*-acetyloxy-14-hydroxy-8*β*-(2-methylbutanoyloxy)-acanthospermolide	$C_{22}H_{30}O_7$	$CDCl_3$	[167]
9-13-54	1(10)*E*-4*Z*-(7*S*,8*S*)-14-oxo-15-senecioyloxygermacra-1(10),4,11(13)-trien-8,12-olide	$C_{20}H_{24}O_5$	$CDCl_3$	[168]
9-13-55	1(10)*E*-4*Z*-(7*S*,8*S*)-14-oxo-15-isovaleroyloxygermacra-1(10),4,11(13)-trien-8,12-olide	$C_{20}H_{26}O_5$	$CDCl_3$	[168]



9-13-41



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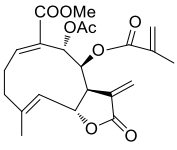

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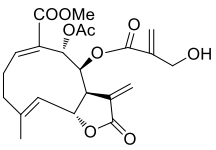

9-13-44

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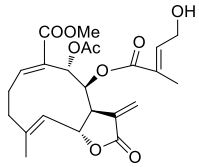

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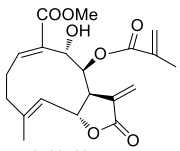
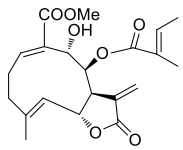


9-13-46



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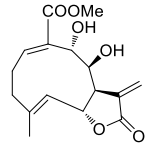

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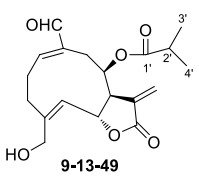

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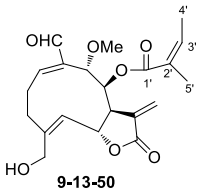

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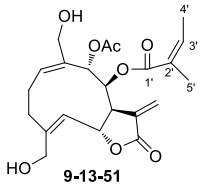
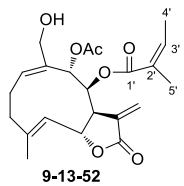


9-13-51



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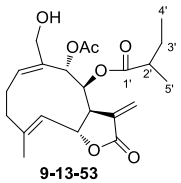

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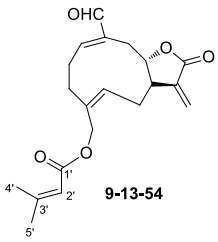
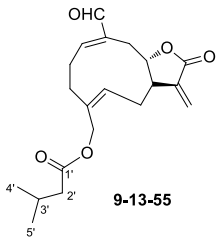


9-13-54



9-13-55

Table 9-13-13: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-41**~**9-13-45**.

H	9-13-41	9-13-42	9-13-43	9-13-44	9-13-45
1	7.00 dd(10.4, 7.6)	7.01 dd(10.0, 7.2)	7.00 dd(10.0, 7.2)	7.01 dd(10.0, 7.6)	7.00 dd(10.4, 7.6)
2	2.66 dddd (12.8, 12.8, 10.8, 2.0) 2.46 dddd (12.4, 7.6, 5.6, 1.6)	2.64 dddd (12.8, 12.8, 10.4, 2.0) 2.45 dddd (12.4, 8.0, 6.0, 2.0)	2.65 dddd (12.4, 12.4, 10.4, 2.0) 2.44 dddd (12.0, 8.0, 6.0, 2.0)	2.62 dddd (12.8, 12.8, 10.8, 2.0) 2.45 dddd (12.4, 8.0, 6.0, 2.0)	2.64 dddd (12.4, 12.4, 10.8, 2.0) 2.45 dddd (12.4, 8.0, 6.0, 2.0)
3	2.39 ddd (12.4, 5.6, 2.0) 2.03 br t (*ca.* 11.6)	2.39 ddd (12.0, 6.0, 2.0) 2.03 br t (*ca.* 12.0)	2.39 ddd (12.0, 6.0, 2.0) 2.03 br t (*ca.* 11.6)	2.38 ddd (13.0, 6.0, 2.0) 2.04 br t (*ca.* 11.8)	2.38 ddd (12.0, 5.6, 2.0) 2.03 br t (*ca.* 11.8)
5	4.95 br d(10.8)	4.95 br d(10.8)	4.96 br d(10.4)	4.96 br d(11.2)	4.96 br d(10.4)
6	5.10 t(10.4)	5.08 t(10.0)	5.11 t(10.0)	5.12 t(10.0)	5.12 t(10.0)
7	2.78 dddd (9.6, 3.2, 3.2, 1.2)	2.78 dddd (9.6, 3.2, 3.2, 1.2)	2.76 dddd (10.0, 3.2, 2.8, 1.2)	2.78 dddd (9.6, 3.6, 3.6, 1.2)	2.78 dddd (9.6, 3.2, 3.2, 1.2)
8	6.65 dd(8.4, 1.2)	6.64 dd(8.4, 1.2)	6.62 dd(8.8, 1.4)	6.64 dd(8.4, 1.4)	6.64 dd(8.4, 1.4)

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Table 9-13-13 (continued)

H	9-13-41	9-13-42	9-13-43	9-13-44	9-13-45
9	5.40 d(8.4)	5.41 d(8.4)	5.43 d(8.4)	5.46 d(8.4)	5.43 d(8.4)
13	6.25 d(3.2) 5.72 d(2.8)	6.29 d(3.6) 5.77 d(2.8)	6.26 d(3.2) 5.81 d(3.2)	6.27 d(3.6) 5.80 d(3.2)	6.25 d(3.6) 5.79 d(2.8)
15	1.99 s	1.99 s	1.89 s	1.94 s	1.93 s
3′	3.01 q(5.2)	3.52 d(11.2), 3.67 d(11.2)	5.57 t(1.6), 6.01 br s	5.86 d(1.2), 6.17 br s	6.74 td(6.0, 1.6)
4′	1.18 d(5.2)	1.37 s	1.93 s	4.28 br s	4.34 d(5.6)
5′	1.46 s				1.79 d(1.2)
OMe	3.80 s	3.80 s	3.79 s	3.80 s	3.80 s
OAc	1.99 s	1.98 s	2.03 s	2.02 s	2.01 s

Table 9-13-14: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-46**∼**9-13-50**.

H	9-13-46	9-13-47	9-13-48	9-13-49	9-13-50
1	6.84 dd(10.4, 7.2)	6.84 dd(10.4, 7.6)	6.80 dd(10.4, 7.6)	6.63 ddd(9.5, 7.0, 2.0)	6.82 dd(10.0, 7.5)
2	2.48 dddd (12.8, 7.2, 6.0, 2.0) 2.24 dddd (12.0, 12.8, 10.4, 2.0)	2.48 dddd (12.4, 7.2, 6.0, 2.0) 2.24 dddd (12.4, 12.8, 10.8, 2.0)	2.45 m 2.22 dddd(12.4, 12.8, 12.8, 2.0)	2.47 (ov) 2.42 (ov)	2.74 m 2.62 (ov)
3	2.35 ddd (12.0, 6.0, 2.0) 2.03 ddd (12.0, 12.0, 2.0)	2.35 ddd (12.0, 6.0, 2.0) 2.03 ddd (12.8, 12.0, 2.0)	2.33 ddd (12.0, 6.0, 2.0) 2.01 ddd (12.8, 12.8, 2.0)	*α* 2.04 ddd (12.5, 12.5, 2.0) *β* 2.83 ddd (12.5, 6.0, 2.5)	*α* 2.04 ddd (12.0, 12.0, 2.0) *β* 2.85 ddd (12.0, 5.5, 2.5)
5	4.94 br d(10.8)	4.95 br d(9.6)	4.90 br d(10.4)	5.16 br d(10.5)	5.03 br d(10.0)
6	5.09 t(10.0)	5.10 t(10.0)	5.17 t(10.0)	5.23 t(10.5)	5.20 t(10.0)
7	2.64 dddd (9.6, 3.2, 3.2, 1.6)	2.64 dddd (9.6, 3.2, 2.8, 1.6)	2.45 m	2.48 (ov)	2.63 (ov)
8	6.27 dd(8.4, 1.6)	6.28 dd(8.4, 1.6)	4.69 dd(8.0, 1.4)	6.36 ddd (10.0, 8.0, 2.0)	6.65 dd(8.5, 1.5)
9	4.00 t(ca9.0)	4.00 t(9.0)	3.82 m	*α* 2.75 ddd(14.0, 8.0, 2.0) *β* 2.06 ddd(14.0, 10.0, 1.5)	*β* 3.88 dd(8.5, 2.0)
13	5.66 d(3.2), 6.23 d(3.2)	5.66 d(3.2), 6.22 d(3.2)	5.57 d(3.2), 6.31 d(3.6)	5.58 d(3.0), 6.24 d(3.5)	5.87 d(3.0), 6.30 d(3.5)
14				9.46 d(1.5)	9.52 d(2.0)
15	1.89 s	1.90 br s	1.85 s	4.53 d(12.5) 4.32 br d(12.5)	4.47 br d(13.0) 4.37 br d(13.0)

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Table 9-13-14 (continued)

H	9-13-46	9-13-47	9-13-48	9-13-49	9-13-50
2′				2.53 sept(7.0)	
3′	5.61 t(1.6), 6.09 br s	6.84		1.12 d(7.0)	6.05 qq(7.0, 1.5)
4′	1.94 s	1.80 d(7.2)		1.14 d(7.0)	1.96 dq(7.0, 1.5)
5′		1.83 br s			1.88 dq(1.5, 1.5)
OMe	3.80 s	3.80 s	3.77 s		3.10 s

Table 9-13-15: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-51**~**9-13-55**.

H	9-13-51	9-13-52	9-13-53	9-13-54	9-13-55
1	5.80 dd(9.0, 8.0)	5.77 dd(9, 7.5)	5.75 br dd(8.5, 7.5)	6.60 br t(7.5)	6.66
2	2.34 m (ov), 2.42 m (ov)	2.3 (ov), 2.44 m	2.3 (ov), 2.44 m	2.4~2.8 m	2.4~2.8
3	*α* 1.90 ddd (12.5, 12.5, 2.5) *β* 2.69 ddd (12.5, 5.5, 2.5)	*α* 2.0 (ov) *β* 2.3 (ov)	*α* 2.0 (ov) *β* 2.3 (ov)	2.4~2.8 m	2.4~2.8
5	5.15 br d(10.0)	5.03 br d(10.5)	5.01 br d(10.5)	5.31 dd(11.0, 5.8)	5.35
6	5.35 t(10.0)	5.10 dd(10.5, 9)	5.10 dd(10.5, 9)	*α* 2.70 m *β* 2.15 (ov)	*α* 2.70 *β* 2.16 dt(13.0, 11.0)
7	3.35 dddd (10.0, 3.5, 3.0, 2.0)	3.31dddd (9.0, 3.5, 3.0, 2.0)	3.29 dddd (9.0, 3.5, 3.0, 2.0)	2.70 m	2.70
8	6.16 dd(9.5, 2.0)	6.16 dd(9.5, 2.0)	6.06 dd(9.5, 2.0)	3.99 m	3.99
9	*β* 5.53 d(9.5)	*β* 5.42 d(9.5)	*β* 5.35 d(9.5)	*α* 2.90 br d(15) *β* 2.50~2.60 (ov)	*α* 2.93 *β* 2.50~2.60
13	5.68 d(3.0), 6.24 d(3.5)	5.68 d(3.0) 6.24 d(3.5)	5.63 d(3.0) 6.24 d(3.5)	5.53 d(2.9) 6.23 d(3.3)	5.58 6.28
14	4.40 br d(12.5) 4.23 br d(12.5)	4.38 d(12.5) 4.21 br d(12.5)	4.37 br d(12.5) 4.19 d(12.5)	9.48 br s	9.53
15	4.49 br s 4.49 br s	1.97 br s	1.98 br s	4.59 br s 4.59 br s	4.58 4.58
2′			2.30 m	5.66 sept(1.3)	2.04~2.26 m
3′	6.11 qq(7.0, 1.5)	6.10 qq(6.0, 1.5)	1.39 m, 1.60 m		2.04~2.26 m
4′	1.95 dq(7.0, 1.5)	1.95 (ov)	0.86 t(7.5)	2.18 br d(1.3)	1.01 d(6.5)
5′	1.82 dq(1.5, 1.5)	1.82 dq(1.5, 1.5)	1.06 d(7.0)	1.92 br d(1.3)	1.01 d(6.5)
OAc	1.95 s	1.94 s	1.97 s		

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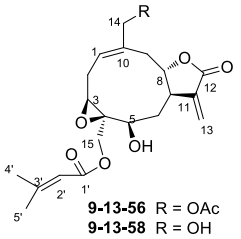
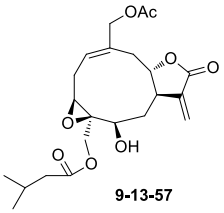
Table 9-13-16: Compounds, MFs, and test solvents of germacrane-type sesquiterpenoids **9-13-56**~**9-13-65**.

No.	Compounds	MFs	Test solvents	References
9-13-56	1(10)*E*-(3*S*,4*R*,5*R*,7*S*,8*S*)-14-acetyloxy-3,4-epoxy-5-hydroxy-15-senecioyloxygermacra-1(10),11(13)-dien-8,12-olide	$C_{22}H_{28}O_8$	$CDCl_3$	[168]
9-13-57	1(10)*E*-(3*S*,4*R*,5*R*,7*S*,8*S*)-14-acetyloxy-3,4-epoxy-5-hydroxy-15-isovaleroyloxygermacra-1(10),11(13)-dien-8,12-olide	$C_{22}H_{30}O_8$	$CDCl_3$	[168]
9-13-58	1(10)*E*-(3*S*,4*R*,5*R*,7*S*,8*S*)-3,4-epoxy-5,14-dihydroxy-15-senecioyloxygermacra-1(10),11(13)-dien-8,12-olide	$C_{22}H_{26}O_7$	$CDCl_3$	[168]
9-13-59	1(10)*E*-(4*R*,5*R*,7*S*,8*S*)-4,5-epoxy-14-oxo-15-senecioyloxygermacra-1(10),11(13)-dien-8,12-olide	$C_{20}H_{24}O_6$	$CDCl_3$	[168]
9-13-60	1(10)*E*-3*Z*-(5*R*,7*S*,8*S*)-14-acetyloxy-5-hydroxy-15-senecioyloxygermacra-1(10),3,11(13)-trien-8,12-olide	$C_{22}H_{28}O_7$	$CDCl_3$	[168]
9-13-61	1(10)*E*-3*Z*-(5*R*,7*S*,8*S*)-14-acetyloxy-5-hydroxy-15-isovaleroyloxygermacra-1(10),3,11(13)-trien-8,12-olide	$C_{22}H_{30}O_7$	$CDCl_3$	[168]
9-13-62	–	$C_{21}H_{26}O_7$	$CDCl_3$	[167]
9-13-63	15-acetyloxy-8*β*-angeloyloxy-14-oxo-(4*Z*)-acanthospermolide	$C_{22}H_{26}O_7$	$CDCl_3$	[167]
9-13-64	8*β*-acetyloxy-15-angeloyloxy-14-oxo-(4*Z*)-acanthospermolide	$C_{22}H_{26}O_7$	$CDCl_3$	[167]
9-13-65	9*α*-acetyloxy-8*β*-(2-methylbutanoyloxy)-14-oxo-(4*Z*)-acanthospermolide	$C_{22}H_{28}O_8$	$CDCl_3$	[167]



9-13-56 R = OAc
9-13-58 R = OH



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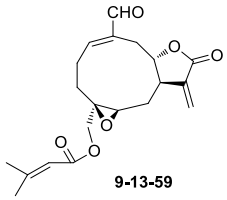

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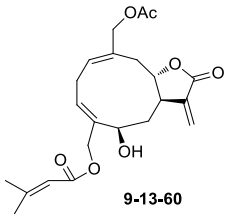
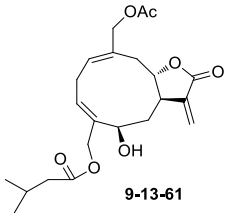


9-13-60



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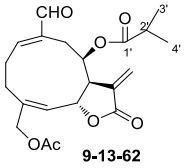

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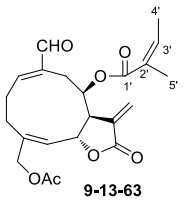

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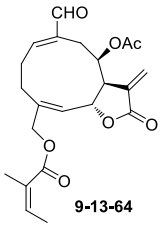

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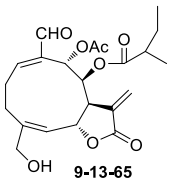

9-13-65

Table 9-13-17: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-56**~**9-13-60**.

H	9-13-56	9-13-57	9-13-58	9-13-59	9-13-60
1	5.89 m	5.87	5.88	6.69 ddd (11.6, 5.51, 1.4)	5.84 dd(9.5, 8.0)
2*α*	2.65 m	2.65	2.65	2.76~2.86 m	2.72 ddd(13.5, 8.0, 7.0)
2*β*	3.10 br q(11.2)	3.10	3.10	2.56~2.58 m	3.66 ddd(13.5, 9.5, 9.5)
3*α*	3.09	3.09	3.09	2.60~2.72 m	5.84 dd(9.5, 7.0)
3*β*				1.24~1.42 m	
5	4.64 br dd(3.6, 3.4)	4.63	4.63	2.76~2.86 m	4.82 br dd(6.3, 3.0)
6*α*	2.21 ddd(16, 3.4, 1.6)	2.20	2.20	2.32 ddd(13.2, 3.8, 2.2)	2.20 ddd(14.8, 3.0, 3.0)
6*β*	2.10 ddd(16, 10.7, 3.6)	2.10	2.10	1.24~1.42 m	1.98 ddd(14.8, 10.2, 6.3)
7	2.99 ddddd (10.7, 7.4, 3.6, 3.1, 1.6)	2.96	2.98	2.63 m	2.94 ddddd (10.2, 5.6, 3.6, 3.2, 3.0)
8	4.54 ddd(7.4, 4.3, 2.4)	4.53	4.52	4.49 ddd(10.0, 6.6, 2.5)	4.47 ddd(5.6, 5.2, 2.0)
9*α*	2.57 dd(15.1, 2.4)	2.56	2.57	2.94 dd(14.3, 10.0)	3.28 dd(15.4, 5.2)
9*β*	3.34 dd(15.1, 4.3)	3.33	3.30	2.82 dd(14.3, 2.5)	2.57 dd(15.4, 2.0)
13	6.31 d(3.6)	6.34	6.32	6.35 d(3.6)	6.26 d(3.6)
	5.58 d(3.1)	5.58	5.59	5.64 d(3.1)	5.52 d(3.2)
14	4.51 d(12.9)	4.50	4.06 br s	9.52 br s	4.50 br s
	4.42 d(12.9)	4.42			
15	4.30 d(12.6)	4.44	4.32	4.32 d(12.6)	4.56 d(12.1)
	3.87 d(12.6)	3.76	3.83	4.11 d(12.6)	4.42 d(12.1)
2′	5.65 hept(1.3)	2.04~2.26 m	5.65	5.74 sept(1.3)	5.65 sept(1.3)
3′		2.04~2.26 m			
4′	2.18 br d(1.3)	0.95 (6.5)	2.18	2.21 br d(1.3)	2.17 d(1.3)
5′	1.91 br d(1.3)	0.94 (6.5)	1.92	1.95 br d(1.3)	1.91 d(1.3)
OAc	2.03 s	2.03			2.03 s

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Table 9-13-18: ^{1}H NMR spectroscopic data of germacrane-type sesquiterpenoids **9-13-61**~**9-13-65**.

H	9-13-61	9-13-62	9-13-63	9-13-64	9-13-65
1	5.84	6.62 ddd (8.0, 7.0, 1.5)	6.63 ddd (8.5, 6.5, 1.5)	6.67 br t(6.5)	6.78 dd(9.0, 6.0)
2α	2.73	2.70 m (ov)	2.70 m (ov)	2.70 m (ov)	3.25 dddd(15.0, 8.0, 6.0, 2.0)
2β	3.67	2.85 dddd (15.0, 7.0, 4.0, 1.0)	2.85 dddd (15.0, 6.5, 4.0, 1.0)	2.85 dddd (15.0, 6.5, 4.0, 1.0)	2.80 m (ov)
3α	5.84	2.69 m (ov)	2.69 m (ov)	2.69 m (ov)	2.58 ddd(14.0, 8.0, 2.0)
3β		2.40 ddd(14.5, 7.5, 4.0)	2.40 ddd(14.5, 7.5, 4.0)	2.40 ddd(14.5, 7.5, 4.0)	2.99 ddd(14.0, 11.0, 8.0)
5	4.81	5.55 br d(9.5)	5.57 br d(9.5)	5.55 br d(9.5)	5.58 br d(9.5)
6	α 2.20, β1.98	5.46 dd(9.5, 4.0)	5.48 dd(9.5, 4.0)	5.41 dd(9.5, 4.0)	5.43 dd(9.5, 4.5)
7	2.94	2.64 dddd(4.0, 3.0, 2.5, 2.5)	2.67 dddd(4.0, 3.0, 2.5, 2.5)	2.75 dq(4.0, 3.0, 2.5, 1.5)	2.75 m (ov)
8	4.47	5.93 ddd(10.0, 7.0, 2.5)	5.98 ddd(10.0, 7.0, 2.5)	6.13 ddd(10.0, 7.0, 1.5)	6.53 dd(9.0, 2.5)
9α	3.25	3.07 br ddd(14.0, 7.0, 1.5)	3.07 br ddd(14.0, 7.0, 1.5)	3.07 br dd(14.0, 7.0)	5.80 dd(9.0, 2.0)
9β	2.58	2.40 ddd (14.0, 10.0, 1.5)	2.57 ddd (14.0, 10.0, 1.5)	2.57 ddd(14.0, 10.0, 2.0)	
13	6.27 5.53	6.35 d(3.0) 5.71 d(2.5)	6.36 d(3.0) 5.72 d(2.5)	6.40 d(3.0) 5.79 d(2.5)	6.41 d(3.0) 5.86 d(2.5)
14	4.52 d(12.4) 4.41 d(12.4)	9.41 d(1.5)	9.43 d(1.5)	9.45 d(2.0)	9.40 d(2.0)
15	4.55 4.45	4.49 s	4.53 dd(13.5, 1.5) 4.46 dd(13.5, 1.0)	4.49 s	4.08 s
2′	2.19 m	2.49 sept(7.0)			2.31 sext(7.0)
3′	2.10 m	1.12 d(7.0)	6.09 qq(7.0, 1.5)	6.15 (ov)	1.39 m, 1.60 m (ov)
4′	0.95 d(6.5)	1.09 d(7.0)	1.96 dq(7.0, 1.5)	1.96 dq(7.0, 1.5)	0.85 t(7.0)
5′	0.95 d(6.5)		1.81 dq(1.5, 1.5)	1.85 dq(1.5, 1.5)	1.05 d(7.0)
OAc	2.04	2.12 s	2.12 s	2.12 s	2.00 s

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9.14 Elemane-type sesquiterpenoids

Table 9-14-1: Compounds, MFs, and test solvents of elemane-type sesquiterpenoids **9-14-1**~**9-14-10**.

No.	Compounds	MFs	Test solvents	References
9-14-1	macrophyllilactone A	$C_{15}H_{20}O_3$	$CDCl_3$	[169]
9-14-2	macrophyllilactone B	$C_{15}H_{22}O_4$	$CDCl_3$	[169]
9-14-3	macrophyllilactone C	$C_{15}H_{22}O_4$	$CDCl_3$	[169]
9-14-4	macrophyllilactone D	$C_{15}H_{22}O_4$	$CDCl_3$	[169]
9-14-5	3,4-epoxy-5-*epi*-elemasteriractinolide	$C_{15}H_{20}O_3$	$CDCl_3$	[170]
9-14-6	3,4-epoxy-5,10-*epi*-elemasteriractinolide	$C_{15}H_{20}O_3$	$CDCl_3$	[170]
9-14-7	3,4-epoxy-11α,13-dihydroelemen-12,8-olide	$C_{15}H_{22}O_3$	$CDCl_3$	[170]
9-14-8	–	$C_{20}H_{30}O_4$	$CDCl_3$	[171]
9-14-9	chlorantene F	$C_{15}H_{16}O_3$	$CDCl_3$	[172]
9-14-10	(–)-*cis*-β-elemene	$C_{15}H_{24}$	C_6D_6	[173]

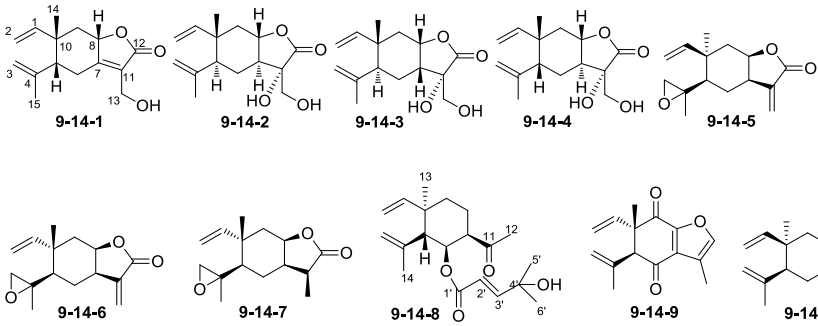

Table 9-14-2: ^{1}H NMR spectroscopic data of elemane-type sesquiterpenoids **9-14-1**~**9-14-5**.

H	9-14-1	9-14-2	9-14-3	9-14-4	9-14-5
1	5.74 dd(17.2, 10.8)	5.72 dd(17.6, 10.8)	5.84 dd(17.6, 10.9)	5.83 dd(17.6, 10.7)	5.73 dd(17.5, 10.8)
2	4.96 d(10.8) 5.02 d(17.2)	4.97 d(10.8) 5.00 d(17.6)	4.89 d(10.9) 4.95 d(17.6)	4.97 d(10.7) 5.00 d(17.6)	5.02 d(17.5) 5.00 d(10.8)
3	4.73 br s 5.00 br s	4.59 br s 4.88 br s	4.66 br s 4.95 br s	4.69 br s 4.92 br s	2.60 br s
5	2.12 dd(13.6, 4.0)	1.95 dd(13.6, 4.0)	2.55 dd(13.9, 4.6)	2.05 dd(9.5, 4.6)	1.07 dd(12.4, 4.1)
6	α 2.59 dd(14.4, 13.6) β 2.83 dd(14.4, 4.0)	α 1.46 m β 1.50 m	α 1.82 m β 1.86 m	α 1.79 m β 1.81 m	2.31 m

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Table 9-14-2 (continued)

H	9-14-1	9-14-2	9-14-3	9-14-4	9-14-5
7		2.34 m	2.84 m	2.42 m	3.31 m
8	4.89 dd(11.7, 6.1)	5.02 ddd(11.7, 12.0, 1.9)	4.78 ddd(12.0, 6.1, 5.6)	4.91 ddd(12.1, 10.2, 6.0)	4.78 m
9	*α* 1.42 dd(12.4, 11.7)	*α* 1.42 dd(16.0, 12.0)	*α* 1.87 dd(12.2, 12.0)	*α* 1.80 dd(12.3, 12.1)	1.96 dd(13.2, 13.2)
	β 2.26 dd(12.4, 6.1)	*β* 2.09 dd(16.0, 1.9)	*β* 1.98 dd(12.0, 5.6)	*β* 1.94 dd(12.3, 6.0)	1.86 dd(13.2, 5.8)
13	4.40 br s	3.73 d(12.0) 4.06 d(12.0)	3.64 d(11.6) 3.70 d(11.6)	3.71 d(12.0) 3.99 d(12.0)	6.32 d(3.1) 5.61 d(3.1)
14	1.18 s	1.03 s	1.03 s	1.02 s	1.15 s
15	1.76 s	1.71 s	1.72 s	1.75 s	1.25 s
OH		3.23 br d(11.4, 13-OH) 3.69 br s(11-OH)	2.98 br d(11.2, 13-OH) 3.90 br s(11-OH)	3.01 br d(11.2-13-OH) 3.88 br s(11-OH)	

Table 9-14-3: ^{1}H NMR spectroscopic data of elemane-type sesquiterpenoids **9-14-6**~**9-14-10**.

H	9-14-6	9-14-7	9-14-8	9-14-9	9-14-10
1	5.76 dd(17.5, 10.8)	6.04 dd(17.5, 10.8)	5.83 dd(11.0, 17.2)	5.81 dd(17.4, 10.6)	6.29 dd(11.0, 17.3)
2	5.08 d(10.8)	5.02 d(17.5)	*α* 4.91 dd(1.1, 17.2)	5.13 dd(17.4, 8.3)	5.01 ddd(1.3, 6.0, 11.0)
	5.06 d(17.6)	4.98 d(10.8)	*β* 4.90 dd(1.1, 11.0)	5.09 dd(10.6, 8.3)	
3	2.69 d(4.5)	2.60 d(4.5)	*α* 4.62 br s	4.82 s	4.75 s
	2.63 d((4.5)	2.53 d(4.5)	*β* 4.90 br s	5.01 s	4.87 s
5	1.14 dd(13.2, 2.6)	1.19~1.42 m	2.92 d(11.3)	3.52 s	1.94 dd(3.5, 12.0)
6	2.00 ddd(13.6, 7.5, 2.6)	1.65 m	5.28 dd(5.6, 11.3)		1.58~1.64 m
	1.62~1.72 m	1.19~1.42 m			
7	3.02 m	2.62 m	3.35 m		1.87~1.92 m
8	4.53 m	4.64 m	1.86 m		1.49~1.54 m
9	1.95 dd(15.2, 3.6)	2.03 dd(15.3, 4.4)	*α* 1.23 m		1.27 dt(5.04, 12.9)
	1.62~1.72 m	1.77 dd(15.3, 14.1)	*β* 1.87 m		1.58~1.64 m
11		2.78 dq(7.4, 7.4)			
12			2.11 s	7.46 q(1.0)	1.67 s
13	6.20 d(0.9) 5.63 d(0.7)	1.22 d(7.4)	1.05 s	2.24 d(1.0)	4.71 d(6.0)
14	1.20 s	1.17 s	1.68 s	1.62 s	1.05 s
15	1.22 s	1.36 s		1.33 s	1.66 s

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Table 9-14-3 (continued)

H	9-14-6	9-14-7	9-14-8	9-14-9	9-14-10
2′			5.93 d(15.7)		
3′			6.97 d(15.7)		
5′			1.35 s		
6′			1.35 s		

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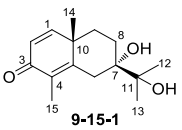
9.15 Eudesmane-, lindenane-, and oppositane-type sesquiterpenoids

Table 9-15-1: Compounds, MFs, and test solvents of eudesmane-type sesquiterpenoids **9-15-1**~**9-15-15**.

No.	Compounds	MFs	Test solvents	References
9-15-1	canusesnol A	$C_{15}H_{22}O_3$	CD_3OD	[174]
9-15-2	canusesnol B	$C_{15}H_{24}O_4$	CD_3OD	[174]
9-15-3	canusesnol C	$C_{15}H_{24}O_4$	CD_3OD	[174]
9-15-4	canusesnol D	$C_{15}H_{26}O_3$	CD_3OD	[174]
9-15-5	canusesnol E	$C_{15}H_{24}O_3$	CD_3OD	[174]
9-15-6	chlorantene B	$C_{15}H_{19}NO_5$	$CDCl_3$	[175]
9-15-7	chlorantene C	$C_{15}H_{18}O_4$	$CDCl_3$	[175]
9-15-8	4α-hydroxy-8,12-epoxyeudesma-7,11-diene-1,6-dione	$C_{15}H_{18}O_4$	$CDCl_3$	[175]
9-15-9	chlorantene D	$C_{15}H_{16}O_4$	CD_3COCD_3	[175]
9-15-10	chlorantene G	$C_{15}H_{24}O_2$	$CDCl_3$	[175]
9-15-11	(–)-(7*S*,10*S*)-7-hydroxyeudesm-4-en-6-one	$C_{15}H_{24}O_2$	C_6D_6	[176]
9-15-12	(–)-(7*R*,10*S*)-eudesm-4-en-6-one	$C_{15}H_{24}O$	C_6D_6	[176]
9-15-13	halichonadin B	$C_{17}H_{29}NO_2$	C_5D_5N	[177]
9-15-14	halichonadin C	$C_{16}H_{25}N$	$CDCl_3$	[177]
9-15-15	halichonadin D	$C_{15}H_{27}N$	C_5D_5N	[177]



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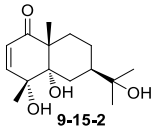

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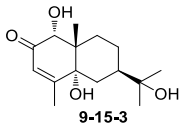

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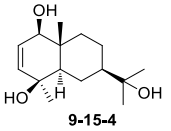

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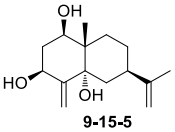

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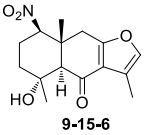

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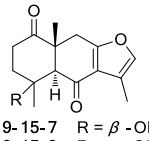
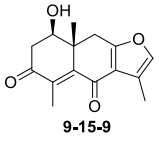


9-15-7 R = β-OH
9-15-8 R = α-OH



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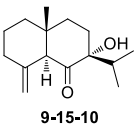

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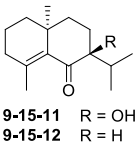
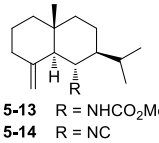


9-15-11 R = OH
9-15-12 R = H



9-15-13 R = $NHCO_2Me$
9-15-14 R = NC
9-15-15 R = NH_2

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Table 9-15-2: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-1**~**9-15-5**.

H	9-15-1	9-15-2	9-15-3	9-15-4	9-15-5
1	6.97 d(9.7)		4.45 s	3.44 d(5.6)	4.02 dd(11.8, 4.8)
2	6.21 d(9.7)	5.78 d(10.3)		5.82 dd(5.6, 9.9)	1.52 m, 2.14 m
3		6.42 d(10.3)	5.91 s	5.69 d(9.9)	4.63 dd(6.1, 11.6)
5				1.66 m	
6	*α* 3.00 d(14.4)	*α* 1.59 m	*α* 2.07 br d(*ca.* 13)	1.85 m	1.81 m
	β 2.53 d(14.4)	*β*1.86 m	*β* 1.55 br t(*ca.* 13)	1.30 m	1.65 m
7		1.84 m	1.08 m	1.36 m	2.53 m
8	*α* 1.68 m	1.71 m	1.58 m	1.71 m	1.61 m
	β 2.09 ddd(14.0, 14.0, 4.7)	1.30 m	1.23 m		1.39 m
9	1.76 m, 1.65 m	2.02 m, 1.62 m	1.20 m	*α* 1.79 m, *β* 1.22 m	1.75 m, 1.65 m
12	1.30 s	1.20 s	1.17 s	1.20 s	1.77 s
13	1.30 s	1.19 s	1.17 s	1.20 s	4.75 s, 4.72 s
14	1.25 s	1.22 s	1.26 s	0.94 s	0.76 s
15	1.91 s	1.44 s		1.25 s	5.19 s, 4.78 s

Table 9-15-3: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-6**~**9-15-10**.

H	9-15-6	9-15-7	9-15-8	9-15-9	9-15-10
1	4.63 dd(12.6, 4.0)			4.19 dd(11.3, 5.9)	1.58 m
2	2.30 m	3.09 ddd(14.1, 14.1, 5.5)	2.75 ddd(15.2, 14.7, 6.0)	2.70 dd(16.2, 11.3)	1.60 m
	2.13 m	2.20 ddd(14.1, 5.6, 3.6)	2.47 ddd(15.2, 4.6, 2.9)	2.65 dd(16.2, 5.9)	
3	1.91 ddd(13.8, 7.2, 3.6)	2.14 ddd(13.3, 5.5, 3.6)	2.04 ddd(13.4, 6.0, 2.9)		2.22 m
	1.62 ddd(14.3, 13.8, 4.1)	1.74 ddd(14.1, 13.3, 5.6)	1.92 ddd(14.7, 13.4, 4.6)		1.94 m
5	2.64 s	2.78 s	2.91 s		3.80 s
8					1.89 m, 1.69 m
9	3.10 d(17.1)	3.14 d(17.9)	3.09 d(17.7)	3.19 d(17.6)	1.98 m
	2.97 d(17.1)	2.77 d(17.9)	2.96 d(17.7)	3.04 d(17.6)	1.39 m
11					2.18 m
12	7.12 br s	7.09 br s	7.14 br s	7.39 br s	0.91 d(6.7)
13	2.19 d(1.1)	2.16 d(1.0)	2.21 d(1.3)	2.21 s	0.88 d(6.7)
14	1.10 s	1.39 s	1.28 s	1.28 s	0.73 s
15	1.54 s	1.50 s	1.74 s	2.03 s	5.77 s, 4.99 s

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Table 9-15-4: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-11**~**9-15-15**.

H	9-15-11	9-15-12	9-15-13	9-15-14	9-15-15
1	1.24 m, 1.31 m	1.26 m, 1.35 m	α 1.16 m, β 1.31 m	α 1.27 m, β 1.46 m	α 1.17 m, β 1.28 m
2	1.33 m, 1.41 m	1.38 m, 1.43 m	1.48 m	α 1.60 m, β 1.57 m	1.47 m
3	1.77 m	1.77 m	α 1.78 dd(12.4, 5.6)	α 1.97 ddd(13.0, 5.7, 5.7)	1.82 m
			β 2.22 m	β 2.33 ddd(13.0, 1.9, 1.9)	2.17 m
5			2.01 d(11.2)	2.05 d(11.0)	2.34 d(11.1)
6			3.93 br dd(11.2, 11.2)	3.93 t(11.0)	3.62 t(11.1)
7		1.91 ddd(4.4, 6.5, 12.3)	1.33 m	1.49 m	2.18 d(10.9)
8	1.59 m, 1.74 m	1.55 m, 1.59 m	1.38 m	α 1.49 m, β 1.21 m	α 1.45 m, β 1.25 m
9	1.23 m, 1.82 m	1.44 m	α 1.12 m, β 1.39 m	α 1.22 m, β 1.47 m	α 1.29 m, β 1.37 m
11	2.36 m	2.50 dqq(4.4, 6.9, 6.9)	2.24 m	2.27 m	2.74 m
12	0.96 d(7.0)	0.95 d(6.9)	1.06 d(6.8)	0.95 d(7.1)	1.03 d(4.5)
13	0.97 d(6.3)	0.97 d(6.9)	0.87 d(7.1)	0.83 d(6.9)	0.99 d(4.6)
14	0.83 s	0.85 s	0.75 s	0.66 s	0.67 s
15	1.82 s	1.75 s	4.94 br s, 5.16 br s	4.63 br s, 4.99 br s	5.06 br s, 5.08 br s
OMe			3.67 s		
NH			5.72 m		

Table 9-15-5: Compounds, MFs, and test solvents of eudesmane-type sesquiterpenoids **9-15-16**~**9-15-40**.

No.	Compounds	MFs	Test solvents	References
9-15-16	tubipolide A	$C_{17}H_{20}O_4$	$CDCl_3$	[178]
9-15-17	tubipolide B	$C_{15}H_{18}O_2$	$CDCl_3$	[178]
9-15-18	tubipolide C	$C_{17}H_{20}O_5$	$CDCl_3$	[178]
9-15-19	tubipolide D	$C_{15}H_{18}O_3$	$CDCl_3$	[178]
9-15-20	tubipolide E	$C_{15}H_{18}O_4$	$CDCl_3$	[178]
9-15-21	tubipolide F	$C_{15}H_{16}O_3$	$CDCl_3$	[178]
9-15-22	tubipolide G	$C_{17}H_{18}O_4$	$CDCl_3$	[178]
9-15-23	(1β,6α)-1,6,14-trihydroxyeudesm-3-en-12-oic acid γ-lactone	$C_{15}H_{22}O_4$	C_5D_5N	[179]

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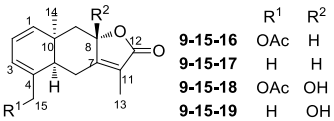
Table 9-15-5 (continued)

No.	Compounds	MFs	Test solvents	References
9-15-24	(1*β*,6*α*)-1,6,14-trihydroxyeudesma-3,11(13)-dien-12-oic acid *γ*-lactone	$C_{15}H_{20}O_4$	C_5D_5N	[179]
9-15-25	(1*S*,4*S*,5*S*,6*S*,7*S*,10*R*)-1-hydroxy-15-acetoxyeudesm-11(13)-en-6,12-olide	$C_{17}H_{24}O_5$	$CDCl_3$	[180]
9-15-26	(1*S*,4*S*,5*S*,6*S*,7*S*,10*R*)-1,4-dihydroxy-15-acetoxyeudesm-11(13)-en-6,12-olide	$C_{17}H_{24}O_6$	$CDCl_3$	[180]
9-15-27	(1*R*,4*S*,5*S*,6*S*,7*S*,10*R*)-1,4-dihydroxy-15-acetoxyeudesm-11(13)-en-6,12-olide	$C_{17}H_{24}O_6$	$CDCl_3$	[180]
9-15-28	(1*R*,4*S*,5*S*,6*S*,7*S*,10*R*)-1-hydroxy-4,15-diacetoxyeudesm-11(13)-en-6,12-olide	$C_{19}H_{26}O_7$	$CDCl_3$	[180]
9-15-29	(1*S*,4*R*,5*S*,6*S*,7*S*,10*R*)-1,15-diacetoxy-4-hydroxyeudesm-11(13)-en-6,12-olide	$C_{19}H_{26}O_7$	$CDCl_3$	[180]
9-15-30	(1*S*,5*S*,6*S*,7*S*,10*R*)-1-hydroxy-15-acetoxyeudesma-4(15),11(13)-dien-6,12-olide	$C_{17}H_{22}O_5$	$CDCl_3$	[180]
9-15-31	1*β*,2*β*-epoxy-3*β*-senecioyloxy-5*βH*,6*αH*,7*αH*,10*α*Me-eudesma-4(15),11(13)-dien-6,12-olide	$C_{20}H_{24}O_5$	$CDCl_3$	[181]
9-15-32	–	$C_{20}H_{26}O_5$	$CDCl_3$	[181]
9-15-33	1*β*,2*β*:11*α*,13-diepoxy-3*β*-senecioyloxy-5*βH*,6*αH*,7*αH*,10*α*Me-eudesm-4(15)-en-6,12-olide	$C_{20}H_{24}O_6$	$CDCl_3$	[181]
9-15-34	1*β*,2*β*-epoxy-3*β*-senecioyloxy-5*βH*,6*αH*,7*αH*,10*α*Me,11*α*Me-eudesm-4(15)-en-6,12-olide	$C_{20}H_{26}O_5$	C_6D_6	[181]
9-15-35	3*β*-angeloyloxy-1*β*,2*β*-epoxy-5*βH*,6*αH*,7*αH*,10*α*Me,11*R*Me-eudesm-4(15)-en-6,12-olide	$C_{20}H_{26}O_5$	C_6D_6	[181]
9-15-36	1*β*,2*β*-epoxy-3*β*-(3-methylbutanoyloxy)-5*βH*,6*αH*,7*αH*,10*α*Me,11*α*Me-eudesm-4(15)-en-6,12-olide	$C_{20}H_{28}O_5$	C_6D_6	[181]
9-15-37	11*α*-angeloyloxy-1*β*,2*β*-epoxy-3*β*-sene cioyloxy-5*βH*,6*αH*,7*αH*,10*α*Me-eudesm-4(15)-en-6,12-olide	$C_{25}H_{32}O_7$	$CDCl_3$	[181]
9-15-38	–	$C_{25}H_{32}O_7$	$CDCl_3$	[181]
9-15-39	–	$C_{25}H_{34}O_7$	$CDCl_3$	[181]
9-15-40	8*α*-(2′,3′-epoxy-2′-methylbutyryloxy)-4*α*-hydroxy-9-oxo-5*βH*-eudesm-1,11(13)-dien-6*β*,12-olide	$C_{20}H_{24}O_7$	$CDCl_3$	[182]



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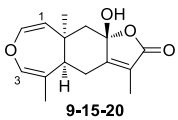
9-15-17	H	H
9-15-18	OAc	OH
9-15-19	H	OH



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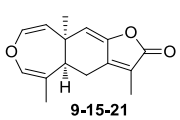

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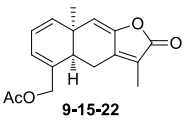

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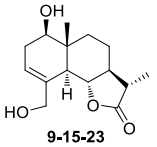

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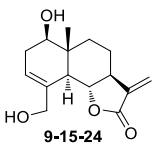

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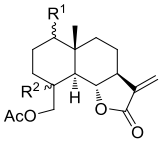
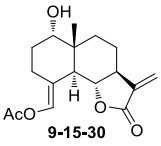


	R^1	R^2
9-15-25	α-OH	α-H
9-15-26	α-OH	β-OH
9-15-27	β-OH	β-OH
9-15-28	β-OH	β-OAc
9-15-29	α-OAc	α-OH



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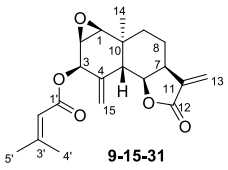

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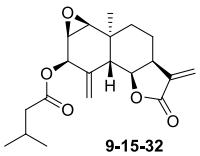

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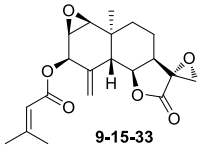

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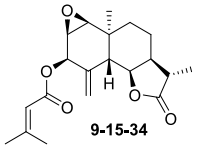

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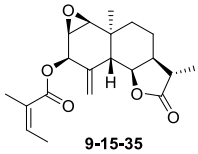

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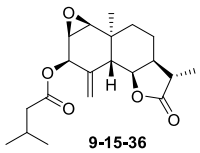

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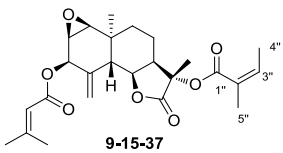

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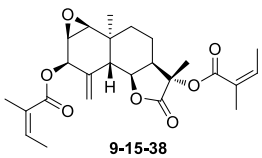

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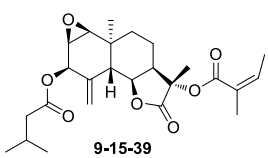
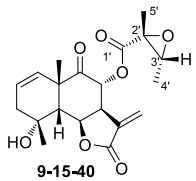


9-15-39



9-15-40

Table 9-15-6: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-16**~**9-15-20**.

H	9-15-16	9-15-17	9-15-18	9-15-19	9-15-20
1	5.66 d(9.0)	5.49 d(9.6)	5.83 d(9.5)	5.64 d(9.6)	4.70 dd(7.8, 1.8)
2	6.02 dd(9.0, 5.2)	5.95 dd(9.6, 5.2)	5.87 dd(9.5, 5.0)	5.85 dd(9.3, 5.1)	6.14 d(7.8)
3	6.00 br d(5.2)	5.71 br d(5.2)	5.96 d(5.0)	5.70 br d(5.1)	6.24 br s
5	1.89 dd(13.2, 4.8)	1.73 dd(13.4, 4.8)	1.86 dd(13.5, 4.0)	1.72 dd(15.2, 4.5)	1.78 m

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Table 9-15-6 (continued)

H	9-15-16	9-15-17	9-15-18	9-15-19	9-15-20
6*α*	2.85 dd(13.2, 4.8)	2.80 dd(13.4, 4.8)	2.65 dd(13.5, 4.0)	2.65 dd(15.2, 4.5)	2.72 m
6*β*	2.11 t(13.2)	2.03 t(13.4)	2.37 t(13.5)	2.33 t(15.2)	
8	4.66 m	4.67 dd(12.6, 6.0)			
9	1.25 t(12.6)	1.22 t(12.6)	1.59 d(13.8)	1.60 d(14.1)	1.49 d(14.1)
	2.47 dd(12.6, 5.7)	2.43 dd(12.6, 6.0)	2.50 d(13.8)	2.47 d(14.1)	2.38 d(14.1)
13	1.82 br s	1.84 br s	1.79 br s	1.85 br s	1.87 br s
14	0.98 s	0.99 s	0.96 s	1.00 s	1.24 s
15	4.66 m	1.86 br s	4.58 d(13.0)	1.87 br s	1.74 br s
			4.64 d(13.0)		
OAc	2.12 s		2.06 s		

Table 9-15-7: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-21**~**9-15-25**.

H	9-15-21	9-15-22	9-15-23	9-15-24	9-15-25
1	4.47 dd(7.8, 1.2)	5.54 d(9.0)	3.88 dd(6.8, 9.6)	3.88 dd(6.8, 9.6)	3.50 br dd(3.8, 2.4)
2	6.06 d(7.8)	5.93 dd(9.0, 5.1)	2.39 m, 2.64 m	2.59 m, 2.64 m	*α* 1.58 m, *β* 1.92 m
3	6.25 br s	5.98 br d(5.1)	6.14 br s	6.14 br s	*α* 1.88 m, *β* 1.60 m
4					2.41 m
5	2.26 dd(13.5, 4.0)	2.25 dd(16.5, 4.3)	2.39 d(10.4)	2.39 d(10.4)	2.35 dd(11.5, 5.2)
6	*α* 2.74 t(13.5)	*α* 2.78 dd(16.5, 4.3)	4.16 dd(10.4, 10.4)	4.11 dd(10.0, 10.4)	3.94 dd(11.5, 10.6)
	β 2.82 dd(13.5, 4.0)	*β* 2.45 t(16.5)			
7			1.47 m	2.50 m	2.48 m
8			1.47 m, 1.68 m	1.51 m, 1.81 m	*α* 2.05 m, *β* 1.58 m
9	5.65 s	5.54 s	1.33 m, 1.47 m	1.33 m, 1.47 m	*α* 2.00 m, *β* 1.24 m
11			2.32 m		
13	1.91 br s	1.88 br s	1.15 d(7.2)	5.31 d(2.4), 6.10 d(2.4)	5.40 d(3.3), 6.06 d(3.0)
14	1.39 s	1.11 s	1.10 s	1.07 s	0.97 s
15	1.75 br s	4.60 d(13.2)	4.60 dd(14.4, 6.8)	4.60 dd(14.4, 6.8)	4.32 t(10.4)
		4.71 d(13.2)			4.03 br dd(10.4, 3.5)
OAc					2.06 s

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Table 9-15-8: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-26**~**9-15-30**.

H	9-15-26	9-15-27	9-15-28	9-15-29	9-15-30
1	3.48 dd(5.7, 6.3)	3.36 dd(11.4, 3.9)	3.43 dd(7.4, 6.7)	4.69 dd(2.7, 2.1)	3.50 t(2.7)
2*α*	1.56 m	1.67 m	1.65~1.78 m	1.74~1.86 m	1.70 dddd(13.8, 5.8, 2.7, 2.0)
2*β*	2.18 dddd(15.0, 13.5, 5.1, 2.5)	1.91 m			1.87 tdd(13.8, 5.0, 2.5)
3*α*	1.85 ddd(14.7, 13.0, 4.8)	1.52 m	1.63 m		2.05 m
3*β*	1.54 m	1.80 m	2.87 dt(14.5, 3.3)		2.73 ddd(13.8, 5.0, 2.0)
5	2.06 d(11.0)	1.53 d(11.0)	1.87 d(11.0)	2.41 d(12.0)	2.87 br d(11.0)
6	4.23 t(11.0)	4.27 t(11.0)	4.25 t(11.0)	4.13 dd(12.0, 11.0)	4.00 t(11.0)
7	2.52 ddtd(11.8, 11.0, 3.3, 3.0)	2.51 tddd(11.0, 3.5, 3.3, 3.0)	2.53 tddd(11.2, 4.2, 3.3, 3.0)	2.54 tddd(11.0, 4.2, 3.3, 3.0)	2.58 tddd(11.0, 4.3, 3.3, 3.0)
8*α*	2.06 m	2.05 m	2.07 m	2.11 m	2.08 m
8*β*	1.67 m	1.61 m	1.60 m	1.61 m	1.59 m
9*α*	1.99 m	1.27 m	1.34 br ddd(12.8, 12.8, 3.8)	1.74 ddd(12.6, 11.0, 3.3)	2.09 m
9*β*	1.25 m	2.05 m	2.09 m	1.37 dt(12.6, 2.7)	1.37 ddd(12.8, 3.6, 2.0)
13	6.06 d(3.3) 5.39 d(3.0)	6.08 d(3.3) 5.42 d(3.0)	6.10 d(3.3) 5.43 d(3.0)	6.14 d(3.3) 5.47 d(3.0)	6.08 d(3.3) 5.40 d(3.0)
14	1.18 s	1.17 s	1.11 s	1.11 s	0.86 s
15	4.67 d(11.7) 4.03 d(11.7)	4.66 d(11.7) 4.01 d(11.7)	4.89 d(11.0) 4.39 d(11.0)	4.39 d(12.0) 4.32 d(12.0)	6.98 t(1.8)
OAc	2.09 s	2.09 s	2.04 s, 2.05 s	2.12 s, 2.11 s	2.14 s

Table 9-15-9: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-31**~**9-15-35**.

H	9-15-31	9-15-32	9-15-33	9-15-34	9-15-35
1	2.88 d(3.9)	2.88 d(3.8)	2.92 d(3.9)	2.33 d(3.8)	2.26 d(3.9)
2	3.46 dd(3.9, 4.2)	3.42 dd(4.0, 3.8)	3.51 dd(4.2, 3.9)	3.34 dd(4.2, 3.8)	3.23 dd(4.2, 3.9)
3	5.69 d(4.2)	5.60 d(4.0)	5.66 d(4.2)	5.63 d(3.8)	5.53 d(4.2)
5	2.23 d(10.2)	2.23 m	2.37 d(11.2)	2.50 d(11.0)	2.38 d(11.0)
6	4.83 dd(10.4, 7.7)	4.81 dd(10.6, 7.7)	4.96 dd(11.2, 7.8)	4.05 dd(11.0, 6.5)	3.98 dd(11.0, 7.0)
7	3.30 m	3.30 m	3.13 m	1.57 m	1.53 m
8	2.10 m	2.10 m	1.87 m	1.06 m, 1.20 m	1.05 m, 1.13 m

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Table 9-15-9 (continued)

H	9-15-31	9-15-32	9-15-33	9-15-34	9-15-35
9*α*	1.49 ddd(14.3, 4.6, 3.1)	1.48 ddd(13.1, 4.4, 2.7)	1.60 m	0.88 ddd(13.4, 4.7, 2.0)	0.86 m
9*β*	1.78 dt(13.2, 5.5)	1.78 dt(13.2, 5.5)	1.72 dt(14.9, 5.6)	1.44 dt(13.4, 4.7)	1.40 m
11				1.80 m	1.83 m
13	6.31 dd(3.6, 0.6) 5.56 d(3.6)	6.31 d(3.6) 5.56 d(3.6)	3.26 dd(6.5, 0.7) 3.10 dd(6.5, 0.7)	0.82 d(7.0)	0.80 d(6.8)
14	0.87 s	0.87 s	0.91 s	0.29 s	0.23 s
15	5.40 dd(1.8, 0.7) 5.23 d(1.8)	5.25 d(1.8), 5.38 d(1.8)	5.47 dd(2.0, 0.7) 5.26 d(2.0)	5.08 d(1.8), 29 d(1.8)	5.19 d(1.6) 4.97 d(1.6)
2′	5.73 m	2.23 d(7.0) 2-H	5.75 m	5.70 m	
3′		2.07 m			5.52 qq(7.4, 1.7)
4′	2.15 d(1.5)	0.95 d(6.6)	2.17 d(1.5)	2.10 s	1.96 dq(7.4, 1.7)
5′	1.88 d(1.5)	0.95 d(6.6)	1.90 d(1.5)	1.30 s	1.82 m

Table 9-15-10: ^{1}H NMR spectroscopic data of eudesmane-type sesquiterpenoids **9-15-36**~**9-15-40**.

H	9-15-36	9-15-37	9-15-38	9-15-39	9-15-40
1	2.33 d(3.7)	2.90 d(3.9)	2.91 d(3.9)	2.90 d(3.9)	5.75 ddd(10.2, 1.5, 1.5)
2	3.21 dd(4.4, 3.7)	3.48 dd(4.0, 3.9)	3.54 dd(4.0, 3.9)	3.48 dd(4.0, 4.0)	5.70 ddd(10.2, 3.5, 3.5)
3	5.58 d(4.4)	5.60 d(4.0)	5.60 d(4.0)	5.89 d(4.0)	*α* 2.29 ddd(18.2, 3.5, 1.5) *β* 2.20 ddd(18.2, 3.5, 1.5)
5	2.44 d(11.0)	2.44 d(12.2)	2.46 d(12.2)	2.41 d(11.4)	2.64 d(5.1)
6	4.02 dd(11.0, 7.3)	4.97 dd(12.2, 9.2)	4.97 dd(12.2, 9.2)	4.96 dd(11.4, 9.3)	4.90 dd(5.1, 7.0)
7	1.57 m	3.36 m	3.38 m	3.37 m	3.42 dddd(11.9, 7.0, 1.7, 1.5)
8	*α* 1.17 dddd (14.7, 6.1, 4.9, 2.0) *β* 1.06 ddt (14.7, 4.9, 2.0)	1.95 m	1.80 m	1.80 m	5.45 d(11.9)
9*α*	0.88 ddd (13.4, 4.0, 2.0)	1.92 dt(14.7, 6.5)	1.90 dt(14.7, 6.5)	1.78 m	
9*β*	1.44 dt(13.4, 4.9)	1.55 m	1.57 m	1.51 m	
11	1.80 m				
13	0.82 d(6.8)	1.61 s	1.61 s	1.61 s	5.84 d(1.5), 6.36 d(1.7)
14	0.28 s	0.85 s	0.85 s	0.85 s	1.59 s

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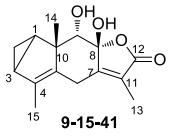
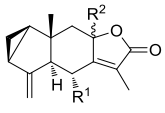
Table 9-15-10 (continued)

H	9-15-36	9-15-37	9-15-38	9-15-39	9-15-40
15	5.31 d(1.6)	5.41 d(1.8)	5.41 d(1.8)	5.41 d(1.3)	1.26 s
	5.08 d(1.6)	5.28 d(1.8)	5.28 d(1.8)	5.29 d(1.3)	
2′	2.04 d(7.3)	5.74 m		2.24 d(7.0)	
3′	2.10 m		6.18 qq(7.4, 1.5)	2.10 m	3.11 q(5.4)
4′	0.82 d(7.3)	2.15 d(1.7)	1.95 dq(7.4, 1.5)	0.95 d(6.6)	1.37 d(5.4)
5′	0.83 d(7.3)	1.88 d(1.7)	1.87 m	0.95 d(6.6)	1.63 s
3″		6.15 qq(7.3, 1.3)	6.10 qq(7.2, 1.5)	6.15 qq(7.4, 1.5)	
4″		1.98 dq(7.3, 1.3)	1.98 dq(7.2, 1.5)	1.98 dq(7.4, 1.5)	
5″		1.86 m	1.89 m	1.87 m	

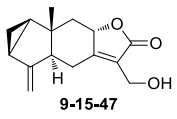
Table 9-15-11: Compounds, MFs, and test solvents of lindenane-type sesquiterpenoids **9-15-41**~**9-15-50**.

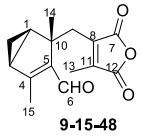
No.	Compounds	MFs	Test solvents	References
9-15-41	8*β*,9*α*-dihydroxylindan-4(5),7(11)-dien-8*α*,12-olide	$C_{15}H_{18}O_4$	$CDCl_3$	[183]
9-15-42	strychnistenolide A	$C_{15}H_{18}O_4$	C_5D_5N	[184]
9-15-43	strychnistenolide 6-*O*-acetate A	$C_{17}H_{20}O_5$	$CDCl_3$	[184]
9-15-44	strychnistenolide B	$C_{15}H_{18}O_4$	C_5D_5N	[184]
9-15-45	strychnistenolide 6-*O*-acetate B	$C_{17}H_{20}O_5$	$CDCl_3$	[184]
9-15-46	heterogorgiolide	$C_{16}H_{20}O_3$	CD_3OD	[185]
9-15-47	8*β*,9-dihydro-onoseriolide	$C_{15}H_{18}O_3$	$CDCl_3$	[186]
9-15-48	lindenanolide E	$C_{15}H_{16}O_4$	$CDCl_3$	[187]
9-15-49	lindenanolide F	$C_{30}H_{34}O_6$	$CDCl_3$	[187]
9-15-50	lindenanolide G	$C_{16}H_{22}O_6$	$CDCl_3$	[187]

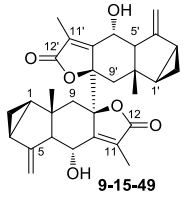




	R^1	R^2
9-15-42	OH	*α*-OH
9-15-43	OAc	*α*-OH
9-15-44	OH	*β*-OH
9-15-45	OAc	*β*-OH
9-15-46	H	*β*-OMe







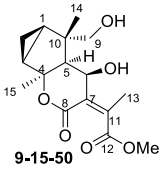


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Table 9-15-12: ^{1}H NMR spectroscopic data of lindenane-type sesquiterpenoids **9-15-41**~**9-15-45**.

H	9-15-41	9-15-42	9-15-43	9-15-44	9-15-45
1	1.70 m	1.33 dt(3.5, 7.5)	1.41 dt(3.5, 7.5)	1.30 dt(3.5, 7.5)	1.31 dt(3.5, 7.5)
2	en 0.23 ddd(4.0, 4.0, 4.0)	0.78 m	0.83 m	1.08 dt(3.5, 7.5)	0.82 m
	ex 0.75 ddd(4.0, 8.0, 8.0)		0.77 dt(3.5, 5.4)	0.79 m	0.77 dt(3.5, 5.4)
3	1.70 m	2.01 m	2.03 m	2.01 m	1.96 m
5		4.12 d(10.5)	3.68 t(2.5, 10.9)	3.00 dt(2.0, 11.7)	2.86 d(12.4)
6	3.24 d(14.0) 2.68 d(14.0)	4.82 d(10.5)	5.70 d(10.9)	5.19 dd(1.3, 11.7)	5.61 d(12.4)
9	3.87 s	2.43 d(14.0)	2.56 d(14.2)	2.74 d(13.0)	2.60 d(13.9)
		2.83 d(14.0)	2.28 d(14.2)	1.97 d(13.0)	1.85 d(13.9)
13	1.81 s	1.94 s	1.94 s	2.38 d(1.3)	1.84 s
14	1.40 s	0.61 s	0.58 s	1.23 d(1.8)	0.99 s
15	1.76 s	5.66 d(1.8)	5.04 br s	5.81 d(1.8)	5.07 d(1.6)
		5.27 d(1.8)	4.77 br s	5.28 d(1.8)	4.80 d(1.6)
OAc			2.10 s		2.20 s

Note: en denotes *endo* and ex *exo*.

Table 9-15-13: ^{1}H NMR spectroscopic data of lindenane-type sesquiterpenoids **9-15-46**~**9-15-50**.

H	9-15-46	9-15-47	9-15-48	9-15-49[①]	9-15-50
1	1.38 dt(3.6, 7.5)	0.85 m	1.78 m	1.40 m	1.25 m
2	0.71 dt(3.6, 6.0)	0.93 m	*α* 0.20 m	*α* 0.74 m	*α* 0.51 dt(5.5, 8.4)
	0.83 ddd(6.0, 7.5, 8.0)	1.38 ddd(3.5, 8, 8)	*β* 1.04 m	*β* 0.84 m	*β* 1.58 m
3	2.02 m	1.97 dd(3.5, 8)	1.83 m	2.07 m	1.49 ddd(3.7, 6.1, 8.4)
5	3.36 m	2.55 dddd(2, 2, 3, 13.5)		3.48 d(10.5)	2.10 d(4.1)
6	2.35 dd(13.0, 18.0)	*α* 2.11 dd(3, 13.5)	9.81 s	4.38 d(10.5)	4.68 d(4.1)
	2.45 m	*β* 2.88 dd(13.5, 13.5)			
8		5.11 dd(12, 6.5)			
9	2.13 d(14.0)	*α* 1.58 dd(12, 12)	*α* 2.70 d(13.2)	*α* 2.30 d(14.4)	3.50 br s
	2.48 d(14.0)	*β* 2.67 dd(6.5, 12)	*β* 2.97 d(13.2)	*β* 2.65 d(14.4)	
13	1.82 br s	4.39 d(6.0)	1.90 s	1.87 s	2.05 s
14	0.52 s	0.79 s	1.42 m	0.42 s	1.35 s
15	4.78 br s	5.02 br s	2.21 s	5.03 s	1.65 s
	5.00 br s	4.75 br s		5.06 s	
OMe	3.08 s				3.75 s
OH		2.72 t(6.0)			

[①] The signials of the symmetric parts from the dimer was overlapped.

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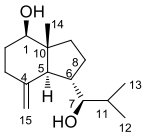
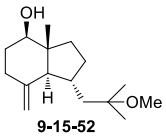
Table 9-15-14: Compounds, MFs, and test solvents of oppositane-type sesquiterpenoids **9-15-51**~**9-15-54**.

No.	Compounds	MFs	Test solvents	References
9-15-51	(7*R**)-opposit-4(15)-ene-1β,7-diol	$C_{15}H_{26}O_2$	$CDCl_3$	[188]
9-15-52	11-methoxyopposit-4(15)-en-1β-ol	$C_{16}H_{28}O_2$	$CDCl_3$	[188]
9-15-53	teclenone A	$C_{15}H_{24}O_2$	$CDCl_3$	[189]
9-15-54	teclenone B	$C_{15}H_{24}O_2$	$CDCl_3$	[189]



8-15-51



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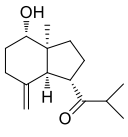

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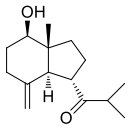

9-15-54

Table 9-15-15: ^{1}H NMR spectroscopic data of oppositane-type sesquiterpenoids **9-15-51**~**9-15-54**.

H	9-15-51	9-15-52	9-15-53	9-15-54
1	3.59 dd(11.4, 4.8)	3.53 dd(11.7, 4.4)	3.64 dd(11.8, 4.2)	3.62 dd(11.3, 4.6)
2	α 1.87 m	α 1.80 m	α 1.49 m	α 1.48 m
	β 1.50 dddd (13.2, 13.2, 11.4, 5.1)	β 1.50 m	β 1.81 m	β 1.79 m
3	α 2.12 ddd(13.6, 13.2, 5.5)	α 2.02 m	2.25 m	α 2.09 m
	β 2.30 m	β 2.29 ddd(13.6, 5.1, 1.8)		β 2.26 m
5	1.84 d(10.6)	1.52 d(10.6)	2.53 d(10.9)	2.57 d(11.1)
6	2.33 m	2.13 m	3.25 ddd(10.3, 10.9, 6.8)	3.17 ddd(10.1, 11.1, 6.6)
7	3.23 br d(9.9)	1.27 dd(13.9, 10.3) 1.84 d(13.9)		
8	α 1.33 m, β 1.91 m	2.07 m	α 1.81 m, β 1.96 m	α 1.59 m, β 2.09 m
9	α 1.39 m, β 1.76 m	α 1.41 m, β 1.71 m	α 1.42 m, β 2.03 m	α 1.48 m, β 1.79 m
11	1.76 m		2.50 m	2.72 q
12	0.91 d(7.0)	1.17 s	1.02 d(6.9)	1.10 d(6.8)
13	1.00 d(7.0)	1.18 s	0.97 d(6.9)	1.08 d(6.8)
14	0.67 s	0.64 s	0.90 s	0.67 s
15	4.81 d(1.5)	4.61 d(1.5)	4.73 s	4.76 s
	4.95 d(1.5)	4.85 d(1.5)	4.64 s	4.38 s
OMe		3.19 s		

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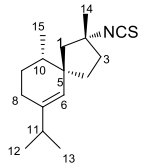
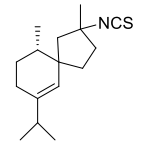
9.16 Spiroaxane- and vetisperane-type sesquiterpenoids

Table 9-16-1: Compounds, MFs, and test solvents of spiroaxane-type sesquiterpenoids **9-16-1**~**9-16-10**.

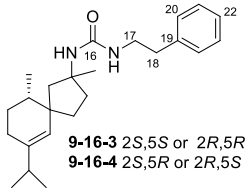
No.	Compounds	MFs	Test solvents	References
9-16-1	(2*R*,5*R*,10*S*)-2-isothiocyanato-6-axene	$C_{16}H_{25}NS$	$CDCl_3$	[190]
9-16-2	2-isothiocyanato-6-axene	$C_{16}H_{25}NS$	$CDCl_3$	[190]
9-16-3	*N*-phenethyl-2-formamido-6-axene	$C_{24}H_{36}N_2O$	CD_3OD	[190]
9-16-4	*N*-phenethyl-2-formamido-6-axene	$C_{24}H_{36}N_2O$	CD_3OD	[190]
9-16-5	(2*R*,5*R*,10*S*)-2-*N*-methyl-6-axene	$C_{16}H_{29}N$	$CDCl_3$	[190]
9-16-6	(2*R*,5*R*,10*S*)-2-*N*-methyl axane	$C_{16}H_{31}N$	$CDCl_3$	[190]
9-16-7	exiguamide	$C_{16}H_{27}NO$	DMSO-d_6	[191]
9-16-8	exicarbamate	$C_{17}H_{29}NO_2$	C_6D_6	[191]
9-16-9	exigurin	$C_{21}H_{36}N_2O_3$	C_6D_6	[191]
9-16-10	(–)-10-*epi*-axisonitrile-3	$C_{16}H_{25}N$	C_6D_6	[191]



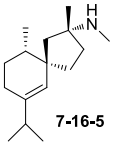
9-16-1 2*R*,5*R*



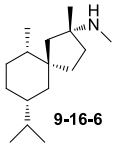
9-16-2 2*S*,5*R* or 2*R*,5*S*



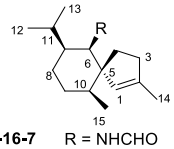
9-16-3 2*S*,5*S* or 2*R*,5*R*
9-16-4 2*S*,5*R* or 2*R*,5*S*



7-16-5



9-16-6



9-16-7 R = NHCHO
9-16-8 R = NHCOOMe
9-16-9 R = $NHCOCH_2N(CH_3)CH_2COOMe$
9-16-10 R = NC

Table 9-16-2: ^{1}H NMR spectroscopic data of spiroaxane-type sesquiterpenoids **9-16-1**~**9-16-5**.

H	9-16-1	9-16-2	9-16-3	9-16-4	9-16-5
1	2.09 dd(1.5, 14.7) 1.68 d(14.7)	1.98 dd(14.1, 2.0) 1.74 d(14.1)	2.04 d(14.2) 1.58 d(14.2)	2.05 dd(1.0, 14.2) 1.60 d(14.2)	1.78
3	2.01 dddd(1.6, 4.2, 6.4, 12.7) 1.81 m	2.05 m 1.60 m	1.84 m 1.71 m	1.92 m 1.56 ddd(7.3, 8.7, 12.7)	–

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Table 9-16-2 (continued)

H	9-16-1	9-16-2	9-16-3	9-16-4	9-16-5
4	1.46 m 1.43 m	1.77 m 1.63 m	1.76 m 1.30 m	1.70 ddd(5.3, 7.4, 12.9) 1.42 m	–
6	5.14 s	5.45 s	5.26 s	5.40 s	5.31
8	1.92 m, 1.82 m	1.90 ddd(1.5, 5.9, 7.2)	1.92 m, 1.85 m	1.89 m	–
9	1.93 m 1.63 m	1.58 m 1.36 dddd(7.2, 7.2, 9.3, 13.3)	1.66 m 1.42 m	1.62 m	–
10	1.70 ddq(2.9, 6.8, 6.8)	1.45 ddq(2.4, 9.3, 6.8)	1.60 m	1.46 m	–
11	2.11 sept(6.8)	2.15 sept(6.8)	2.12 sept(6.5)	2.11 sept(6.6)	2.15
12	0.96 d(6.8)	0.99 d(6.8)	0.98 d(7.0)	0.95 d(7.0)	0.98
13	0.96 d(6.8)	0.99 d(6.8)	0.98 d(7.0)	0.95 d(7.0)	0.98
14	1.51 s	1.49 s	1.38 s	1.36 s	1.43
15	0.90 d(6.8)	0.85 d(6.8)	0.87 d(7.0)	0.87 d(7.0)	0.92
16					2.62
17			3.30 m	3.30 m	
18			2.73 t(7.2)	2.75 dt(2.5, 7.2)	
20			7.26 m	7.26 m	
21			7.16 m	7.20 m	
22			7.17 m	7.17 m	
NH					9.20

Table 9-16-3: ^{1}H NMR spectroscopic data of spiroaxane-type sesquiterpenoids **9-16-6**~**9-16-10**.

H	9-16-6	9-16-7	9-16-8	9-16-9	9-16-10
1	1.98, 1.79	5.58 br s	5.53 br s	5.67 br s	5.25 br s
3	2.08	2.34 ddd(15.8, 8.8, 7.5)	2.74 ddd(15.8, 8.7, 7.6)	2.82 m	2.11 ddd(16.4, 8.1, 8.1)
	1.78	1.99 br dd(15.8, 8.8)	2.09 ddd(15.8, 8.7, 2.1)	2.14 ddd(15.6, 8.8, 2.5)	1.95 ddd(16.4, 9.0, 2.9)
4	1.92	1.80 ddd(12.6, 7.5, 2.1)	2.27 ddd(12.5, 7.6, 2.1)	2.23 ddd(12.2, 7.5, 2.5)	2.28 ddd(13.0, 8.1, 2.9)
	1.40	1.42 ddd(12.6, 8.8, 8.8)	1.60 ddd(12.5, 8.7, 8.7)	1.64 m	1.82 ddd(13.0, 9.0, 8.1)
6	1.27, 1.13	3.82 dd(10.5, 3.5)	4.08 dd(10.5, 3.5)	4.48 dd(11.1, 3.5)	3.51 br s
7	–	1.11 m	1.26 m	1.36 m	0.96 m
8	1.40	ax 1.31 m	ax 0.79 qd(13.5, 3.5)	ax 1.02 m	ax 1.49 m
	1.13	eq 1.56 m	eq 1.46 m	eq 1.66 m	eq 1.49 m
9	1.27	ax 1.74 tt(13.5, 5.4)	ax 1.69 tt(13.5, 3.5)	ax 1.84 m	ax 1.56 m
	1.13	eq 1.44 m	eq 1.32 m	eq 1.43 m	eq 1.42 m

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Table 9-16-3 (continued)

H	9-16-6	9-16-7	9-16-8	9-16-9	9-16-10
10	1.69	1.47 m	1.57 m	1.71 m	1.55 m
11	1.40	1.30 m	1.40 m	1.55 m	1.72 m
12	0.86	0.86 d(6.5)	0.88 d(6.6)	0.98 d(6.6)	0.86 d(6.6)
13	0.86	0.68 d(6.5)	1.05 d(6.6)	1.12 d(6.6)	0.82 d(6.6)
14	–	1.68 br s	1.62 br s	1.68 br s	1.51 br s
15	0.89	0.95 d(7.5)	0.87 d(7.6)	1.14 d(7.5)	1.29 d(7.8)
16	2.57	8.08 br s			
OMe			3.55 s	3.28 s	
17				3.05 s	
NMe				2.09 s	
18				2.85 s	
NH	9.19				

Table 9-16-4: Compounds, MFs, and test solvents of vetisperane-type sesquiterpenoids **9-16-11**~**9-16-14**.

No.	Compounds	MFs	Test solvents	References
9-16-11	canusesnol I	$C_{15}H_{26}O_2$	CD_3OD	[192]
9-16-12	canusesnol J	$C_{15}H_{22}O_3$	CD_3OD	[192]
9-16-13	(4*R*,5*R*,7*R*)-1(10)-spirovetiven-11-ol-2-one	$C_{15}H_{24}O_2$	$CDCl_3$	[193]
9-16-14	solafuranone	$C_{15}H_{20}O_2$	CD_3COCD_3	[194]

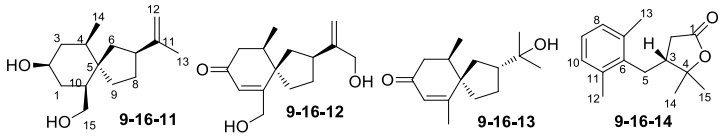

Table 9-16-5: ^{1}H NMR spectroscopic data of vetisperane-type sesquiterpenoids **9-16-11**~**9-16-14**.

H	9-16-11	9-16-12	9-16-13	9-16-14
1	2.24 m, 1.07 m	6.11 s	5.74 br s	
2	3.56 sept(4.6)			2.53 m
				2.21 dd(13.0, 22.0)
3	1.64 m	2.79 m	*α* 2.20 dd(16.9, 5.1)	2.53 m
	1.04 m	2.23 m	*β* 2.61 dd(16.9, 4.4)	
4	1.48 m	2.21 m	2.09 m	
5				2.86 dd(3.0, 14.0)
				2.78 dd(11.0, 14.0)

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Table 9-16-5 (continued)

H	9-16-11	9-16-12	9-16-13	9-16-14
6	1.70 m, 1.59 m	2.28 m, 1.61 m	α 1.85 m, β 1.57 m	
7	2.40 m	2.71 m	2.10 m	
8	1.76 m, 1.35 m	2.00 m 1.66 m	1.83 m, 1.76 m	7.00 s
9	1.45 m, 1.37 m	1.93 m, 1.76 m	α 1.53 m, β 1.99 m	7.00 s
10	1.40 m		2.09 m	7.00 s
12	4.70 s, 4.67 s	5.06 s, 4.94 s	1.25 s	2.34 s
13	1.74 s	4.07 s	1.25 s	2.34 s
14	0.94 d(6.8)	1.01 d(6.6)	1.00 d(7.1)	1.43 s
15	3.88 dd(10.0, 3.1) 3.24 t(10.0)	4.31 s	1.97 d(1.0)	1.55 s

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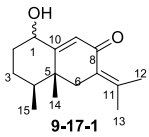
9.17 Eremophilane- and bakkane-type sesquiterpenoids

Table 9-17-1: Compounds, MFs, and test solvents of eremophilane-type sesquiterpenoids **9-17-1**~**9-17-14**.

No.	Compounds	MFs	Test solvents	References
9-17-1	1-hydroxyeremophil-7(11),9(10)-dien-8-one	$C_{15}H_{22}O_2$	C_6D_6	[195]
9-17-2	(3*S*)-3-acetoxyeremophil-7(11),9(10)-dien-8-one	$C_{17}H_{24}O_3$	C_6D_6	[195]
9-17-3	(3*S*)-3-acetoxyeremophil-1(2),7(11),9(10)-trien-8-one	$C_{17}H_{22}O_3$	C_6D_6	[195]
9-17-4	phomadecalin A	$C_{15}H_{20}O_3$	$CDCl_3$	[196]
9-17-5	phomadecalin B	$C_{17}H_{22}O_5$	$CDCl_3$	[196]
9-17-6	phomadecalin D	$C_{15}H_{20}O_4$	$CDCl_3$	[196]
9-17-7	phomadecalin C	$C_{15}H_{18}O_4$	$CDCl_3$	[196]
9-17-8	canusesnol F	$C_{15}H_{22}O_4$	CD_3OD	[197]
9-17-9	canusesnol G	$C_{15}H_{26}O_3$	CD_3OD	[197]
9-17-10	canusesnol H	$C_{14}H_{22}O_3$	CD_3OD	[197]
9-17-11	6*β*-sarracinoyloxy-1*β*,10*β*-epoxy-furanoeremophilane	$C_{20}H_{26}O_5$	$CDCl_3$	[198]
9-17-12	6*α*-angeloyloxy-10*βH*-furanoeremophil-1-one	$C_{20}H_{26}O_4$	$CDCl_3$	[198]
9-17-13	1*α*-hydroxy-9-deoxycacalol	$C_{15}H_{18}O_2$	$CDCl_3$	[198]
9-17-14	1*β*-hydroxy-11(*R*,*S*)-8-oxoeremophil-6,9-dien-12-al	$C_{15}H_{20}O_3$	$CDCl_3$	[198]



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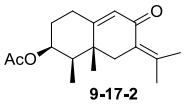

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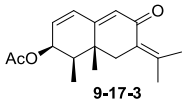
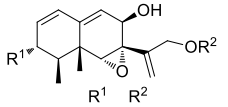
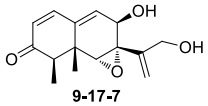


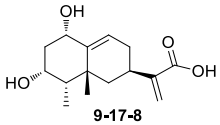
9-17-3



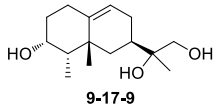
	R^1	R^2
9-17-4	H	H
9-17-5	OH	Ac
9-17-6	OH	H



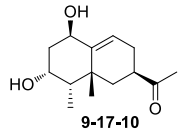
9-17-7



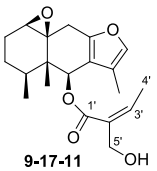
9-17-8



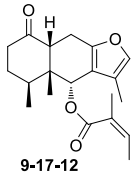
9-17-9



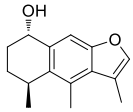
9-17-10



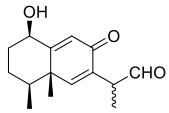
9-17-11



9-17-12



9-17-13



9-17-14

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Table 9-17-2: ^{1}H NMR spectroscopic data of eremophilane-type sesquiterpenoids **9-17-1**~**9-17-5**.

H	9-17-1	9-17-2	9-17-3	9-17-4	9-17-5
1	3.71 m, 3.76 m	1.66 m(14.5), 2.24 m	5.79 d(9.7)	5.95 br d(9.6)	5.99 br dd(9.6, 2.7)
				5.72 br dd(9.6, 5.1)	5.74 br dd(9.6, 2.4)
2	1.26 m, 1.74 m	1.75 m(14.5), 1.89 m(14.5)	5.93 dd(9.7, 5.4)		
3	1.07 m, 1.74 m	4.93 m(3.2)	5.25 t(5.0)	1.88 m, 2.10 ddd (13.0, 13.0, 5.1)	3.94 br d(9.0)
4	1.09 m	1.12 dd(7.2, 3.3)	1.44 dd(7.2, 5.0)	1.90 m	1.72 m
6	2.70 d(13.6)	2.66 d(13.6)	2.67 d(13.7)	3.18 s	3.11 s
	1.90 d(13.6)	1.81 d(13.6)	1.81 d(13.7)		
8				4.71 br s	4.68 br s
9	5.78 s, 5.63 s	5.90 s	5.87 s	5.25 br d(2.4)	5.36 br d(2.4)
12	2.29 s	2.27 s	2.30 s	5.33 br d(0.9)	5.44 br s
				5.30 br s	5.36 br s
13	1.55 s	1.54 s	1.54 d(1.4)	4.31 dd(13.0, 0.9)	4.80 br d(13.0)
				4.18 br d(13.0)	4.70 br d(13.0)
14	1.05 s	1.01 s	1.06 s	0.95 s	0.97 s
15	0.73 d(6.7)	0.73 d(7.1)	0.75 d(7.2)	1.03 d(6.8)	1.21 d(6.6)
OAc		1.65 s	1.65 s		2.10 s
1-OH	0.67 m				

Table 9-17-3: ^{1}H NMR spectroscopic data of eremophilane-type sesquiterpenoids **9-17-6**~**9-17-10**.

H	9-17-6	9-17-7	9-17-8	9-17-9	9-17-10
1	5.90 br dd(9.9, 2.1)	6.87 br d(10.0)	4.29 br s	1.75 m, 2.01 m	4.27 br t(2.6)
2	5.63 br d(9.9)	5.95 br d(10.0)	1.85 m	1.68 m	1.84 m
			1.65 m	1.40 m	1.63 td(12.8, 3.8)
3	3.82 br d(10.0)		4.50 dt(4.5, 12.3)	4.17 dt(12.0, 4.6)	4.50 dt(12.3, 4.4)
4	1.64 m	2.84 q(6.6)	1.68 m	1.68 m	1.74 m
6	3.17 s	3.17 s	α 1.89 m	1.29 m, 1.84 m	1.44 m, 1.96 m
			β 1.27 dd(13.4, 13.4)		
7			2.77 br t(ca. 13)	1.92 m	2.72 m
8	4.64 br s	4.84 br d(2.1)	1.96 m, 2.11 m	2.01 m, 2.33 m	2.07 m, 2.17 m
9	5.23 br s	5.80 br d(2.1)	5.92 d(5.4)	5.58 d(6.5)	5.88 dd(6.3, 2.2)
12	5.23 br s	5.37 br s	6.16 s	3.41 s	2.18 s
	5.19 br s	5.35 br s	5.53 s		
13	4.17 br d(13.0)	4.35 br d(13.0)		1.08 s	
	4.04 br d(13.0)	4.22 br d(13.0)			
14	0.89 s	1.06 s	1.35 s	1.17 s	1.35 s
15	1.10 d(6.9)	1.22 d(6.6)	0.96 d(7.0)	0.93 d(7.0)	0.89 d(7.0)

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Table 9-17-4: ^{1}H NMR spectroscopic data of eremophilane-type sesquiterpenoids **9-17-11**~**9-17-14**.

H	9-17-11	9-17-12	9-17-13	9-17-14
1	3.11 d(4.6)		4.83 dd(9.8, 6.3)	4.55 t(2.7)
2	1.89 m	2.42 m	1.82 m	1.67 dddd(13.3, 13.3, 3.5, 2.7)
	2.05 m	2.45 m	2.15 m	2.07 dq(13.3, 3.5)
3	1.39 m	1.66 m	1.92 m	1.55 m
	1.61 m	2.25 m	1.96 m	1.95 dq(13.3, 3.5)
4	1.94 m	1.94 m	3.25 m	1.50 m
6	6.51 s	5.80 s		6.80 s
9	2.19 br d(16.8)	2.70 dd(17.6, 5.8)	7.55 br s	6.20 s
	3.22 br d(16.8)	2.86 dd(17.6, 11.4)		
10		2.98 dd(11.4, 5.8)		
11				3.67 dq(1.9, 5.5)
12	7.06 s	7.02 s	7.30 q(1.5)	9.65 s
13	1.81 s	1.55 s	2.39 s	1.25 d(7.4)
14	1.23 s	0.67 s	2.60 s	1.35 s
15	1.07 d(7.3)	0.99 d(7.1)	1.25 d(6.6)	1.10 d(6.2)
3′	6.47 tq(1.1, 7.3)	6.02 qq(5.8, 1.5)		
4′	2.10 d(7.3)	1.96 dq(5.8, 1.5)		
5′	4.27 br s	1.89 dq(1.5, 1.5)		
OH	2.33			

Table 9-17-5: Compounds, MFs, and test solvents of eremophilane-type sesquiterpenoids **9-17-15**~**9-17-29**.

No.	Compounds	MFs	Test solvents	References
9-17-15	8*β*-hydroxyeremophil-3,7(11)-diene-8*α*,12(6*α*,15)-diolide	$C_{15}H_{16}O_5$	$CDCl_3$	[199]
9-17-16	8*β*-methoxyeremophil-3,7(11)-diene-8*α*,12(6*α*,15)-diolide	$C_{16}H_{18}O_5$	$CDCl_3$	[199]
9-17-17	8*β*-ethoxyeremophil-3,7(11)-diene-8*α*,12(6*α*,15)-diolide	$C_{17}H_{20}O_5$	$CDCl_3$	[199]
9-17-18	mairetolide A	$C_{15}H_{20}O_3$	$CDCl_3$	[200]
9-17-19	mairetolide B	$C_{15}H_{20}O_4$	$CDCl_3$	[200]
9-17-20	mairetolide C	$C_{17}H_{26}O_5$	$CDCl_3$	[200]
9-17-21	mairetolide D	$C_{16}H_{24}O_5$	$CDCl_3$	[200]
9-17-22	mairetolide E	$C_{16}H_{24}O_4$	$CDCl_3$	[200]
9-17-23	mairetolide F	$C_{15}H_{22}O_4$	$CDCl_3$	[200]
9-17-24	mairetolide G	$C_{15}H_{22}O_5$	CD_3OD	[200]
9-17-25	mairetolide H	$C_{15}H_{22}O_5$	CD_3OD	[200]
9-17-26	3*β*-acetoxy-6*β*-methoxyeremophila-7(11),9(10)-dien-12,8*β*-olide	$C_{18}H_{24}O_5$	CD_3COCD_3	[201]
9-17-27	3*β*-acetoxy-8*α*-hydroxy-6*β*-methoxyeremophila-7(11),9(10)-dien-12,8*β*-olide	$C_{18}H_{24}O_6$	CD_3COCD_3	[201]

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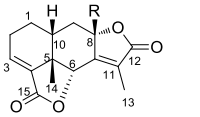
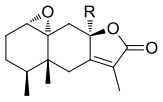
Table 9-17-5 (continued)

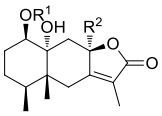
No.	Compounds	MFs	Test solvents	References
9-17-28	3β-acetoxy-10β-hydroxy-6β,8β-dimethoxyeremophil-7(11)-en-12,8α-olide	$C_{19}H_{28}O_7$	CD_3COCD_3	[201]
9-17-29	3β-acetoxy-6β,8β,10β-trihydroxyeremophil-7(11)-en-12,8α-olide	$C_{17}H_{24}O_7$	CD_3COCD_3	[201]



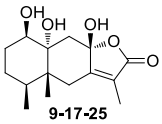
9-17-15 R = OH
9-17-16 R = OMe
9-17-17 R = OCH_2CH_3



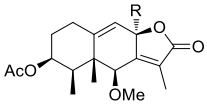
9-17-18 R = H
9-17-19 R = OH



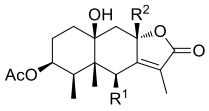
	R^1	R^2
9-17-20	Me	OMe
9-17-21	Me	OH
9-17-22	Me	H
9-17-23	H	H
9-17-24	H	OH



9-17-25



9-17-26 R = H
9-17-27 R = OH



	R^1	R^2
9-17-28	OMe	OMe
9-17-29	OH	OH

Table 9-17-6: ^{1}H NMR spectroscopic data of eremophilane-type sesquiterpenoids **9-17-15**~**9-17-19**.

H	9-17-15	9-17-16	9-17-17	9-17-18	9-17-19
1	α 1.68~1.72 m	α 1.68~1.74 m	α 1.66~1.71 m	3.06 d(3.5)	3.06 d(3.9)
	β 2.19~2.33 m	β 2.14~2.20 m	β 2.17~2.21 m		
2	α 2.34~2.39 m	α 2.32~2.37 m	α 2.32~2.36 m	2.06 m	1.98 m
	β 2.40~2.42 m	β 2.37~2.43 m	β 2.37~2.41 m		
3	6.87 dd(3.2, 3.6)	6.87 dd(3.2, 3.6)	6.86 dd(3.2, 3.6)	1.26 m	1.28 m
4				1.91 m	1.98 m
6	5.24 d(2.0)	5.06 d(2.0)	5.05 d(2.0)	α 2.21 d(13.5)	α 2.38 d(13.5)
				β 2.76 d(13.5)	β 2.66 d(13.5)
8				4.91 br dd(9, 9)	
9	α 1.35 t(13.6)	α 1.30 t(13.2)	α 1.28 t(13.2)	2.02 d(13)	2.43 d(14)
	β 2.24 dd(13.6, 4.8)	β 2.23 dd(13.2, 4.8)	β 2.24 dd(13.2, 4.4)	1.86 d(13)	1.76 d(14)
10	2.02~2.07 m	2.02~2.07 m	2.02~2.06 m		
13	1.95 d(2.0)	2.02 d(2.0)	2.00 d(2.0)	1.85 dd(1.8, 1.2)	1.85 d(1.5)
14	1.44 s	1.43 s	1.43 s	0.82 s	0.83 s
15				0.83 d(7)	0.84 d(6.3)
OMe		3.23 s			

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Table 9-17-6 (continued)

H	9-17-15	9-17-16	9-17-17	9-17-18	9-17-19
OEt			3.32 dq(7.5, 6.4) 3.53 dq(7.5, 6.4) 1.24 t(6.4)		
OH					4.22 br s

Table 9-17-7: ^{1}H NMR spectroscopic data of eremophilane-type sesquiterpenoids **9-17-20**~**9-17-23**.

H	9-17-20	9-17-21	9-17-22	9-17-23
1	3.08 t(2.6)	3.10 dd(2.6, 2.3)	3.07 dd(2.3, 2.0)	3.67 dd(2.3, 2.3)
2	*α* 1.88 dddd (14.3, 13.5, 4.3, 2.6)	*α* 1.85 dddd (14.3, 13, 4.5, 2.6)	1.82 m	2.04 m 1.65 m
	β 1.75 dddd (14.3, 4.4, 2.6, 2.3)	*β* 1.78 m		
3	*α* 1.28 m	*α* 1.28 ddd(13.5, 7, 4.5)	*α* 1.29 ddd(13.5, 7, 3.5)	*α* 1.34 ddd(13.5, 8, 3.5)
	β 1.40 dddd(13.5, 13.5, 12.5, 4.4)	*β* 1.41 dddd(13.5, 13, 12, 4)	*β* 1.46 br ddd(13.5, 12, 7)	*β* 1.60 dddd(13.5, 13.5, 13.5, 4)
4	2.15 dqd(12.3, 7.0, 4.0)	2.12 dqd(12, 7, 4)	1.94 dqd(12.0, 6.8, 3.5)	1.99 m
6	*α* 2.25 br d(13.0) *β* 2.40 d(13.0)	2.40 br s	*α* 2.40 br d(13.3) *β* 2.47 d(13.3)	2.46 s
8			5.08 dd(9.7, 8.2)	5.11 dd(10, 7.6)
9	*α* 2.06 d(14.3)	*α* 2.05 d(14.3)	*α* 2.07 dd(13.2, 9.7)	*α* 2.05 dd(13, 10)
	β 2.47 d(14.3)	*β* 2.47 d(14.3)	*β* 2.12 dd(13.2, 8.2)	*β* 2.19 dd(13, 7.6)
13	1.88 d(1.5)	1.79 d(0.6)	1.87 br s	1.81 br s
14	0.78 d(0.6)	0.77 s	0.80 s	0.89 s
15	0.83 d(7)	0.84 d(7)	0.88 d(6.8)	0.90 d(7)
OMe	3.24 s(1-OMe) 3.15 s(8-OMe)	3.24 s 3.24 s	3.26 s 3.26 s	
10-OH	4.02 br s			

Table 9-17-8: ^{1}H NMR spectroscopic data of eremophilane-type sesquiterpenoids **9-17-24**~**9-17-29**.

H	9-17-24	9-17-25	9-17-26	9-17-27	9-17-28	9-17-29
1	3.54 dd(2.9, 2.4)	3.52 dd(3.5, 2.5)	*α* 2.46~2.53 m	*α* 2.46~2.50 m	*α* 1.85~1.93 m	*α* 2.13~2.18 m
			β 2.05~2.09 m	*β* 2.01~2.03 m	*β* 1.22~1.27 m	*β* 1.43~1.49 m

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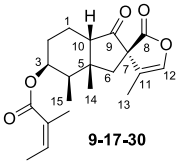
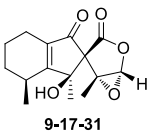
Table 9-17-8 (continued)

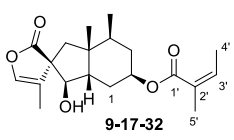
H	9-17-24	9-17-25	9-17-26	9-17-27	9-17-28	9-17-29
2*α*	2.14 m	2.09 dddd (13.5, 13.5, 5, 3.5)	1.55~1.64 m	1.59~1.66 m	1.72~1.79 m	1.78~1.87 m
2*β*	1.54 m	1.54 m	1.95~2.03 m	1.94~2.03 m	1.66~1.70 m	1.59~1.66 m
3	*α* 1.28 m	*α* 1.27 m	4.94 dt(3.0, 2.5)	4.94 dt(3.0, 2.5)	4.87 dt(2.5, 1.5)	4.90 dt(3.0, 1.5)
	β 1.58 m	*β* 1.57 dddd (13.5, 13.5, 13.5, 6.5)				
4	2.14 m	2.14 m	1.92~1.99 m	1.98~2.02 m	1.67~1.72 m	1.31~1.36 m
6	2.48 d(13.2)	*α* 2.35 d(13)	4.23 q(1.0)	4.24 q(1.0)	4.39 s	4.70 s
	2.40 d(13.2)	*β* 2.48 d(13)				
8			5.28 d(1.5)	5.74 d(1.0)		
9	*α* 1.96 d(14)	*α* 1.89 d(14)	5.61 t(1.5)		*α* 2.40 d(15)	*α* 2.37 d(15.0)
	β 2.39 d(14)	*β* 2.33 d(14)			*β* 2.22 d(15)	*β* 2.22 d(15.0)
13	1.81 d(1.2)	1.79 d(1.5)	1.93 d(1.0)	1.94 d(1.0)	1.96 s	1.88 s
14	0.878 s	0.864 d(1)	1.14 s	1.14 s	1.36 s	1.43 s
15	0.875 d(6.7)	0.861 d(6.5)	1.15 d(7.0)	1.14 d(7.0)	0.96 d(7.0)	0.91 d(8.0)
OMe			3.46 s	3.43 s	3.40 s(6-OMe) 3.24 s(8-OMe)	
OAc			2.06 s	2.06 s	2.05 s	2.11 s

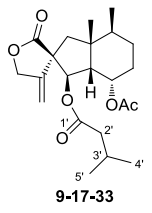
Table 9-17-9: Compounds, MFs, and test solvents of bakkane-type sesquiterpenoids **9-17-30**~**9-17-34**.

No.	Compounds	MFs	Test solvents	References
9-17-30	franchetianone A	$C_{20}H_{26}O_5$	C_6D_6	[202]
9-17-31	ligulolide A	$C_{15}H_{18}O_5$	$CDCl_3$	[203]
9-17-32	9-hydroxyisobakkenolide	$C_{20}H_{28}O_5$	$CDCl_3$	[204]
9-17-33	bakkenolide G	$C_{22}H_{32}O_6$	$CDCl_3$	[205]
9-17-34	deisobutyryl bakkenolide H	$C_{19}H_{28}O_5$	$CDCl_3$	[205]









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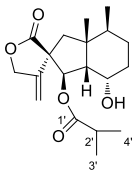

9-17-34

Table 9-17-10: ^{1}H NMR spectroscopic data of bakkane-type sesquiterpenoids **9-17-30**~**9-17-34**.

H	9-17-30	9-17-31	9-17-32	9-17-33	9-17-34
1	*β* 1.46 tt(14.0, 4.4)	ax 2.21 m	1.66 m	5.03 dt(7.2, 4.6)	4.59 m
		eq 2.16 m	2.13 m		
2	*α* 1.36 dddd	ax 1.82 m	5.01 m	1.72 m	1.76 m
	(14.0, 11.3, 4.4, 2.7)	eq 1.70 m		1.78 m	2.06 m
	β 1.64 br d(14.0)				
3	5.02 q(3.0)	ax 1.85 m	1.39 m	1.28 m	1.31 m
		eq 1.58 m	1.81 m	1.64 m	1.62 m
4	0.85 qd(6.9, 3.0)	2.77 br q(7.2)	1.66 m	1.52 m	1.51 m
6	*α* 1.69 d(14.6)		1.70 d(14.4)	1.93 d(14.8)	1.92 d(14.8)
	β 1.80 d(14.6)		1.96 m	2.21 d(14.8)	2.18 d(14.8)
9			4.36 d(12.0)	5.77 d(11.2)	5.72 d(11.2)
10	2.65 m		2.59 ddd(12.0,	2.67 dd(11.2, 4.6)	2.80 dd(11.2,
			6.0, 2.0)		4.8)
12	6.08 q(1.6)	5.51 s	6.76 s	4.65 dt(13.2, 2.4)	4.63 d(13.2)
				4.69 dt(13.2, 2.4)	4.66 d(13.2)
13	1.08 d(1.6)	1.61 s	1.77 s	5.17 t(2.4)	5.14 br s
				5.21 t(2.4)	5.18 br s
14	1.10 s	1.56 s	1.10 s	1.07 s	1.06 s
15	0.65 d(6.9)	1.34 d(7.2)	0.92 d(6.6)	0.87 d(6.8)	0.87 d(6.8)
2′				2.11 dd(14.2, 6.8)	2.57 sept(7.2)
				2.19 dd(14.2, 6.8)	
3′	5.71 qq(7.1, 1.4)		6.06 q(7.2)	2.06 m	1.10 d(7.2)
4′	2.00 dq(7.1, 1.4)		1.94 d(7.3)	0.93 d(6.4)	1.12 d(7.2)
5′	1.78 quint(1.4)		1.85 s	0.93 d(6.4)	
OAc				1.91 s	

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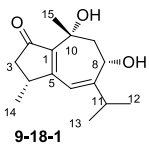
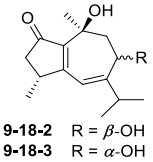
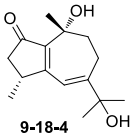
9.18 Guaiane-, pseudoguaiane-, bourbonane-, xanthane-, patchoulane-, and carabrane-type sesquiterpenoids

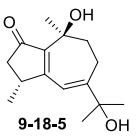
Table 9-18-1: Compounds, MFs, and test solvents of guaiane-type sesquiterpenoids **9-18-1**~**9-18-15**.

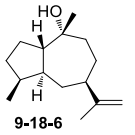
No.	Compounds	MFs	Test solvents	References
9-18-1	nardoguaianon E	$C_{15}H_{22}O_3$	$CDCl_3$	[206]
9-18-2	nardoguaianon F	$C_{15}H_{22}O_3$	$CDCl_3$	[206]
9-18-3	nardoguaianon G	$C_{15}H_{22}O_3$	$CDCl_3$	[206]
9-18-4	nardoguaianon H	$C_{15}H_{22}O_3$	$CDCl_3$	[206]
9-18-5	nardoguaianon I	$C_{15}H_{22}O_3$	$CDCl_3$	[206]
9-18-6	–	$C_{15}H_{26}O$	$CDCl_3$	[207]
9-18-7	–	$C_{15}H_{28}O_2$	$CDCl_3$	[207]
9-18-8	4*α*,7*α*-epoxyguaiane-10*α*,11-diol	$C_{15}H_{26}O_3$	$CDCl_3$	[208]
9-18-9	7*α*,10*α*-epoxyguaiane-4*α*,11-diol	$C_{15}H_{26}O_3$	$CDCl_3$	[208]
9-18-10	10*β*,11*β*-epoxyguaiane-1*α*,4*α*-diol	$C_{15}H_{26}O_3$	$CDCl_3$	[208]
9-18-11	10*β*,11*β*-epoxyguaiane-1*α*,4*α*,7*α*-triol	$C_{15}H_{26}O_4$	$CDCl_3$	[208]
9-18-12	nardoguaianone A	$C_{15}H_{22}O_4$	$CDCl_3$	[209]
9-18-13	nardoguaianone B	$C_{15}H_{22}O_4$	$CDCl_3$	[209]
9-18-14	nardoguaianone C	$C_{15}H_{22}O_5$	$CDCl_3$	[209]
9-18-15	nardoguaianone D	$C_{15}H_{22}O_5$	$CDCl_3$	[209]

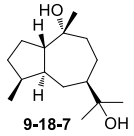


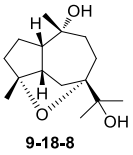


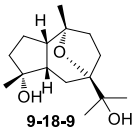


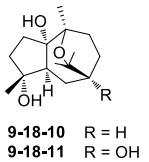


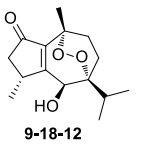


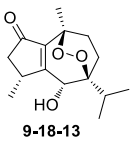


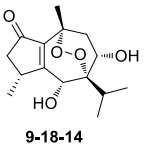












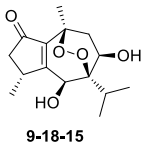


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Table 9-18-2: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-1**~**9-18-5**.

H	9-18-1	9-18-2	9-18-3	9-18-4	9-18-5
3*α*	2.03 dd(18.8, 1.8)	2.03 dd(18.9, 1.7)	2.07 dd(18.8, 1.7)	2.02 dd(18.9, 1.8)	2.06 dd(18.7, 1.8)
3*β*	2.62 dd(18.8, 6.4)	2.66 dd(18.9, 6.7)	2.68 dd(18.8, 6.8)	2.65 dd(18.9, 6.4)	2.67 dd(18.7, 7.0)
4	2.75 ddq(6.4, 1.8, 7.0)	2.88 ddq(6.7, 1.7, 7.1)	2.85 ddq(6.8, 1.7, 7.0)	2.80 ddq(6.4, 1.8, 7.0)	2.84 ddq(7.0, 1.8, 7.3)
6	5.87 s	5.75 s	5.83 s	6.33 s	6.29 s
8	4.52 br t(5.2)	4.51 br d(9.0)	4.44 br d(8.4)	2.43 br dd(16.8, 8.8) 2.33 ddd (16.8, 11.0, 1.2)	2.45 br dd(17.2, 7.0) 2.36 ddd (17.2, 10.3, 1.8)
9	2.10 br d(5.2)	2.06 br dd(13.0, 9.0) 2.11 br d(13.0)	2.01 dd(14.6, 1.8) 2.47 dd(14.6, 8.4)	1.75 ddd(13.7, 8.8, 1.2) 2.02 ddd(13.7, 11.0, 0.9)	1.74 br dd(13.9, 7.0) 2.04 ddd(13.9, 10.3, 1.5)
11	3.02 sept(6.7)	3.02 sept(13.0)	2.64 sept(6.8)		
12	1.18 d(6.7)	1.18 d(6.8)	1.15 d(6.8)	1.41 s	1.42 s
13	1.14 d(6.7)	1.15 d(6.8)	1.13 d(6.8)	1.44 s	1.43 s
14	1.26 d(7.0)	1.13 d(7.1)	1.21 d(7.0)	1.23 d(7.0)	1.20 d(7.0)
15	1.46 s	1.44 s	1.49 s	1.45 s	1.44 s

Table 9-18-3: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-6**~**9-18-10**.

H	9-18-6	9-18-7	9-18-8	9-18-9	9-18-10
1	2.10 m	2.05 m	2.15 m (ov)	1.88 m	
2	1.52 m, 1.68 m	1.47 m, 1.69 m	*α* 1.68 m, *β* 1.82 m	*α* 1.86 m, *β* 2.08 m	*α* 2.54 ddd (14.4, 8.4, 6.0) *β* 1.78 m
3	1.25 m, 1.68 m	1.24 m, 1.69 m	*α* 1.76 m, *β* 2.17 m	*α* 2.05 m, *β* 1.96 m	*α* 1.92 m, *β*1.71 m
4	2.20 m	2.00 m			
5	2.20 m	1.90 m	2.31 br t(7.8)	2.73 dd(11.4, 7.8)	1.93 m(ov)
6	1.40 m 1.25 m	1.69 m 1.60 m	*α* 2.55 br d(12.6) *β* 2.36 ddd(12.6, 7.8, 1.8)	*α* 2.02 m (ov) *β* 1.90 m (ov)	*α* 1.94 m (ov) *β* 1.70 m
7	2.23 m	1.60 m			1.34 m
8	1.80 m 1.40 m	1.90 m 1.24 m	*α* 1.70 m *β* 1.81 m	*α* 1.45 m *β* 1.40 m	*α* 1.71 m *β* 1.44 m
9	1.89 m	1.90 m	*α* 1.58 br dd (13.2, 9.6)	*α* 1.84 m	*α* 1.43 m
	1.52 m	1.47 m	*β* 1.86 m	*β* 1.96 m	*β* 1.80 m
12	1.68 m	1.16 s	1.17 s	1.20 s	1.18 s

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Table 9-18-3 (continued)

H	9-18-6	9-18-7	9-18-8	9-18-9	9-18-10
13	4.64 br s 4.56 br s	1.14 s	1.23 s	1.23 s	1.30 s
14	0.86 d(6.8)	0.92 d(6.8)	1.33 s	1.29 s	1.21 s
15	1.17 s	1.12 s	1.30 s	1.23 s	1.11 s

Table 9-18-4: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-11**~**9-18-15**.

H	9-18-11	9-18-12	9-18-13	9-18-14	9-18-15
2	*α* 2.52 ddd (13.5, 12.3, 2.7) *β* 1.84 m (ov)				
3*α*	1.91 m (ov)	2.09 dd(18.3, 1.8)	2.09 dd(18.3, 1.8)	2.15 dd(18.4, 1.8)	2.11 dd(18.7, 1.8)
3*β*	1.72 m	2.68 dd(18.3, 6.7)	2.75 dd(18.3, 6.9)	2.71 dd(18.4, 6.4)	2.79 dd(18.7, 6.6)
4		3.17 ddq(6.7, 1.8, 7.3)	2.94 ddq(6.9, 1.8, 7.2)	1.79 ddq(6.4, 1.8, 6.9)	3.15 ddq(6.6, 1.8, 7.3)
5	1.92 m				
6	*α* 2.03 m (ov) *β* 1.58 m (ov)	4.95 s	4.59 s	4.49 d(11.5)	4.55 br s
8	*α* 1.92 m (ov) *β* 1.80 m	*α* 1.96 m *β* 1.78 m	2.03~2.09 m	3.52 t(8.1)	3.54 t(8.1)
9	*α* 1.75 m *β* 1.68 m	*α* 1.86 m *β* 2.00 m	1.87~1.93 m	1.95 dd(14.2, 8.1) 2.39 dd(14.2, 8.1)	2.42 dd(13.6, 8.1) 1.95 dd(13.6, 8.1)
11		1.95 sept(6.7)	1.91 sept(6.9)	2.41 sept(7.3)	2.42 sept(7.0)
12	1.17 s	1.10 d(6.7)	1.06 d(6.9)	1.21 d(7.3)	1.21 d(7.0)
13	1.34 s	1.06 d(6.7)	1.05 d(6.9)	1.12 d(7.3)	1.14 d(7.0)
14	1.30 s	1.28 d(7.3)	1.37 d(7.2)	1.38 d(6.9)	1.22 d(7.3)
15	1.13 s	1.59 s	1.64 s	1.65 s	1.64 s

Table 9-18-5: Compounds, MFs, and test solvents of guaiane-type sesquiterpenoids **9-18-16**~**9-18-40**.

No.	Compounds	MFs	Test solvents	References
9-18-16	menverin A	$C_{15}H_{18}O_3$	C_5D_5N	[210]
9-18-17	menverin B	$C_{15}H_{18}O_3$	C_5D_5N	[210]
9-18-18	menverin C	$C_{15}H_{18}O_4$	C_5D_5N	[210]
9-18-19	menverin D	$C_{15}H_{18}O_4$	C_5D_5N	[210]
9-18-20	zedoalactone A	$C_{15}H_{22}O_4$	C_5D_5N	[211]
9-18-21	zedoalactone C	$C_{15}H_{22}O_4$	C_5D_5N	[211]
9-18-22	zedoalactone B	$C_{15}H_{20}O_5$	C_5D_5N	[211]

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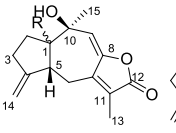
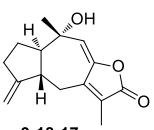
Table 9-18-5 (continued)

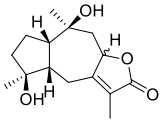
No.	Compounds	MFs	Test solvents	References
9-18-23	hedyosumin A	$C_{15}H_{16}O_4$	$CDCl_3$	[212]
9-18-24	hedyosumin B	$C_{15}H_{18}O_4$	$CDCl_3$	[212]
9-18-25	hedyosumin C	$C_{15}H_{20}O_4$	$CDCl_3$	[212]
9-18-26	hedyosumin D	$C_{17}H_{20}O_4$	$CDCl_3$	[212]
9-18-27	(4*S**,5*S**)-dihydro-5-[(1*R**,2*S**)-2-hydroxy-2-methyl-5-oxo-3-cyclopenten-1-yl]-3-methylene-4-(3-oxobutyl)-2(3*H*)-furanone	$C_{15}H_{18}O_5$	$CDCl_3$	[213]
9-18-28	–	$C_{15}H_{18}O_5$	$CDCl_3$	[213]
9-18-29	–	$C_{15}H_{18}O_5$	$CDCl_3$	[213]
9-18-30	–	$C_{15}H_{18}O_5$	$CDCl_3$	[213]
9-18-31	eupalinilide A	$C_{20}H_{25}ClO_7$	$CDCl_3$	[214]
9-18-32	eupalinilide B	$C_{20}H_{24}O_6$	$CDCl_3$	[214]
9-18-33	eupalinilide C	$C_{20}H_{24}O_7$	$CDCl_3$	[214]
9-18-34	eupalinilide D	$C_{15}H_{19}ClO_5$	$CDCl_3$	[214]
9-18-35	eupalinilide E	$C_{20}H_{25}ClO_6$	$CDCl_3$	[214]
9-18-36	eupalinilide F	$C_{20}H_{26}O_8$	CD_3OD	[214]
9-18-37	eupalinilide G	$C_{20}H_{24}O_8$	$CDCl_3$	[214]
9-18-38	eupalinilide H	$C_{20}H_{25}ClO_7$	$CDCl_3$	[214]
9-18-39	eupalinilide I	$C_{20}H_{26}O_9$	CD_3OD	[214]
9-18-40	eupalinilide J	$C_{22}H_{28}O_{10}$	$CDCl_3$	[214]



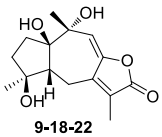
9-18-16 R = α-H
9-18-18 R = α-OH
9-18-19 R = β-OH



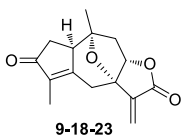
9-18-17



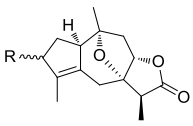
9-18-20 8α-H
9-18-21 8β-H



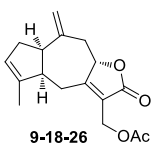
9-18-22



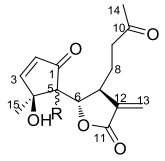
9-18-23



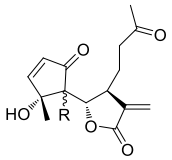
9-18-24 R = =O
9-18-25 R = β-OH



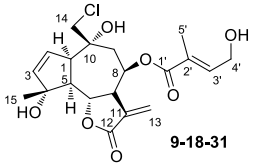
9-18-26



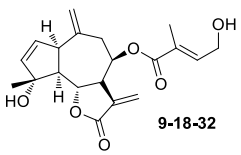
9-18-27 R = β-H
9-18-29 R = α-H



9-18-28 R = α-H
9-18-30 R = β-H



9-18-31



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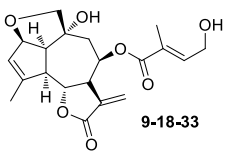

9-18-33

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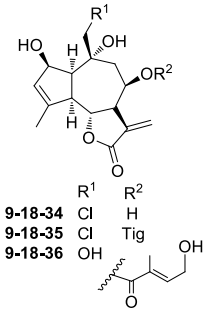

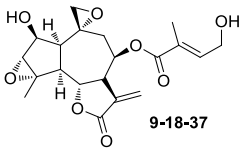

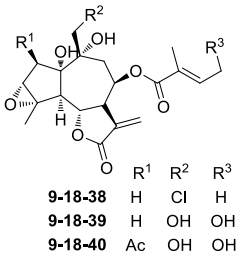

Table 9-18-6: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-16**~**9-18-20**.

H	9-18-16	9-18-17	9-18-18	9-18-19	9-18-20
1	2.00 ddd(6.9, 9.2, 11.1)	2.46 m			3.20 ddd(7.5, 7.5, 11.3)
2*α*	1.89 m	2.22 m	2.11 ddd(1.6, 8.0, 13.6)	2.14 dd(7.2, 12.5)	1.60 m
2*β*	2.17 m	1.84 m	2.83 m	2.58 ddd(7.7, 7.9, 12.5)	1.99 m
3*α*	2.40 m	2.38 m	2.89 m	2.50 dd(7.9, 14.4)	1.88 m
3*β*	2.47 m	2.38 m	2.57 m	2.96 m	1.99 m
5	3.14 m	2.44 m	3.69 br d(12.2)	3.09 br d(9.9)	2.47 ddd(3.5, 7.5, 14.5)
6*α*	2.30 ddd(2.0, 12.5, 18.0)	2.30 ddd(1.8, 7.7, 17.4)	3.13 ddd(1.9, 12.2, 18.2)	3.04 dd(3.5, 15.0)	1.96 dd(12.0, 14.5)
6*β*	3.04 dd(3.0, 18.0)	2.94 dd(2.7, 17.4)	3.01 dd(4.0, 18.2)	3.60 dd(9.9, 15.0)	2.54 dd(3.5, 12.0)
8					5.08 ddd(1.6, 3.2, 6.7)
9	6.12 s	6.26 s	6.10 s	6.31 s	*α* 2.42 dd(6.7, 15.4) *β* 2.17 dd(3.2, 15.4)
13	1.80 d(2.0)	1.80 d(1.8)	1.79 d(1.9)	1.86 s	1.8 d(1.6)
14	5.09 s 4.99 s	5.09 s 4.98 s	5.19 d(1.6) 5.12 d(1.6)	5.13 s 5.08 s	1.52 s
15	1.55 s	1.48 s	1.88 s	1.90 s	1.32 s

Table 9-18-7: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-21**~**9-18-25**.

H	9-18-21	9-18-22	9-18-23	9-18-24	9-18-25
1	3.40 ddd(5.4, 5.4, 12.5)		2.87 m	2.81 m	2.51 m
2*α*	1.86 m	2.03 m	2.48 dd(18.8, 6.8)	2.48 dd(18.8, 7.0)	2.42 m

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Table 9-18-7 (continued)

H	9-18-21	9-18-22	9-18-23	9-18-24	9-18-25
2*β*	1.89 m	3.06 m	1.85 dd(18.8, 2.7)	1.82 dd(18.8, 2.8)	1.02 m
3*α*	1.75 m	2.12 m			4.71 br t
3*β*	1.96 m	2.36 m			
5	2.55 ddd(5.4, 5.4, 10.0)	3.32 dd(3.0, 12.0)			
6*α*	2.30 dd(10.0, 18.5)	3.18 ddd(1.5, 12.0, 17.0)	2.95 d(14.0)	2.80 d(14.4)	2.42 d(13.6)
6*β*	2.71 dd(5.4, 18.5)	3.08 ddd(1.5, 3.0, 17.0)	2.75 d(14.0)	2.68 d(14.4)	2.28 d(13.6)
8	5.75 ddd(1.0, 1.6, 11.0)		4.38 dd(7.2, 2.4)	4.38 dd(7.0, 1.8)	4.45 br d(7.1)
9*α*	2.33 dd(1.5, 11.0)	6.09 s	1.80 dd(13.7, 2.4)	1.74 dd(14.5, 1.8)	1.63 br d(14.2)
9*β*	1.67 dd(11.0, 11.0)		2.12 dd(13.7, 7.2)	1.98 dd(14.5, 7.0)	2.34 dd(14.2, 7.1)
11				2.62 q(7.0)	2.53 q(7.2)
13	1.73 d(1.0)	1.69 s	5.99 s, 6.46 s	1.34 d(7.0)	1.33 d(7.2)
14	1.44 s	1.72 s	1.71 s	1.72 s	1.69 s
15	1.27 s	1.87 s	1.42 s	1.42 s	1.31 s
OH		7.10 s(1-OH) 6.00 s(10-OH) 6.19 s(4-OH)	1.42 s	1.42 s	1.31 s

Table 9-18-8: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-26**~**9-18-30**.

H	9-18-26	9-18-27	9-18-28	9-18-29	9-18-30
1	3.09 m				
2	2.43 br d(8.4)	6.09 d(4.3)	6.07 d(5.8)	6.17 d(5.8)	6.14 d(5.6)
3	5.42 s	7.45 d(4.3)	7.48 d(5.8)	7.46 d(5.7)	7.52 d(5.6)
5	2.51 m	2.65 br s	2.70 d(10.5)	2.32 d(9.1)	2.56 d(2.0)
6	*α* 1.95 d(13.2) *β* 2.79 d(13.2)	4.49 br d(6.3)	4.47 dd(10.5, 2.0)	4.57 dd(9.1, 2.5)	4.60 dd(2.0, 6.4)
7		3.59 m	3.47 m	3.54 m	3.72 m
8	4.71 dd(10.5, 5.5)	1.96 m	*ca.* 1.9 m	*ca.* 1.8 m	1.96 m
9	*α* 2.05 dd(12.0, 10.5) *β* 3.05 dd(12.0, 5.5)	2.62 t(5.4)	*ca.* 2.6 m	*ca.* 2.5 m	2.58 m
13	4.79 d(2.5)	5.63 d(2.1) 6.31 d(2.1)	5.78 d(1.5) 6.36 d(1.8)	5.75 d(1.6) 6.36 d(1.9)	5.65 d(2.8) 6.31 d(3.2)
14	1.75 s	2.19 s	2.21 s	2.18 s	2.19 s
15	5.06 s, 5.15 s	1.61 s	1.59 s	1.60 s	1.55 s
OAc	2.06 s				

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Table 9-18-9: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-31**~**9-18-35**.

H	9-18-31	9-18-32	9-18-33	9-18-34	9-18-35
1	3.55 (ov)	3.37 br d(9.3)	3.00 t-like(8.8, 7.3)	2.45 (ov)	2.61 br s
2	6.00 dd(5.8, 2.6)	5.76 dd(5.6, 2.6)	5.25 dd(7.3, 1.7)	4.54 dd(4.1, 1.7)	4.59 (ov)
3	5.87 d(5.8)	5.94 d(5.6)	5.48 d(1.7)	5.72 br s	5.74 br s
5	2.86 dd(11.9, 10.4)	2.42 dd(10.8, 9.3)	3.16 t-like(9.2, 8.8)	2.73 dd(11.0, 7.3)	2.76 dd(10.9, 7.4)
6	4.71 dd(11.9, 9.8)	4.97 dd(10.8, 9.2)	4.62 t-like (10.2, 9.2)	4.49 dd(11.0, 8.7)	4.59 dd(10.9, 8.7)
7	3.13 br d(9.8)	3.23 m	3.49 m	3.75 dd(8.7, 4.0)	3.93 (ov)
8	5.70 m	5.65 m	5.82 m	4.42 td(8.1, 4.0)	5.64 td(8.4, 4.7)
9	2.71 dd(15.4, 3.8)	2.81 dd(14.3, 3.2)	2.41 dd(14.7, 5.5)	2.31 m	2.43 m
	1.82 (ov)	2.35 dd(14.3, 3.3)	1.67 dd(14.7, 8.9)	2.42 (ov)	2.50 m
13	6.34 d(3.4)	6.31 d(3.4)	6.33 d(3.6)	6.40 d(3.8)	6.26 d(3.7)
	5.60 d(3.0)	5.63 d(3.0)	5.56 d(3.2)	5.58 d(3.2)	5.44 d(3.3)
14	3.63 d(10.9)	4.96 br s	3.67 d(9.8)	3.95 d(11.1)	3.92 d(11.1)
	3.57 d(10.9)	4.92 br s	3.54 d(9.8)	3.67 d(11.1)	3.66 d(11.1)
15	1.50 s	1.56 s	1.93 d(1.4)	2.00 s	2.02 s
3′	6.72 br t(6.0)	6.73 br t(6.0)	6.71 br t(6.0)		6.70 br q(8.0)
4′	4.35 d(6.0)	4.30 br d(6.0)	4.34 br d(6.0)		1.74 d(8.0)
5′	1.82 s	1.77 s	1.78 s		1.72 s

Table 9-18-10: ^{1}H NMR spectroscopic data of guaiane-type sesquiterpenoids **9-18-36**~**9-18-40**.

H	9-18-36	9-18-37	9-18-38	9-18-39	9-18-40
1	2.42 m	1.71 dd(8.5, 5.0)	2.43 (ov)	2.29 (ov)	2.57 dd(7.7, 4.4)
2	4.55 br s	4.38 d(5.0)	4.34 d(4.5)	4.22 (ov)	5.29 d(4.4)
3	5.73 br s	3.31 br s	3.28 br s	3.25 br s	3.12 br s
5	2.71 dd(10.7, 7.3)	2.50 dd(11.5, 8.5)	2.56 dd(11.3, 7.8)	2.46 dd(11.4, 7.6)	2.64 dd(10.9, 7.7)
6	4.70 dd(10.7, 8.3)	4.84 dd(11.5, 8.2)	4.77 dd(11.3, 8.5)	4.83 dd(11.4, 8.8)	4.70 dd(10.9, 8.8)
7	4.04 dd(8.3, 4.3)	3.54 dd(8.2, 3.9)	3.96 dd(8.5, 4.3)	4.08 dd(8.8, 4.0)	4.05 dd(8.8, 3.9)
8	5.66 td(8.4, 4.3)	5.56 ddd (8.7, 7.4, 3.9)	5.60 td(8.3, 4.3)	5.62 td(8.2, 4.0)	5.63 m
9	2.35 m	2.79 dd(15.0, 7.4)	2.49 dd(14.8, 8.3)	2.46 (ov)	2.44 dd(14.8, 9.2)
		2.13 dd(15.0, 8.7)	2.43 (ov)	2.29 (ov)	1.87 dd(14.8, 7.4)
13	6.17 d(3.8)	6.33 d(3.6)	6.26 d(3.7)	6.16 d(3.8)	6.27 d(3.0)
	5.45 d(3.3)	5.55 d(3.0)	5.43 d(3.3)	5.44 d(3.3)	5.45 d(2.7)

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Table 9-18-10 (continued)

H	9-18-36	9-18-37	9-18-38	9-18-39	9-18-40
14	3.63 d(11.1)	2.73 d(4.9)	3.74 d(11.3)	3.51 d(11.2)	3.43 d(11.0)
	3.48 d(11.1)	2.64 d(4.9)	3.60 d(11.3)	3.40 d(11.2)	3.36 d(11.0)
15	1.99 s	1.68 s	1.70 s	1.64 s	1.70 s
3′	6.68 t(6.0)	6.69 br t(5.8)	6.72 br q(7.7)	6.69 br t(5.9)	6.71 t(5.6)
4′	4.21 d(6.0)	4.32 d(5.8)	1.75 d(7.7)	4.22 (ov)	4.32 br s
5′	1.74 s	1.75 s	1.74 s	1.75 s	1.76 s
COMe					2.06 s

Table 9-18-11: Compounds, MFs, and test solvents of pseudoguaiane-type sesquiterpenoids **9-18-41**~**9-18-50**.

No.	Compounds	MFs	Test solvents	References
9-18-41	parthenin	$C_{15}H_{18}O_4$	$CDCl_3$	[215]
9-18-42	–	$C_{17}H_{24}O_5$	$CDCl_3$	[215]
9-18-43	–	$C_{17}H_{24}O_5$	$CDCl_3$	[215]
9-18-44	–	$C_{17}H_{20}O_5$	$CDCl_3$	[215]
9-18-45	–	$C_{17}H_{20}O_5$	$CDCl_3$	[215]
9-18-46	(3*aR*,3*bS*,4*R*,5*aS*,6*aR*,7*S*,9*aS*)-octahydro-4-hydroxy-1,3*b*,7-trimethyl-4*H*-oxireno[1,8*a*]azuleno[4,5-*b*]furan-2(1*H*)-one	$C_{15}H_{22}O_4$	$CDCl_3$	[216]
9-18-47	(3*aS*,6*S*,9*S*,9*aS*,9*bR*)-3*a*,4,5,6,8,9,9*a*,9*b*-octahydro-9-hy-droxy-3,6,9*a*-trimethylazuleno[4,5-*b*]furan-2(3*H*)-one	$C_{15}H_{22}O_3$	$CDCl_3$	[216]
9-18-48	dichrocepholide A	$C_{15}H_{20}O_5$	CD_3OD	[217]
9-18-49	dichrocepholide B	$C_{15}H_{20}O_6$	CD_3OD	[217]
9-18-50	dichrocepholide C	$C_{15}H_{20}O_6$	CD_3OD	[217]

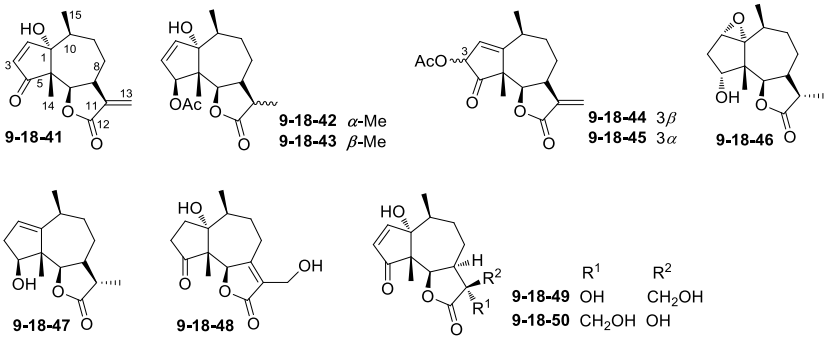

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Table 9-18-12: ^{1}H NMR spectroscopic data of pseudoguaiane-type sesquiterpenoids **9-18-41**~**9-18-45**.

H	9-18-41	9-18-42	9-18-43	9-18-44	9-18-45
2	7.48 d(6.2)	6.05 dd(5.9, 2.1)	5.97 dd(6.1, 2.1)	6.02 d(1.5)	6.08 d(1.5)
3	6.15 d(6.2)	5.89 dd(5.9, 1.4)	5.92 dd(6.1, 1.5)	5.93 d(1.5)	5.44 d(1.5)
4		6.12 dd(2.1, 1.4)	6.15 dd(2.1, 1.5)		
6	4.98 d(8.2)	5.22 d(9.0)	4.82 d(9.0)	4.46 d(9.0)	4.62 d(9.0)
7	3.46 m	2.54 m	3.05 m	3.42 m	3.38 m
8	2.18~2.37 m	1.86 m, 2.02~2.09 m	1.51 m, 1.76 m	2.02 m, 2.12 m	1.96 m, 2.05 m
9	1.63 m, 1.84 m	1.62 m, 2.02~2.09 m	1.67 m, 2.08 m	1.75 m, 1.84 m	1.63 m, 1.81 m
10	2.10 m	2.21 m	2.21 m	2.91 m	2.94 m
11		2.36 m	2.84 m		
13	5.56 d(2)	1.23 d(7)	1.16 d(7)	5.55 d(2)	5.58 d(2)
	6.24 d(2)			6.28 d(2)	6.24 d(2)
14	1.24 s	1.08 s	1.07 s	1.21 s	1.24 s
15	1.12 d(7)	1.09 d(7)	1.10 d(7)	1.19 d(7)	1.19 d(7)
OAc		2.13 s	2.13 s	2.12 s	2.12 s

Table 9-18-13: ^{1}H NMR spectroscopic data of pseudoguaiane-type sesquiterpenoids **9-18-46**~**9-18-50**.

H	9-18-46	9-18-47	9-18-48	9-18-49	9-18-50
2	3.43 br s	5.38 t(2.0)	1.82 m, 2.56 m	7.61 d(6.0)	7.60 d(6.0)
3	2.23 dd(14.0, 6.0)	2.53 ddd	2.41 m	6.13 d(6.0)	6.12 d(6.0)
	2.02~2.12 m	(14.0, 8.0, 2.0)			
		2.20 ddd			
		(14.0, 8.0, 2.0)			
4	3.62 br d(6.0)	4.10 t(8.0)			
6	5.08 d(8.5)	4.39 d(8.6)	5.43 s	5.01 d(6.3)	4.93 d(7.3)
7	2.58~2.66 m	2.68~2.87 m		2.96 ddd(2.3, 6.3, 6.3)	3.04 ddd(3.9, 7.3, 7.3)
8	2.02~2.12 m	1.60~1.66 m	2.97 d-like	1.79 m	1.80 m
	1.79~1.92 m			2.07 m	1.90 m
9	1.79~1.92 m	1.66~1.74 m	α 2.33 ddd(3.5, 6.9, 13.5)	2.21 ddd(3.6, 6.7, 13.2)	2.17 ddd(4.1, 7.2, 14.1)
	1.73~1.79 m	1.22~1.28 m	β 1.45 ddd(6.9, 10.1, 13.5)	1.68 ddd(6.7, 9.8, 13.2)	1.75 ddd(7.2, 10.2, 14.1)
10	1.79~1.92 m	2.68~2.87 m	2.16 m	2.33 m	2.34 m
11	2.39~2.49 m	2.68~2.87 m			
13	1.28 d(7.0)	1.20 d(7.0)	4.28 s	3.70 d(12.0),	3.57 d(11.0),
				3.80 d(12.0)	3.70 d(11.0)
14	1.09 s	1.21 s	0.86 s	1.31 s	1.31 s
15	1.22 d(7.0)	1.18 d(7.0)	1.10 d(7.0)	1.12 d(6.8)	1.11 d(7.7)

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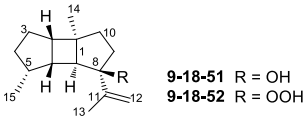
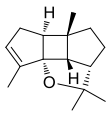
Table 9-18-14: Compounds, MFs, and test solvents of bourbonane-type sesquiterpenoids **9-18-51**~**9-18-53**.

No.	Compounds	MFs	Test solvents	References
9-18-51	8*β*-hydroxyprespatane	$C_{15}H_{24}O$	$CDCl_3$	[218]
9-18-52	8*β*-hydroperoxyprespatane	$C_{15}H_{24}O_2$	$CDCl_3$	[218]
9-18-53	(–)-(1*S**,5*S**,6*S**,7*S**,10*S**)-bourbon-3-en-5,11-oxide	$C_{15}H_{22}O$	C_6D_6	[219]



9-18-51 R = OH
9-18-52 R = OOH



9-18-53

Table 9-18-15: ^{1}H NMR spectroscopic data of bourbonane-type sesquiterpenoids **9-18-51**~**9-18-53**.

H	9-18-51	9-18-52	9-18-53
2	2.13 t(7.0)	2.18 m	2.17 d(10.1)
3	*α* 1.70 m, *β* 1.43 m	*α* 1.70 m, *β* 1.45 m	2.10 d(17.3), 2.44 ddt(17.3, 9.2)
4	*α* 1.71 m, *β* 1.30 m	*α* 1.72 m, *β* 1.49 m	5.42 s
5	1.82 m	1.82 m	
6	1.84 m	1.95 m	
7	1.80 m	1.72 m	2.54 d(7.9)
8			2.19 t(8.5)
9	*α* 1.65 m *β* 2.40 td(12.5, 7.4)	2.26 m	1.65 dt(13.2, 7.9), 2.02 ddt(9.5, 6.6, 12.9)
10	*α* 1.85 td(12.5, 7.4) *β* 1.60 td(12.5, 7.4)	*α* 1.75 m, *β* 1.58 m	1.38 dt(6.9, 12.6), 1.52 dd(12.0, 6.6)
12	4.87 br s, 4.94 br s	5.04 br s, 5.09 br s	1.10 s
13	1.77 br s	1.75 br s	1.33 s
14	1.04 s	0.97 s	0.95 s
15	0.92 d(6.0)	0.90 d(6.3)	1.74 d(1.3)
OOH		7.71 br s	

Table 9-18-16: Compounds, MFs, and test solvents of xanthane-type sesquiterpenoids **9-18-54**~**9-18-63**.

No.	Compounds	MFs	Test solvents	References
9-18-54	6-*α*-acetyl-4-*O*-oxobedfordiaic acid	$C_{17}H_{24}O_5$	$CDCl_3$	[220]
9-18-55	6-*α*-acetyl-4-*O*-oxobedfordiaic methyl ester	$C_{18}H_{26}O_5$	$CDCl_3$	[220]
9-18-56	1*β*,4*β*-epoxy-5*β*-hydroxy-10*αH*-xantha-11(13)-en-12,8*β*-olide	$C_{15}H_{22}O_4$	$CDCl_3$	[221]

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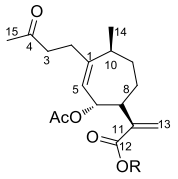
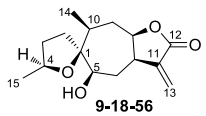
Table 9-18-16 (continued)

No.	Compounds	MFs	Test solvents	References
9-18-57	1*β*,4*β*,4*α*,5*β*-diepoxy-10*αH*,11*αH*-xantha-12,8*β*-olide	$C_{15}H_{22}O_4$	$CDCl_3$	[221]
9-18-58	4-acetoxy-1*β*,5*β*-epoxy-10*αH*-xantha-11(13)-en-12,8*β*-olide	$C_{17}H_{24}O_5$	$CDCl_3$	[221]
9-18-59	(1*S*,5*S*,6*R*,7*R*,8*R*,9*S*,10*S*)-5-angeloyloxy-8,9-epoxy-1-hydro-xy-2-oxoxantha-3,11-dien-6,12-olide	$C_{20}H_{24}O_7$	$CDCl_3$	[222]
9-18-60	(1*S*,5*S*,6*R*,7*S*,10*S*)-5-angeloyloxy-1-hydroxy-2-oxoxantha-3,11-dien-6,12-olide	$C_{20}H_{26}O_6$	$CDCl_3$	[222]
9-18-61	(1*S*,5*S*,6*R*,7*R*,8*S*,10*S*)-5-angeloyloxy-1,8-dihydroxy-2-oxo-xantha-3,11-dien-6,12-olide	$C_{20}H_{26}O_7$	$CDCl_3$	[222]
9-18-62	(1*S*,5*S*,6*R*,7*S*,9*R*,10*S*)-5-methylbutanoyloxy-1,4,9-trihydroxy-2-oxoxanth-11-en-6,12-olide	$C_{20}H_{30}O_8$	$CDCl_3$	[222]
9-18-63	(1*S*,5*S*,6*R*,7*S*,10*R*)-1-hydroxy-4-methoxy-5-methylbutanoy-loxy-2,9-dioxoxanth-11-en-6,12-olide	$C_{21}H_{32}O_8$	$CDCl_3$	[222]



9-18-54 R = H
9-18-55 R = Me



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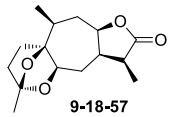

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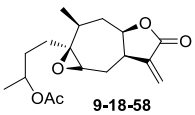

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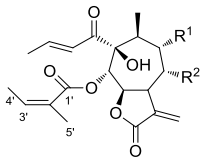
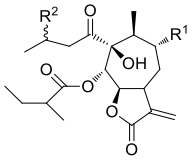


	R^1	R
9-18-59	-O-	
9-18-60	H	H
9-18-61	H	OH



	R^1	R^2
9-18-62	OH	OH
9-18-63	=O	OMe

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Table 9-18-17: ^{1}H NMR spectroscopic data of xanthane-type sesquiterpenoids **9-18-54**~**9-18-58**.

H	9-18-54	9-18-55	9-18-56	9-18-57	9-18-58
2	1.69 m (ov)	1.71 (ov)	2.11 br dd(12.2, 8.6)	1.92 m (ov)	1.98 m (ov)
	2.30 m	2.25	1.71 br dd(12.2, 4.0)	1.80 m	
3	1.69 m (ov)	1.70 (ov)	2.01 m	1.90 m (ov)	1.57 m (ov)
	2.31 m	2.30	1.47 m (ov)	1.74 m (ov)	
4			4.18 ddq(5.8)		4.88 ddq(6.4)
5	5.71 br s	5.72	3.59 br d(10)	3.55 br d(11.5)	3.05 dd(8, 5.4)
6	5.33 dd(10.2, 1.5)	5.32	2.03 dd(15, 5.6)	1.97 dd(14, 4.5)	2.17 ddd(15, 8, 3.2)
			1.65 ddd(15, 12, 10)	1.60 ddd(14, 12, 11.5)	1.95 ddd(15, 13, 5.4, ov)
7	2.50 ddd (10.2, 10.2, 3.1)	2.50	3.34 dddt(12, 9, 5.6, 3.2)	2.74 dddd (12, 7.5, 7, 4.5)	3.28 ddddd (13, 7.5, 3.2, 2)
8	1.55 m (ov)	1.51 (ov)	4.64 ddd(12, 9, 3.3)	4.62 ddd(11, 7.0, 6.0)	4.60 ddd(11.5, 7.5, 3.5)
	1.86 m	1.87			
9	1.70 m (ov)	1.67 (ov)	1.79 br dd(14, 3.3)	2.04 br dd(14, 6.0, ov)	1.77 ddd(14, 3.5, 3.5)
	2.42 m	2.45	1.50 ddd(14, 12, 11, ov)	1.58 ddd(14, 12, 11)	1.50 ddd(14, 11.5, 11, ov)
10	2.02 m	2.0	1.58 br dq(11, 6.7, ov)	2.02 dq(12.0, 7.0, ov)	1.58 br dq(11.7, 3.5, ov)
13	5.60 br s	5.50	6.28 d(3.2)	1.23 d(7.5)	6.28 d(2.2)
	6.20 br s	6.05	5.59 d(2.9)		5.65d(1.6)
14	1.03 d(7.5)	1.00	1.03 d(6.7)	1.13 d(7.0)	1.15 d(7)
15	2.15 s	2.14	1.29 d(5.8)	1.59 s	1.22 d(6.4)
OAc	1.90 s	1.86			2.02 s
OMe		3.70 s			

Table 9-18-18: ^{1}H NMR spectroscopic data of xanthane-type sesquiterpenoids **9-18-59**~**9-18-63**.

H	9-18-59	9-18-60	9-18-61	9-18-62	9-18-63
3	6.68 dd(1.5, 15.3)	6.56 br d(15.2)	6.78 br d(15.3)	2.83 dd(8.2, 17.9)	3.22 dd(9.2, 14.6)
				2.68 dd(2.7, 17.9)	2.44 dd(3.7, 14.6)
4	7.10 dq(7.0, 15.3)	7.08 dq(6.9, 15.2)	7.01 dq(15.3, 7.0)	4.26 m	3.80 m
5	5.47 d(10.7)	5.31 br d(10.5)	5.55 d(10.1)	5.28 br d(11.0)	5.40 d(10.2)
6	5.09 dd(8.6, 10.7)	5.01 br dd(8.3, 10.5)	5.07 dd(10.1, 8.0)	4.98 br dd(8.9, 11.0)	4.87 dd(8.0, 10.2)
7	3.51 m	3.45 m	3.39 m	3.65 m	3.70 m
8	3.16 m	1.64~1.87 m	3.83 br s	2.25~2.30 m	2.75 m
9	3.16 m	1.64~1.87 m	2.38 m, 1.60 m	3.84 m	
10	1.86 qd(6.8, 8.5)	2.21 m	2.45 m	1.99 m	3.47 q

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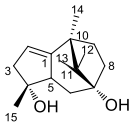
Table 9-18-18 (continued)

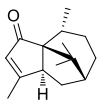
H	9-18-59	9-18-60	9-18-61	9-18-62	9-18-63
13	6.51 d(2.7) 6.04 d(2.5)	6.34 d(3.0) 5.61 br s	6.37 d(1.8) 5.93 br s	6.35 d(2.9) 5.71 d(2.9)	6.34 d(2.2) 5.68 d(2.2)
14	1.08 d(6.8)	0.74 d(6.3)	0.82 d(6.0)	0.95 d(4.4)	0.97 d(7.4)
15	1.94 dd(1.5, 7.0)	1.91 br d(6.9)	1.89 dd(1.3, 7.0)	1.25 d(6.2)	1.24 d(6.1)
2′				2.34 m	2.40 m
3′	6.18 dq(1.5, 7.3)	6.16 br q(7.2)	6.18 dq(1.2, 7.3)	1.65 m, 1.48 m	1.70 m, 1.50 m
4′	1.96 dd(1.5, 7.3)	1.98 br d(6.2)	1.94 dd(1.3, 7.3)	0.91 t	0.91 t
5′	1.79 quint(1.5)	1.84 br s	1.84 br s	1.16 d(6.7)	1.17 d(7.0)
OMe					3.29 s
OH	4.55 s	4.36 br s	4.29 s	4.39 br s, 3.15 s	

Table 9-18-19: Compounds, MFs, and test solvents of patchoulane-type sesquiterpenoids **9-18-64**~**9-18-68**.

No.	Compounds	MFs	Test solvents	References
9-18-64	1-patchoulene-4*α*,7*α*-diol	$C_{15}H_{24}O_2$	$CDCl_3$	[208]
9-18-65	5*α*,7*α*,10*βH*-3-patchoulen-2-one	$C_{15}H_{22}O$	$CDCl_3$	[223]
9-18-66	5*α*,7*α*,10*βH* -4(14)-patchoulen-2*α*-ol	$C_{15}H_{24}O$	$CDCl_3$	[223]
9-18-67	(–)-cypera-2,4(15)-diene	$C_{15}H_{22}$	C_6D_6	[224]
9-18-68	cyperadione	$C_{15}H_{24}O_2$	$CDCl_3$	[224]



9-18-64



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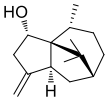

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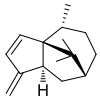

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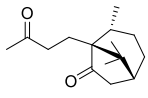

9-18-68

Table 9-18-20: ^{1}H NMR spectroscopic data of patchoulane-type sesquiterpenoids **9-18-64**~**9-18-68**.

H	9-18-64	9-18-65	9-18-66	9-18-67	9-18-68
2	5.07 br d(4.2)		3.84 dd(9.3, 6.9)	6.17 d(5.6), 2.11 m	1.50 ddd(15.4, 11.7, 5.7)
3	*α* 2.52 d(16.2)	5.65 q(1.2)	2.69 dd(15.3, 6.9)	5.69 dd(5.6, 1.0)	2.35 ddd(16.4, 11.7, 4.4)
	β 2.36 dd(16.2, 4.2)		2.05~2.14 m	2.44 ddd(16.4, 12.3, 5.7)	
5	2.83 dd(12.0, 7.8)	2.33 d(3.6)	2.18 d(4.2)	3.03 m	

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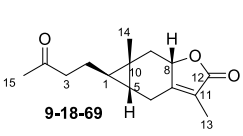
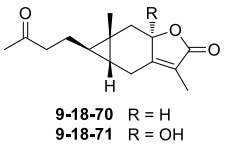
Table 9-18-20 (continued)

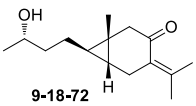
H	9-18-64	9-18-65	9-18-66	9-18-67	9-18-68
6	*α* 1.62 m	1.94 d(11.2)	1.72 dd(12.3, 3.2)	1.68 m	1.96 d(19.0)
	β 1.71 m	1.75 ddd(11.2, 3.6, 3.6)	1.58 m	2.10 m	2.48 dd(19.0, 7.3)
7		1.91~1.99 m	1.61 m	1.85 m	1.90 ddd(6.6, 3.3, 3.3)
8	*α* 1.64 m	1.70 dd(11.2, 5.2)	1.59 m	1.51 dt(14.8.6.1)	1.45 dq(13.6, 3.2)
	β 1.86 m	1.49 dd(11.2, 4.4)	1.40 m	1.86 m	2.01 dddd(13.6, 12.9, 6.0, 2.7)
9	*α* 1.50 m	1.94 m	1.90 m	1.03 m	1.10 dddd(14.5, 12.9, 12.9, 6.0)
	β 1.82 m	1.62 dd(10.4, 5.2)	1.42 m	1.29 m	1.68 ddd(14.5, 6.0, 6.0)
10		1.69 ddd(8.4, 7.1, 4.8)	1.61 m	2.12 dddd(13.2, 6.1, 6.1, 6.1)	
12	0.68 s	1.01 s	0.96 s	0.99 s	1.21 s
13	0.92 s	1.14 s	1.01 s	1.01 s	0.98 s
14	1.02 s	1.29 d(7.1)	1.14 d(7.5)	0.77 d(6.6)	0.78 d(6.0)
15	1.29 s	1.98 d(1.2)	4.59 td(3.0, 0.9) 4.55 dd(3.0, 3.0)	4.98 m 4.98 m	2.18 s

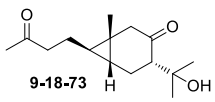
Table 9-18-21: Compounds, MFs, and test solvents of carabrane-type sesquiterpenoids **9-18-69**~**9-18-76**.

No.	Compounds	MFs	Test solvents	References
9-18-69	curcumenolactone A	$C_{15}H_{20}O_3$	$CDCl_3$	[225]
9-18-70	curcumenolactone B	$C_{15}H_{20}O_3$	$CDCl_3$	[225]
9-18-71	curcumenolactone C	$C_{15}H_{20}O_4$	$CDCl_3$	[225]
9-18-72	4*S*-dihydrocurcumenone	$C_{15}H_{24}O_2$	$CDCl_3$	[226]
9-18-73	curcarabranol A	$C_{15}H_{24}O_3$	$CDCl_3$	[226]
9-18-74	curcarabranol B	$C_{15}H_{24}O_3$	$CDCl_3$	[226]
9-18-75	comosone III	$C_{16}H_{24}O_4$	$CDCl_3$	[227]
9-18-76	dimethoxycurcumenone	$C_{17}H_{28}O_3$	$CDCl_3$	[227]









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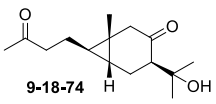

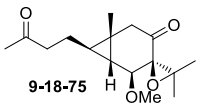

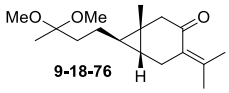

Table 9-18-22: ^{1}H NMR spectroscopic data of carabrane-type sesquiterpenoids **9-18-69**~**9-18-73**.

H	9-18-69	9-18-70	9-18-71	9-18-72	9-18-73
1	0.19 dt(6.2)	0.64 dt(5.2, 7.3)	0.15 dt(5.8, 7.0)	0.46 dt(4.9, 6.4)	0.44 dt(5.2, 6.0)
2	1.61 dt(7.3, 7.3)	1.65 dt(7.3, 7.3)	1.61 dt(7.0, 7.0)	1.33 m 1.46~1.50 m	1.62 m
3	2.51 t(7.3)	2.54 t(7.2)	2.50 t(7.0)	1.46~1.50 m	2.52 m
4				3.79 m	
5	0.70 ddd(0.6, 6.2, 7.0)	0.58 br dd(*ca.* 5, 7)	0.76 ddd(1.0, 5.8, 5.8)	0.65 m	0.59 ddd(5.2, 8.2, 8.2)
6	*α* 2.90 br d(*ca.* 17)	*α* 2.64 br dq(19.0, 2.0)	*α* 2.84 br d(*ca.* 16)	2.82 s	*α* 1.46 m
	β 2.78 qdd(1.8, 7.0, 16.8)	*β* 3.12 dd(7.3, 18.6)	*β* 2.90 qdd(2.1, 5.8, 15.9)		*β* 2.54 m
7					2.37 dd(5.5, 7.0)
8	4.68 qdd(1.8, 7.7, 11.3)	4.65 qdd(1.7, 6.4, 11.9)	3.65 br s		
9	*α* 1.32 dd(11.3, 13.5)	*α* 2.64 dd(6.4, 11.9)	*α* 1.74 d(17.7)	2.52 Bq(15.6)	2.22 ABq(15.0)
	β 2.55 dd(7.7, 13.5)	*β* 1.36 dd(11.9, 11.9)	*β* 2.54 d(17.7)	2.56 Bq(15.6)	2.52 ABq(15.0)
12				1.79 s	1.08 s
13	1.77 dd(1.8, 1.8)	1.77 dd(1.7, 1.8)	1.77 d(2.1)	2.09 s	1.20 s
14	1.16 s	1.13 s	1.19 s	1.12 s	1.13 s
15	2.15 s	2.17 s	2.15 s	1.18 d(6.1)	2.16 s
1-OH					4.22 br s

Table 9-18-23: ^{1}H NMR spectroscopic data of carabrane-type sesquiterpenoids **9-18-74**~**9-18-76**.

H	9-18-74	9-18-75	9-18-76
1	0.55 dt(6.9, 7.3)	0.79 ddd(8.1, 5.4, 5.4)	0.47 m①
2	1.62 dt(7.3, 7.3)	1.64 m 1.76 m	1.34 m②
3	2.48 m	2.56 t(7.6)	1.65 m②
5	0.72 m	1.13 t-like(*ca.* 5.0)	0.66 m①
6	*α* 2.20 m, *β* 2.00 m	3.88 d(4.1)	2.83 br s

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Table 9-18-23 (continued)

H	9-18-74	9-18-75	9-18-76
7	2.07 m		
9	2.46 ABq(17.1)	2.68 d(19.9)	2.56 d(15.6)
	2.61 ABq(17.1)	2.77 d(19.9)	2.51 d(15.6)
12	1.12 s	1.18 s	2.10 s
13	1.17 s	1.39 s	1.79 s
14	1.11 s	1.21 s	1.13 s
15	2.15 s	2.17 s	1.23 s
OMe		3.43 s	3.15 s, 3.15 s
OH	4.49 br s		

①②Assignments bearing the same superscript may be exchanged in each column.

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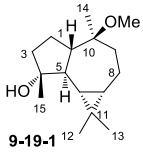
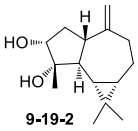
9.19 Aromadendrane-, bicyclogermacrane-, aristolane-, nardosinane-, valerenane-, gorgonane-, brasilane-, and pacifigorgiane-type sesquiterpenoids

Table 9-19-1: Compounds, MFs, and test solvents of aromadendrane-type sesquiterpenoids **9-19-1**~**9-19-10**.

No.	Compounds	MFs	Test solvents	References
9-19-1	*ent*-4*β*-hydroxy-10*α*-methoxyaromadendrane	$C_{16}H_{28}O_2$	$CDCl_3$	[228]
9-19-2	*ent*-3*β*-hydroxyspathulenol	$C_{15}H_{24}O_2$	$CDCl_3$	[228]
9-19-3	(–)-(1*R**,5*S**,6*R**,7*S**,10*S**)-myli-4(15)-ene	$C_{15}H_{22}$	C_6D_6	[229]
9-19-4	(–)-(6*R*,7*S*)-*α*-taylorione	$C_{15}H_{22}O$	C_6D_6	[229]
9-19-5	(+)-(5*S**,6*S**,7*S**)-aromadendra-1(10),4(15)-diene	$C_{15}H_{22}$	C_6D_6	[229]
9-19-6	(+)-(1*S*,6*R*,7*S*)-aromadendra-4,10(14)-diene	$C_{15}H_{22}$	C_6D_6	[229]
9-19-7	(1*S*,6*R*,7*S*)-aromadendra-4,9-diene	$C_{15}H_{22}$	C_6D_6	[229]
9-19-8	(–)-aromadendra-1(10),3-diene	$C_{15}H_{22}$	C_6D_6	[230]
9-19-9	(+)-plagiochiline W	$C_{15}H_{22}O$	C_6D_6	[230]
9-19-10	(+)-plagiochiline X	$C_{15}H_{20}O$	C_6D_6	[230]



9-19-1



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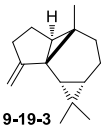
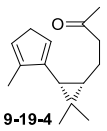


9-19-3



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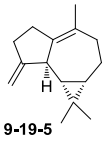

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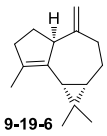

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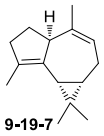

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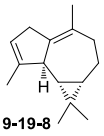

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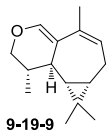

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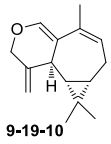

9-19-10

Table 9-19-2: ^{1}H NMR spectroscopic data of aromadendrane-type sesquiterpenoids **9-19-1**~**9-19-5**.

H	9-19-1	9-19-2	9-19-3	9-19-4	9-19-5
1	2.00 (ov)	2.12 m	1.44~1.53 m	6.04 br s	
2	1.60 (ov)	1.84 ddd(12.2, 11.0, 9.1)	1.44~1.53 m	2.76 t(1.7)	2.30 m
		1.91 dd(12.2, 5.9)	1.85 m		
3	1.59 (ov)	3.65 dd(9.1, 5.9)	2.16 m	6.01 br s	2.30 m
			2.51 br t(14.7)		

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Table 9-19-2 (continued)

H	9-19-1	9-19-2	9-19-3	9-19-4	9-19-5
5	1.25 t(10.7)	1.44 dd(11.2, 10.4)			3.04 br d(3.0)
6	0.40 dd(10.7, 9.6)	0.47 dd(11.2, 9.6)	1.22 d(9.5)	1.27 dd(8.7, 1.9)	0.89 dd(5.6, 5.6)
7	0.61 ddd(11.1, 9.6, 6.2)	0.71 ddd(11.3, 9.6, 6.2)	0.53 dt(8.8, 9.2)	0.70 dt(6.3, 8.5)	0.59 m
8	0.84 m, 1.82 m	1.00 (ov), 1.97 (ov)	0.72 m, 1.62 m	1.61 m, 1.88 m	1.51 m, 1.70 m
9	1.59 (ov) 1.68 td(12.9, 6.9)	2.01 t(13.1) 2.42 dd(13.1, 5.9)	1.44~1.53 m	2.12 m	2.10 br d(18.0) 2.21 br d(4.2)
12	1.02 s	1.04 s	1.02 s	0.95 s	1.05 s
13	1.02 s	1.02 s	1.05 s	1.09 s	1.12 s
14	1.10 s	4.65 d(2), 4.66 d(2)	0.99 s	1.67 s	1.54 br s
15	1.23 s	1.22 s	5.09 s 5.12 s	1.95 d(1.0)	4.92 br s 5.02 br d(1.3)
OMe	3.17 s				

Table 9-19-3: ^{1}H NMR spectroscopic data of aromadendrane-type sesquiterpenoids **9-19-6**~**9-19-10**.

H	9-19-6	9-19-7	9-19-8	9-19-9	9-19-10
1	3.07 br s	3.38 br s			
2	1.89 m, 2.01 m	2.20~2.26 m	3.00 d(20.5), 3.14 d(20.5)	6.78 s	6.78 s
3	2.15 dd(15.1, 8.8)	1.88 m	5.34~5.39 m	3.49 dd(5.05, 10.4)	4.08 d(11.3)
	2.30 m			3.78 dd(2.5, 10.4)	4.27 d(11.4)
4				1.52~1.58 m	
5			3.06 d(10.7)	1.96 dd(4.1, 11.0)	2.99 d(11.0)
6	1.11 br d	1.19 br d(8.8)	0.68 t(10.4)	0.49 dd(9.5, 11.0)	0.71 dd(9.8, 11.0)
7	0.74 m	0.95 m	0.55~0.60 m	0.97~0.99 m	1.01~1.03 m
8	1.27 m, 1.77 m	2.03 m 2.20~2.26 m	1.56~1.62 m, 1.66~1.73 m	2.30 t(7.6)	2.09 br t(7.9)
9	2.44 br d(13.2), 2.49 m	5.73 br t(7.6)	2.13~2.27 m	5.44 t(6.3)	5.44 t(6.0)
12	0.87 s	0.96 s	0.98 s	0.92 s	0.91 s
13	1.08 s	1.09 s	1.08 s	0.99 s	1.02 s
14	5.01 br s	1.72 d(1.0)	1.55 s	1.77 s	1.73 br s
15	1.65 br s	1.69 d(0.9)	1.68 s	0.89 d(7.3)	4.83 s, 4.95 br s

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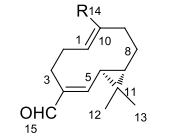
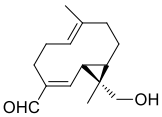
Table 9-19-4: Compounds, MFs, and test solvents of bicyclogermacrane-type sesquiterpenoids **9-19-11**~**9-19-17**.

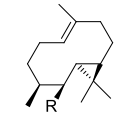
No.	Compounds	MFs	Test solvents	References
9-19-11	kissoone A	$C_{15}H_{22}O$	$CDCl_3$	[231]
9-19-12	kissoone B	$C_{15}H_{22}O_2$	$CDCl_3$	[231]
9-19-13	kissoone C	$C_{17}H_{24}O_3$	$CDCl_3$	[231]
9-19-14	mandolin K	$C_{15}H_{22}O_2$	$CDCl_3$	[232]
9-19-15	(4*S**,5*S**,6*R**,7*R**)-5-methoxy-1(10)*E*-lepidozene	$C_{16}H_{28}O$	$CDCl_3$	[233]
9-19-16	(4*S**,5*S**,6*R**,7*R**)-l(10)*E*-lepidozen-5-o1	$C_{15}H_{26}O$	C_6D_6	[234]
9-19-17	–	$C_{17}H_{24}O_3$	$CDCl_3$	[235]



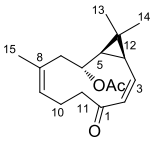
9-19-11 R = Me
9-19-12 R = CH_2OH
9-19-13 R = CH_2OAc



9-19-14



9-19-15 R = OMe
9-19-16 R = OH



9-19-17

Table 9-19-5: ^{1}H NMR spectroscopic data of bicyclogermacrane-type sesquiterpenoids **9-19-11**~**9-19-15**.

H	9-19-11	9-19-12	9-19-13	9-19-14	9-19-15
1	5.00 dd(11.0, 5.5)	4.84 dd(11.0, 5.5)	5.09 dd(11.0, 5.5)	5.07 dd(11.2, 5.2)	5.38 br s
2	2.07 m, 2.16 m	1.82 m, 1.90 m	1.95 m, 2.05 m	2.12 m, 2.20 m	1.83 br q, 2.14 br s
3	1.94 m, 2.74 m	1.66 m, 2.44 d(12.4)	1.76 m, 2.57 m	1.99 dd(12.2, 4.5) 2.77 ddd(12.2, 3.4, 3.4)	1.10~1.17 m, 1.70 br t
4					1.60 m
5	6.24 d(9.5)	6.06 d(9.7)	6.14 d(9.5)	6.29 d(9.6)	2.72 dd(8.2, 1.9)
6	1.43 t(9.5, 9.5)	1.13 dd(9.7, 8.9)	1.22 t(9.5)	1.65 dd(9.6, 9.6)	0.15 dd(8.2, 6.0)
7	0.90 m	0.65 m	0.71 m	1.07 m	–0.14 dd(10.2, 5.5)
8	0.81 m, 1.78 m	0.56 m, 1.52 m	0.64 m, 1.63 m	0.90 m, 1.85 dddd(11.4, 5.0, 2.4, 2.4)	1.10~1.17 m, 1.98 m
9	1.96 m, 2.13 m	1.50 m, 2.30 m	1.66 m, 2.13 m	2.07 ddd(12.5, 12.5, 2.4) 2.15 m	1.96 m, 2.30 br d(12.9)

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Table 9-19-5 (continued)

H	9-19-11	9-19-12	9-19-13	9-19-14	9-19-15
12	1.13 s	0.88 s	0.95 s	3.42 d(11.0), 3.51 d(11.0)	1.06 s
13	1.10 s	0.88 s	0.93 s	1.28 s	1.00 s
14	1.19 s	3.38 d(11.7), 3.10 d(11.7)	3.89 s	1.25 s	1.59 s
15	9.20 s	8.89 s	9.03 s	9.28 d(0.8)	1.01 d(7.1)
OAc			1.74 s		
OMe					3.29 s

Table 9-19-6: ^{1}H NMR spectroscopic data of bicyclogermacrane-type sesquiterpenoids **9-19-16** and **9-19-17**.

H	9-19-16	9-19-17	H	9-19-16	9-19-17
1	5.23 t(7.9)		10		α 2.15 m, β 2.08 m
2	1.93 m, 2.14 m	9.29 s	11		α 1.98 m, β2.76 m
3		6.34 d(9.7)	12	0.99 s	
4	1.57 m	1.70 t(10.0, 9.5)	13	1.00 s	1.17 s
5	3.05 dd(9.2, 2.2)	1.29 t(11.0, 10.0)	14	1.51 s	1.17 s
6	0.24 dd(9.2, 5.5)	4.46 dd(11.0, 4.5)	15	1.10 d(7.0)	1.34 s
7	−0.2 ddd(8.1, 5.5, 2.4)	α 2.26 m, β 2.23 m	OAc		2.04 s
9		5.23 dd(11.0, 4.5)			

Table 9-19-7: Compounds, MFs, and test solvents of aristolane-type sesquiterpenoids **9-19-18**~**9-19-27**.

No.	Compounds	MFs	Test solvents	References
9-19-18	axinysone A	$C_{15}H_{22}O_2$	$CDCl_3$	[236]
9-19-19	axinysone B	$C_{15}H_{22}O_2$	$CDCl_3$	[236]
9-19-20	axinysone C	$C_{15}H_{22}O_3$	$CDCl_3$	[236]
9-19-21	axinysone D	$C_{15}H_{24}O_3$	$CDCl_3$	[236]
9-19-22	axinysone E	$C_{15}H_{20}O_2$	$CDCl_3$	[236]
9-19-23	(10β)-10-hydroxyaristolan-9-one	$C_{15}H_{24}O_2$	$CDCl_3$	[237]
9-19-24	aristol-8-en-1-one	$C_{15}H_{22}O$	$CDCl_3$	[237]
9-19-25	4-*epi*-11-nor-aristola-1(10),11-diene	$C_{14}H_{20}$	C_6D_6	[238]
9-19-26	4-*epi*-11-nor-aristola-1,9,11-triene	$C_{14}H_{18}$	C_6D_6	[238]
9-19-27	(–)-aristol-1(10)-en-12-al	$C_{15}H_{22}O$	C_6D_6	[238]

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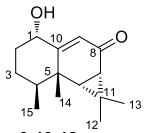
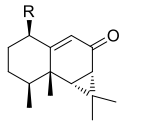
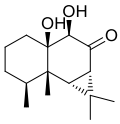


9-19-18



9-19-19 R = OH
9-19-20 R = OOH



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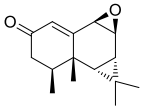

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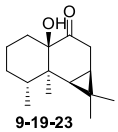

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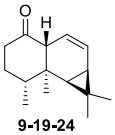

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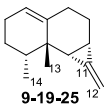

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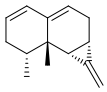
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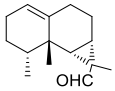

9-19-27

Table 9-19-8: ^{1}H NMR spectroscopic data of aristolane-type sesquiterpenoids **9-19-18**~**9-19-22**.

H	9-19-18	9-19-19	9-19-20	9-19-21	9-19-22
1	4.38 br d(12.0)	4.38 dd(3.0, 3.0)	4.47 dd(2.7, 2.7)	ax 1.43 ddd (13.7, 13.7, 4.1) eq 1.98 m	6.09 s
2	ax 1.39 dddd (13.5, 12.0, 12.0, 3.2) eq 2.15 m	ax 1.58 dddd (14.2, 13.2, 3.6, 3.0) eq 1.99 dddd (14.2, 3.0, 3.0, 3.0)	ax 1.62 m eq 2.16 m	ax 1.34 m eq 1.66 m	
3	ax 1.48 dddd (13.5, 13.5, 12.4, 3.2) eq 1.62 dddd (13.5, 3.8, 3.2, 3.2)	ax 1.84 dddd (13.2, 12.9, 12.9, 3.0) eq 1.40 m	ax 1.62 m eq 1.40 m	ax 1.30 m eq 1.49 m	2.35 m
4	1.84 dqd(12.4, 6.8, 3.8)	1.77 m, 1.40 m	1.80 m	1.95 m	2.25 m
6	1.37 d(8.0)	1.42 d(7.9)	1.44 d(7.9)	1.19 d(8.4)	0.81 d(9.0)
7	1.75 dd(8.0, 1.2)	1.79 dd(7.9, 1.3)	1.83 dd(7.9, 1.3)	1.97 d(8.4)	1.41 dd(9.0, 2.1)
8					3.65 ddd(4.2, 2.1, 1.0)
9	6.20 dd(2.1, 1.2)	5.86 d(1.3)	5.96 d(1.3)	4.23 d(2.6)	3.46 d(4.2)
12	1.21 s	1.21 s	1.22 s	1.22 s	1.11 s
13	1.23 s	1.19 s	1.22 s	1.41 s	1.11 s
14	1.17 s	1.36 s	1.31 s	1.22 s	1.30 s
15	1.07 d(6.8)	1.09 d(6.6)	1.08 d(6.6)	1.03 d(6.7)	1.03 d(6.6)
OOH			7.93 br s		
OH	2.22 br s			4.02 d(2.6) 1.72 br s	

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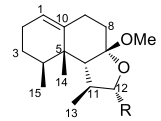
Table 9-19-9: ^{1}H NMR spectroscopic data of aristolane-type sesquiterpenoids **9-19-23**~**9-19-27**.

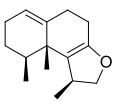
H	9-19-23	9-19-24	9-19-25	9-19-26	9-19-27
1	1.35~1.42 m 1.90~1.93 m		5.35 br s	5.94 d(9.8)	5.33 br s
2	1.53~1.59 m 1.60~1.70 m	2.29~2.42 m	1.99~1.83 m	5.52 d(9.8)	1.95~2.00 m
3	1.16~1.25 m 1.31~1.35 m	1.65~1.73 m 1.90~1.98 m	1.42~1.32 m	1. 87 dd(5.1, 3.2)	1.40~1.46 m
4	1.43~1.51 m	1.92~2.00 m	1.87~1.81 m	1.86~1.88 m	1.58~1.67 m
6	0.81 d(9.1)	0.78 d(8.5)	1.51~1.55 m	1.57~1.60 m	1.48 d(9.8)
7	1.32~1.33 m	1.23 dd(8.5, 5.6)	1.51~1.55 m	1.57~1.60 m	1.60~1.68 m
8	2.26 d(17.0) 3.09 dd(17.0, 9.0)	6.00~6.04 m	1.84~1.99 m	2.32 br d(5.7)	2.07~2.15 m 1.39~1.48 d(9.8)
9		5.8 dd(10.1, 1.9)	1.72~1.78 m 2.13~2.20 m	5.14 t(7.2)	1.87 dd(13.6, 6.3) 2.30~2.38 m
10		2.58 br s			
12	1.05 s	1.01 s	5.44 br d	5.47 d(7.2)	8.66 s
13	1.06 s	1.16 s	1.10 s	1.01 s	1.25 s
14	1.20 s	0.56 s	0.99 d(6.6)	0.94 d(6.6)	1.17 s
15	0.94 d(6.7)	1.05 d(6.6)			0.90 d(6.6)
OH	2.09 br s				

Table 9-19-10: Compounds, MFs, and test solvents of nardosinane-type sesquiterpenoids **9-19-28**~**9-19-37**.

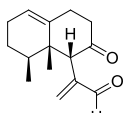
No.	Compounds	MFs	Test solvents	References
9-19-28	2-deoxy-7-*O*-methyllemnacarnol	$C_{16}H_{26}O_2$	$CDCl_3$	[239]
9-19-29	2-deoxy-12*α*-ethoxy-7-*O*-methyllemnacarnol	$C_{18}H_{30}O_3$	$CDCl_3$	[239]
9-19-30	2-deoxy-12*α*-methoxy-7-*O*-methyllemnacarnol	$C_{17}H_{28}O_3$	$CDCl_3$	[239]
9-19-31	nardosinanol A	$C_{15}H_{22}O$	C_6D_6	[240]
9-19-32	nardosinanol B	$C_{15}H_{20}O_2$	C_6D_6	[240]
9-19-33	nardosinanol C	$C_{15}H_{22}O_3$	$CDCl_3$	[240]
9-19-34	nardosinanol D	$C_{16}H_{26}O_4$	$CDCl_3$	[240]
9-19-35	nardosinanol E	$C_{15}H_{22}O_4$	$CDCl_3$	[240]
9-19-36	nardosinanol F	$C_{17}H_{22}O_4$	C_6D_6	[240]
9-19-37	nardosinanol G	$C_{16}H_{24}O_4$	$CDCl_3$	[240]



9-19-28 R = H
9-19-29 R = OEt
9-19-30 R = OMe



9-19-31



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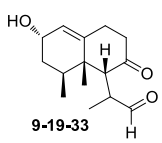

9-19-33

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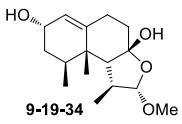

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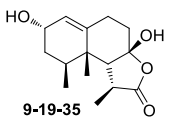

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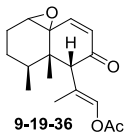

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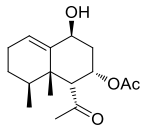

9-19-37

Table 9-19-11: ^{1}H NMR spectroscopic data of nardosinane-type sesquiterpenoids **9-19-28**~**9-19-32**.

H	9-19-28	9-19-29	9-19-30	9-19-31	9-19-32
1	5.45 br s	5.46 br d(4.9)	5.46 br d(4.9)	5.30 br s	5.36 br s
2	2.95 m	1.86 m, 1.91 m	1.98 m, 2.34 m	1.97	1.79
3	1.41 m	1.40 m	1.40 m	1.45	1.17
4	1.70 m	1.66 m	1.65 m	1.63	1.50
6	1.82 m	1.95 d(10.2)	1.96 d(10.2)		4.26 s
8	1.80 m, 1.85 m	1.89 m, 1.91 m	2.90 m, 2.92 m	2.49	2.49, 2.16
9	2.18 m, 2.33 m	2.05 m, 2.35 m	2.04 m, 2.34 m	2.07	2.48, 2.05
11	1.84 m	1.85 m	1.84 m	2.97	
12	3.37 dd(8.7, 5.8) 3.84 dd(8.7, 7.2)	4.59 d(4.9)	4.51 d(4.9)	4.17 t(8.6) 3.82 dd(8.6, 3.0)	9.09 s
13	1.04 d(7.7)	1.16 d(6.8)	1.18 d(6.8)	1.21 d(6.7)	6.18 s 5.43 s
14	1.05 s	1.03 s	1.05 s	1.11 s	0.90 s
15	0.84 d(6.8)	0.81 d(6.3)	0.83 s	1.06 d(6.6)	0.68 d(6.9)
OMe	3.28 s	3.31 s	3.33 s, 3.36 s		
OEt		3.34 dq(14.1, 6.8) 3.76 dq(14.1, 6.8) 1.18 t(6.8)			

Table 9-19-12: ^{1}H NMR spectroscopic data of nardosinane-type sesquiterpenoids **9-19-33**~**9-19-37**.

H	9-19-33	9-19-34	9-19-35	9-19-36	9-19-37
1	5.84 br d(4.7)	5.68 br d(5.0)	5.57 d(5.0)	2.98 br d(2.0)	5.80 br s
2	4.14 br s	4.05 br s	3.93 br s	1.50, 1.85	2.05, 2.10
3	1.57 m	1.57 m	1.52 td(13.0, 4.0) 1.44 m	0.82, 1.39	1.42
4	1.92 m	2.08	1.90 m	1.45	1.57
6	2.85 d(8.8)	1.81 dd(10.6, 1.6)	2.10 d(10.5)	3.14 s	3.48 d(5.3)
7					5.71 dt(12.2, 5.3)
8	2.42 m	2.04 td(13.5, 4.4) 1.89 br d(13.5)	1.62 m, 2.05 m	5.67 d(10.0)	2.23 dt(12.2, 4.1) 2.01
9	2.68 m 2.53 m	2.49 tdt(13.5, 5.0, 1.6) 2.13 dt(13.5, 5.0)	1.96 m, 2.39 m	6.14 d(10.0)	4.50 br s
11	2.69 m	1.90 m	2.40 m		
12	9.62 d(3.1)	4.55 d(4.4)		7.45 s	2.19 s

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Table 9-19-12 (continued)

H	9-19-33	9-19-34	9-19-35	9-19-36	9-19-37
13	0.94 d(7.2)	1.24 d(6.7)	1.36 d(7.0)	1.71 s	
14	0.91 s	1.08 s	0.98 s	1.08 s	1.39 s
15	0.78 d(6.7)	0.87 d(6.7)	0.76 d(6.7)	0.52 d(6.7)	0.93 d(6.5)
OMe		3.35 s			
OAc				1.67 s	2.09 s

Table 9-19-13: Compounds, MFs, and test solvents of valerenane-type sesquiterpenoids **9-19-38**~**9-19-44**.

No.	Compounds	MFs	Test solvents	References
9-19-38	valerenic acid	$C_{15}H_{22}O_2$	$CDCl_3$	[241]
9-19-39	(–)-3β,4β-epoxyvalerenic acid	$C_{15}H_{22}O_3$	$CDCl_3$	[241]
9-19-40	methyl (–)-3β,4β-epoxyvalerenate	$C_{16}H_{24}O_3$	$CDCl_3$	[241]
9-19-41	methyl (–)-3α,4α-epoxyvalerenate	$C_{16}H_{24}O_3$	$CDCl_3$	[241]
9-19-42	valerena-4,7(11)-diene	$C_{15}H_{24}$	$CDCl_3$	[242]
9-19-43	caulerpal A	$C_{17}H_{20}O_4$	$CDCl_3$	[243]
9-19-44	caulerpal B	$C_{16}H_{20}O_3$	$CDCl_3$	[243]

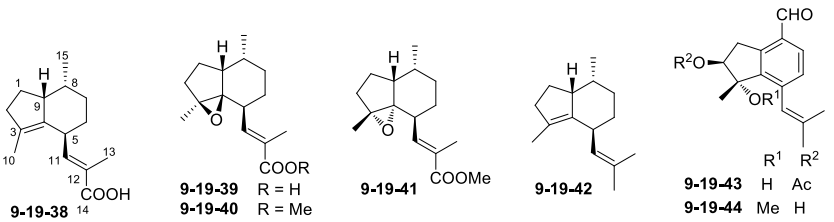

Table 9-19-14: ^{1}H NMR spectroscopic data of valerenane-type sesquiterpenoids **9-19-38**~**9-19-42**.

H	9-19-38	9-19-39	9-19-40	9-19-41	9-19-42
1	1.58 m	1.33 m	1.32 m	1.35 m	1.48~1.57 m
	1.80 m	1.58 m	1.56 m		1.76~1.89 m
2	2.23 t(7.2, 13.6)	1.64 m	1.65 m	1.84 m	2.11~2.25 m
		1.89 m	1.87 m	1.50 m	
5	2.57 dd(5.5, 9.5)	2.66 dd(3.9, 9.5)	2.58 dd(3.7, 8.3)	2.62 dd(4.5, 10.1)	3.36~3.42 m
6	1.45 m	1.64 m	1.62 m	1.49 m	1.27~1.38 m
	1.85 m	1.86 m	1.89 m	2.12 m	1.61~1.63 m
7	1.46 m	1.38 m	1.39 m	1.53 m	1.27~1.38 m
	1.85 m	1.82 m	1.85 m		1.76~1.89 m

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Table 9-19-14 (continued)

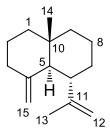
H	9-19-38	9-19-39	9-19-40	9-19-41	9-19-42
8	2.02 m	2.07 m	2.07 m	2.13 m	1.90~2.00 m
9	2.92 m	2.44 t(7.2, 13.6)	2.44 t(7.6, 13.7)	2.18 m	2.93 br s
10	1.66 s	1.42 s	1.41 s	1.23 s	1.63 s
11	7.16 d(9.7)	7.29 d(9.8)	7.15 dq(1.4, 9.7)	7.00 d(10.5)	5.46 d(9.4)
13	1.92 s	1.83 s	1.85 d(1.3)	1.86 s	1.66 s
14					1.69 s
15	0.81 d(8.0)	0.87 d(7.3)	0.87 d(7.3)	1.03 d(7.1)	0.75 d(7.1)
OMe			3.73 s	3.75 s	
COOH	12.29 br s				

Table 9-19-15: ^{1}H NMR spectroscopic data of valerenane-type sesquiterpenoids **9-19-43** and **9-19-44**.

H	9-19-43	9-19-44	H	9-19-43	9-19-44
1α	3.90 dd(17.4, 8.4)	3.84 dd(16.9, 8.0)	13	1.82 d(1.1)	1.84 d(1.2)
1β	3.03 dd(17.4, 8.9)	2.84 dd(16.9, 8.5)	14	1.97 d(1.2)	1.98 d(1.2)
2	5.29 dd(8.9, 8.4)	4.71 dd(8.5, 8.0)	15	10.07 s	10.01 s
6	7.31 d(7.9)	7.28 d(7.9)	OMe		3.61 s
7	7.68 d(7.9)	7.69 d(7.9)	OAc	2.20 s	
10	1.35 s	1.40 s	OH	3.68 br s	
11	6.81 br s	6.61 br s			

Table 9-19-16: Compounds, MFs, and test solvents of gorgonane-type sesquiterpenoids **9-19-45**~**9-19-49**.

No.	Compounds	MFs	Test solvents	References
9-19-45	(+)-(5*S*,6*S*,10*S*)-β-gorgonene	$C_{15}H_{24}$	C_6D_6	[244]
9-19-46	(+)-(5*R*,6*S*,10*S*)-α-gorgonene	$C_{15}H_{24}$	C_6D_6	[244]
9-19-47	(5*S*,6*S*,10*S*)-gorgona-1,4(15),11-triene	$C_{15}H_{22}$	C_6D_6	[244]
9-19-48	(–)-(4*R*,5*R*,6*S*,10*S*)-gorgon-11-en-4-ol	$C_{15}H_{26}O$	C_6D_6	[244]
9-19-49	4α-formamidogorgon-11-ene	$C_{16}H_{27}NO$	$CDCl_3$	[245]



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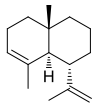

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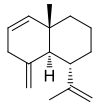

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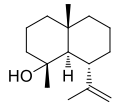

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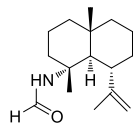

9-19-49

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Table 9-19-17: ^{1}H NMR spectroscopic data of gorgonane-type sesquiterpenoids **9-19-45**~**9-19-49**.

H	9-19-45	9-19-46	9-19-47	9-19-48	9-19-49(*E*/*Z* 5:2)
1	*Re* 1.31~1.38 m	*Re* 1.34~1.43 m	5.40~5.47 m	*Re* 1.16~1.20 m	ax 1.13 ddd(13.0, 13.0, 3.5)
	Si 1.18 ddd(4.4, 4.4, 13.2)	*Si* 1.27~1.31 m		*Si* 0.99~1.09 m	eq 1.37 ddd(13.0, 5.0, 3.0)
2	1.47~1.60 m	1.98-2.10 m	5.40~5.47 m	1.32~1.46 m	ax 1.46~1.50 m eq 1.64~1.68 m
3	*Re* 1.90 ddd(5.4, 5.4, 12.9)	5.37 br s	2.51~2.55 m	1.59~1.65 m	ax 1.56~1.60 m
	Si 2.21 m		2.76~2.81 m	1.74~1.76 m	eq 1.68 ddd(11.0, 3.0, 3.0)
5	1.76 d(11.7)	2.15 br s	2.11 d(11.7)	1.49 d(11.3)	1.32 d(11.0)
6	2.32 m	2.15 br s	2.41 ddd(3.8, 11.7, 11.7)	2.31~2.36 m	ax 2.47 ddd(11.0, 11.0, 3.5) eq 1.42~1.46 m
7	*Re* 1.66~1.71 m *Si* 1.26 m	*Re* 1.19~1.25 m *Si* 1.64~1.72 m	*Re* 1.65~1.69 m *Si* 1.22 dd(4.7, 12.3)	1.32~1.46 m	1.51~1.55 m
8	*Re* 1.40~1.44 m	*Re* 1.34~1.43 m	1.41~1.51 m	1.32~1.46 m	ax 1.41~1.46 m/ 1.40~1.45 m
	Si 1.47~1.60 m	*Si* 1.44~1.60 m			eq 1.54~1.60 m/ 1.45~1.51 m
9	*Re* 1.09 ddd(4.1, 4.1, 13.2)	*Re* 1.34~1.43 m	*Re* 1.31 dd(4.4, 13.2)	*Re* 0.99~1.09 m	ax 1.15 ddd(13.0, 13.0, 3.5)
	Si 1.31~1.38 m	*Si* 0.98~1.09 m	*Si* 1.41~1.51 m	*Si* 1.16~1.20 m	eq 1.28~1.33 m
12	*Z* 4.77~4.80 m *E* 4.81~4.82 m	*Z* 4.75 m *E* 4.79 s	4.79~4.81 m	4.63 m 4.79 d(2.5)	4.74 br s/4.69 br s 4.86 d(2.0)/ 4.82 br s
13	1.61 s	1.64 s	1.58 s	1.78 d	1.62 s
14	0.82 s	0.88 s	0.94 s	0.79 s	1.01 s/0.98 s
15	*Z* 4.77~4.80 m *E* 4.88 br s	1.83 d(1.5)	*Z* 4.86 d(1.9) *E* 4.95 br s	1.22 m	1.31 s
CHO					8.12 d(12.5)/ 7.87 d(2.5)
NH					5.74 d(12.5)/ 5.01 d(2.5)

Table 9-19-18: Compounds, MFs, and test solvents of brasilane-type sesquiterpenoids **9-19-50**~**9-19-54**.

No.	Compounds	MFs	Test solvents	References
9-19-50	xylarenic acid	$C_{15}H_{24}O_3$	$CDCl_3$	[246]
9-19-51	(1*R**,5*R**,6*R**,8*S**,9*R**)-8-chloro-1,6-epoxy-5-isopro-pyl-3,3,9-trimethylbicyclo[4.3.0]-nonan-9-ol	$C_{15}H_{25}ClO_2$	$CDCl_3$	[247]

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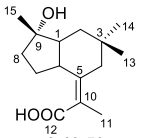
Table 9-19-18 (continued)

No.	Compounds	MFs	Test solvents	References
9-19-52	(1*R**,5*R**,6*R**,8*S**,9*R**)-8-bromo-1,6-epoxy-5-isopro-pyl-3,3,9-trimethylbicyclo[4.3.0]nonan-9-ol	$C_{15}H_{25}BrO_2$	$CDCl_3$	[247]
9-19-53	(1*S**,5*R**,6*S**,8*R**,9*S**)-8-chloro-1,6-epoxy-5-isopro-pyl-3,3,9-trimethylbicyclo[4.3.0]-nonan-9-ol	$C_{15}H_{25}ClO_2$	$CDCl_3$	[247]
9-19-54	brasila-5,10-diene	$C_{15}H_{24}$	C_6D_6	[248]



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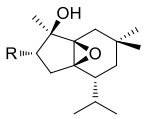
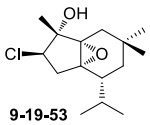


9-19-51 R = Cl
9-19-52 R = Br



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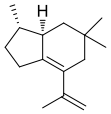

9-19-54

Table 9-19-19: ^{1}H NMR spectroscopic data of brasilane-type sesquiterpenoids **9-19-50**~**9-19-54**.

H	9-19-50	9-19-51	9-19-52	9-19-53	9-19-54
1	1.84 dd(12.8, 3.6)				
2	*α* 1.11 t(12.8)	*α* 1.58 d(14.5)	*α* 1.59 d(15.0)	*α* 1.49 d(15.0)	1.56 ddd (12, 6, 2)
	β 1.57 dd(12.8, 3.6)	*β* 1.85 br d(14.5)	*β* 1.87 br d(15.0)	*β* 1.80 dd(15.0, 2.0)	0.86 t(12)
4	*α* 2.48 d(14.1)	*α* 0.88 dd(12.7, 12.7)	*α* 0.88 dd(12.9, 12.9)	*α* 1.15 dd(13.3, 12.6)	2.07 m
	β 1.95~1.98 m	*β* 1.21 ddd(12.7, 5.2, 1.6)	*β* 1.21 ddd(12.9, 5.1, 1.4)	*β* 0.97 ddd(13.3, 5.1, 2.0)	
5		1.95 m	1.95 m	1.79 m	
6	2.00~2.02 m				
7	*α* 2.06~2.09 m	*α* 1.84 dd(13.9, 9.2)	*α* 1.99 dd(13.9, 9.3)	*α* 2.72 dd(14.0, 7.3)	2.31~2.50 m
	β 1.88~1.90 m	*β* 2.67 dd(13.9, 7.3)	*β* 2.69 dd(13.9, 7.5)	*β* 1.66 dd(14.0, 9.5)	
8	*α* 1.90~1.92 m *β* 1.70~1.73 m	3.88 dd(9.2, 7.3)	3.92 dd(9.3, 7.5)	3.91 dd(9.5, 7.3)	1.07~1.31 m
9					1.07~1.31 m
10		1.92 m	1.93 m	1.97 m	
11	2.00 s	0.98 d(6.6)	0.98 d(6.6)	0.93 d(7.1)	1.82 s
12		0.84 d(6.6)	0.84 d(6.6)	0.90 d(7.1)	4.91 s, 5.03 s
13	0.97 s	0.96 s	0.96 s	0.80 s	0.94 s①

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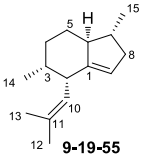
Table 9-19-19 (continued)

H	9-19-50	9-19-51	9-19-52	9-19-53	9-19-54
14	0.93 s	0.95 s	0.95 s	0.92 s	0.99 s①
15	0.18 s	1.22 s	1.27 s	1.22 s	1.00 d(7)
OH		1.56 s	1.80 s		

① Assignments may be exchanged.

Table 9-19-20: Compounds, MFs, and test solvents of pacifigorgiane-type sesquiterpenoids **9-19-55**~**9-19-58**.

No.	Compounds	MFs	Test solvents	References
9-19-55	pacifigorgia-1(9),10-diene	$C_{15}H_{24}$	$CDCl_3$	[242]
9-19-56	pacifigorgia-1(6),10-diene	$C_{15}H_{24}$	$CDCl_3$	[242]
9-19-57	pacifigorgia-2(10),11-diene	$C_{15}H_{24}$	C_6D_6	[242]
9-19-58	pacifigorgia-6,10-diene	$C_{15}H_{24}$	$CDCl_3$	[242]



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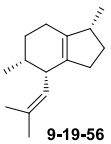
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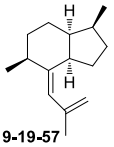

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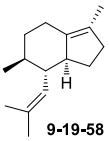

9-19-58

Table 9-19-21: ^{1}H NMR spectroscopic data of pacifigorgiane-type sesquiterpenoids **9-19-55**~**9-19-58**.

H	9-19-55	9-19-56	9-19-57	9-19-58
1			1.82~1.92 m	
2	3.24 dd(4.6, 10.2)	2.82 br s		1.49~1.56 m
3	1.55~1.61 m	1.73~1.87 m	1.82~1.92 m	1.19~1.30 m
4	1.31~1.40 m	1.36~1.52 m	1.69~1.78 m	0.88~0.98 m
				1.74~1.80 m
5	0.92~1.04 m	1.73~1.87 m	0.97~1.15 m	1.74~1.80 m
	1.95~2.03 m	1.93~2.10 m	1.82~1.92 m	2.44~2.48 m
6	2.05~2.15 m		0.81~0.92 m	
7	1.74~1.93 m	2.47~2.57 m	1.35~1.45 m	
8	1.74~1.93 m	1.23~1.31 m	1.15~1.27 m	2.17~2.21 m
	2.39~2.48 m	1.93~2.10 m	1.82~1.92 m	
9	5.18 s	1.93~2.10 m	0.97~1.15 m	1.19~1.30 m
		2.16~2.25 m	1.96~2.06 m	1.85~1.92 m
10	5.19 d(11.7)	4.88 d(10.2)	5.68 s	4.81 br d(10.1)
12	1.64 s	1.65 s	4.84 s, 4.92 s	1.60 d(1.3)

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Table 9-19-21 (continued)

H	9-19-55	9-19-56	9-19-57	9-19-58
13	1.71 s	1.71 s	1.81 s	1.72 d(0.9)
14	0.80 d(6.6)	0.83 d(7.1)	1.05 d(6.6)	0.79 d(6.6)
15	1.07 d(6.6)	0.95 d(6.6)	0.95 d(6.6)	1.61 s

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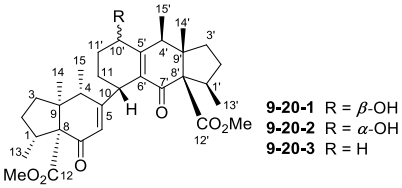
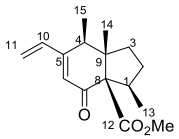
9.20 Pinguisane-type sesquiterpenoids

Table 9-20-1: Compounds, MFs, and test solvents of pinguisane-type sesquiterpenoids **9-20-1**~**9-20-7**.

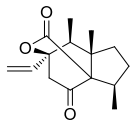
No.	Compounds	MFs	Test solvents	References
9-20-1	bisacutifolone A	$C_{32}H_{44}O_7$	$CDCl_3$	[249]
9-20-2	bisacutifolone B	$C_{32}H_{44}O_7$	$CDCl_3$	[249]
9-20-3	bisacutifolone C	$C_{32}H_{44}O_6$	$CDCl_3$	[249]
9-20-4	acutifolone A	$C_{16}H_{22}O_3$	$CDCl_3$	[249]
9-20-5	acutifolone B	$C_{15}H_{20}O_3$	$CDCl_3$	[249]
9-20-6	lejeuneapinguisanolide	$C_{15}H_{22}O_4$	C_6D_6	[250]
9-20-7	lejeuneapinguisenone	$C_{15}H_{22}O_2$	C_6D_6	[250]



9-20-1 R = β-OH
9-20-2 R = α-OH
9-20-3 R = H



9-20-4



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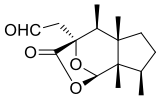

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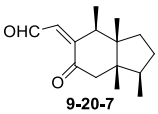

9-20-7

Table 9-20-2: ^{1}H NMR spectroscopic data of pinguisane-type sesquiterpenoids **9-20-1**~**9-20-3**.

H	9-20-1	9-20-2	9-20-3
1	2.18 m	2.17 m	2.19 m
2	1.75 m, 1.96 m	1.75 m, 1.95 m	1.77 m, 1.94 m
3	1.59 m, 1.87 m	1.59 m, 1.86 m	1.60 m, 1.89 m
4	2.91 dq(7.1, 2.2)	2.91 dd(7.1, 1.9)	2.91 dq(7.1, 1.9)
6	5.55 d(2.2)	5.82 d(2.2)	5.59 d(1.9)
10	3.58 dd(6.0, 5.9)	3.48 dd(5.9, 5.9)	3.55 dd(5.2, 4.7)
11	1.61 m, 2.13 m	1.78 m, 1.91 m	1.68 m, 1.83 m
12	1.06 d(6.9)	1.07 d(6.9)	1.06 d(6.9)
14	0.90 s	0.91 s	0.91 s
15	1.29 d(7.1)	1.28 d(7.1)	1.28 d(7.1)
1′	1.82 m	1.76 m	1.96 m

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Table 9-20-2 (continued)

H	9-20-1	9-20-2	9-20-3
2′	1.67 m, 1.78 m	1.64 m, 1.73 m	1.68 m, 1.81 m
3′	1.56 m, 1.68 m	1.53 m, 1.81 m	1.55 m, 1.73 m
4′	2.58 q(6.9)	2.63 d(7.0)	2.31 q(7.1)
10′	4.35 br s	4.29 br s	2.16 m, 2.36 m
11′	1.72 m, 2.03 m	1.84 m, 1.89 m	1.65 m, 1.81 m
13′	0.97 d(6.6)	1.00 d(6.6)	0.98 d(6.9)
14′	1.01 s	1.02 s	0.94 s
15′	1.27 d	1.16 d(7.1)	1.16 d(7.1)
OMe	3.66 s, 3.66 s	3.66 s, 3.66 s	3.66 s, 3.66 s

Table 9-20-3: ^{1}H NMR spectroscopic data of pinguisane-type sesquiterpenoids **9-20-4**~**9-20-7**.

H	9-20-4	9-20-5	9-20-6	9-20-7
1	2.21 m	3.24 m	2.45 m	1.60 m
2	1.68 m, 1.73 m	1.55 m, 2.20 m	1.01 m, 1.54 m	1.11 m, 1.26 m
3	1.53 m, 1.65 m	1.08 m, 1.77 dd(12.6, 8.0)	0.97 m, 1.17 m	0.93 m, 1.41 m
4	2.62 q(7.1)	1.84 dq(7.1, 1.9)	1.68 q(6.1)	2.11 q(2.4, 6.6, 13.2)
5				1.81 d(15.0), 2.21 d(15.0)
6	5.99 s	2.49 dd(19.0, 1.9)		
7		2.58 d(18.1)	5.00 s	
10	6.46 dd(17.4, 11.0)	5.85 dd(17.4, 11.3)	2.30 dd(3.8, 16.5)	5.77 dd(2.4, 7.8)
			2.43 dd(1.2, 16.5)	
11	5.45 d(11.0)	5.34 dd(11.3, 1.1)	9.40 dd(0.6, 7.4)	10.17 d(7.8)
	5.69 d(17.4)	5.48 dd(17.4, 1.1)		
12			0.42 s	0.39 s
13	1.25 d(7.1)	1.41 d(7.7)	0.54 d(4.2)	0.40 d(7.2)
14	1.11 s	1.10 s	0.80 s	0.41 s
15	1.18 d(7.1)	1.03 d(7.1)	0.53 d(3.0)	1.56 d(6.6)
OMe	3.67 s			

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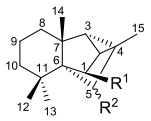
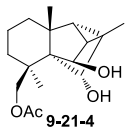
9.21 Cyclomyltaylane-type sesquiterpenoids

Table 9-21-1: Compounds, MFs, and test solvents of cyclomyltaylane-type sesquiterpenoids **9-21-1**~**9-21-10**.

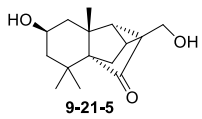
No.	Compounds	MFs	Test solvents	References
9-21-1	cyclomyltaylane-5β-ol	$C_{15}H_{24}O$	$CDCl_3$	[251]
9-21-2	cyclomyltaylane-1β,5α-diol	$C_{15}H_{24}O_2$	$CDCl_3$	[251]
9-21-3	cyclomyltaylane-5α-ol	$C_{15}H_{24}O$	$CDCl_3$	[251]
9-21-4	12-acetoxy-myltaylane-1α,5β-diol	$C_{17}H_{26}O_4$	$CDCl_3$	[251]
9-21-5	5-oxomyltaylane-9β,15-diol	$C_{15}H_{22}O_3$	$CDCl_3$	[251]
9-21-6	5*R*-acetoxy-1*R*-hydroxycyclomyltaylan-10-one	$C_{17}H_{24}O_4$	$CDCl_3$	[252]
9-21-7	1*R*,5*R*-dihydroxycyclomyltaylan-10-one	$C_{15}H_{22}O_3$	$CDCl_3$	[252]
9-21-8	5*R*,10β-diacetoxycyclomyltaylan-9β-ol	$C_{19}H_{28}O_5$	$CDCl_3$	[252]
9-21-9	5*R*,10β,13-triacetoxycyclomyltaylan-9β-ol	$C_{21}H_{30}O_7$	$CDCl_3$	[252]
9-21-10	5*R*,9β,13-triacetoxycyclomyltaylan-10β-ol	$C_{21}H_{30}O_7$	$CDCl_3$	[252]



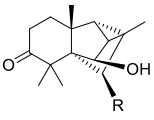
	R^1	R^2
9-21-1	H	β-OH
9-21-2	OH	α-OH
9-21-3	H	α-OH



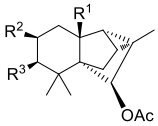
9-21-4



9-21-5



9-21-6 R = OAc
9-21-7 R = OH



	R^1	R^2	R^3
9-21-8	Me	OH	OAc
9-21-9	CH_2OAc	OH	OAc
9-21-10	CH_2OAc	OAc	OH

Table 9-21-2: ^{1}H NMR spectroscopic data of cyclomyltaylane-type sesquiterpenoids **9-21-1**~**9-21-5**.

H	9-21-1	9-21-2	9-21-3	9-21-4	9-21-5
1α	1.15 d(10.7)	3.85 s	1.22 d(10.7)	3.86 s	1.98 m
1β	1.83 d(10.7)		1.36 dd(1.6, 10.7)		
2	1.02 dd(1.1, 4.9)	1.23 m	0.89 dd(1.6, 10.7)	1.23 dd(1.4, 5.2)	2.08 m
3	0.96 d(10.7)	1.27 d(4.9)	0.93 d(5.2)	1.27 d(5.2)	
5	4.08 s	3.48 s	3.64 s	3.59 s	1.96 d(5.2)
8α	1.56 ddd (3.8, 3.8, 12.5)	2.12 ddd (4.1, 4.1, 12.6)	1.99 ddd (4.4, 4.4, 12.4)	2.16 ddd (4.4, 4.4, 12.9)	1.35 dd(3.6, 14.8)
8β	1.32 m	1.33 m	1.16 m	1.32 m	1.92 m
9α	1.47 m	1.50 m	1.47 m	1.50 m	4.34 m
9β	1.65 m	1.67 m	1.60 m	1.60 m	

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Table 9-21-2 (continued)

H	9-21-1	9-21-2	9-21-3	9-21-4	9-21-5
10α	1.41 m	1.98 ddd(4.7, 4.7, 13.7) 1.11 m	1.87 ddd(4.7, 4.7, 1.37) 1.16 m	1.96 ddd(4.9, 4.9, 13.9) 1.48 m	2.10 dd(0.5, 4.7)
10β	1.12 m				1.48 m
12	1.20 m	1.20 s	0.89 s	4.36 d(11.3) 4.41 d(11.3)	1.11 s
13	0.93 s	1.07 s	0.98 s	1.06 s	1.07 s
14	1.43 s	1.47 s	1.01 s	1.46 s	1.39 br s
15	1.10 s	1.15 m	1.13 s	1.16 s	3.66 d(12.4), 3.77 d(12.4)
OAc				2.09 s	

Table 9-21-3: ^{1}H NMR spectroscopic data of cyclomyltaylane-type sesquiterpenoids **9-21-6**~**9-21-10**.

H	9-21-6	9-21-7	9-21-8	9-21-9	9-21-10
1	4.76 br s	4.70 d(1.0)	1.66 dd(11.0, 1.3) 1.46 d(11.0)	1.70 dd(11.0, 1.3) 1.53 d(11.0)	1.65 dd(11.0, 1.3) 1.57 d(11.0)
2	1.38 br d(5.2)	1.36 br d(5.2)	1.06 br d(5.2)	1.15 br d(5.2)	1.15 br d(5.2)
3	1.39 d(5.2)	1.33 d(5.2)	1.01 d(5.2)	1.42 d(5.2)	1.42 d(5.2)
5	5.30 s	3.87 s	5.00 s	5.00 s	5.01 s
8	1.73 ddd(14.0, 7.4, 2.0) 2.03 ddd(14.0, 13.1, 5.7)	1.67 ddd(14.0, 7.4, 2.0) 1.88 ddd(14.0, 13.1, 5.7)	2.40 dd(14.5, 3.8) 1.87 dd(14.5, 2.2)	2.26 m 2.26 m	2.26 m 2.26 m
9	2.32 ddd(15.4, 1.31, 7.4) 2.75 ddd(15.4, 5.7, 2.0)	2.81 ddd(15.4, 13.1, 7.4) 2.23 ddd(15.4, 5.7, 2.0)	4.16 td(3.8, 2.2)	4.16 td(3.8, 3.8)	5.24 td(4.3, 3.2)
10			5.28 d(3.8)	5.29 d(3.8)	3.88 d(4.3)
12	1.07 s	1.28 s	1.14 s	1.01 s	1.00 s
13	1.40 s	1.42 s	1.34 s	0.83 s	1.01 s
14	1.69 s	1.69 s	0.81 s	3.95 d(9.6) 5.05 d(9.6)	3.74 d(9.8) 4.87 d(9.8)
15	1.01 s	1.12 s	1.03 s	1.06 s	1.05 s
OAc	2.03 s		2.16 s(5-OAc) 2.13 s(10-OAc)	2.18 s(5-OAc) 2.13 s(10-OAc) 2.11 s(14-OAc)	2.07 s(5-OAc) 2.08 s(10-OAc) 2.10 s(14-OAc)

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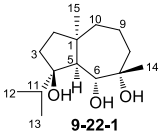
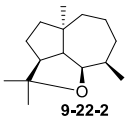
9.22 Salviolane-type sesquiterpenoids

Table 9-22-1: Compounds, MFs, and test solvents of salviolane-type sesquiterpenoids **9-22-1**~**9-22-7**.

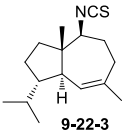
No.	Compounds	MFs	Test solvents	References
9-22-1	homalomenol E	$C_{15}H_{28}O_3$	DMSO-d_6	[253]
9-22-2	(+)-6,11-epoxy-isodaucane	$C_{15}H_{26}O$	C_6D_6	[254]
9-22-3	4,5-*epi*-10-isothiocyanatoisodauc-6-ene	$C_{16}H_{25}NS$	$CDCl_3$	[255]
9-22-4	dysodensiol E	$C_{15}H_{24}O_3$	$CDCl_3$	[256]
9-22-5	15-methoxyisodauc-3-ene-1*β*,5*α*-diol	$C_{16}H_{28}O_3$	$CDCl_3$	[257]
9-22-6	(1*S*,3*aS*,4*R*,5*R*,8*aR*)-1,2,3,3*a*,4,5,6,8*a*-octahydro-7-(hydroxymethyl)-3*a*-methyl-1-(1-methylethyl)-azulene-4,5-diol	$C_{15}H_{26}O_3$	$CDCl_3$	[258]
9-22-7	[(3*aR*,6*aR*,7*S*,9*aS*,9*bR*)-3*a*,4,6*a*,7,8,9,9*a*,9*b*-octahydro-2,2,9a-trimethyl-7-(1-methylethyl)azuleno[4,5-d][1,3]dioxol-5-yl]methanol	$C_{18}H_{30}O_3$	C_6D_6	[258]



9-22-1



9-22-2



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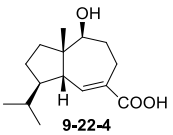

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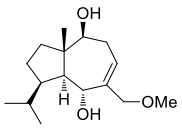

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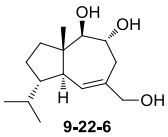

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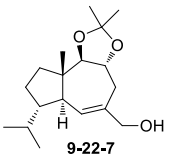

9-22-7

Table 9-22-2: ^{1}H NMR spectroscopic data of salviolane-type sesquiterpenoids **9-22-1**~**9-22-5**.

H	9-22-1	9-22-2	9-22-3	9-22-4	9-22-5
2	1.33 m 1.43 m	1.40~1.49 m	*α* 1.35~1.39 m *β* 1.70~1.75 m	*α* 1.43 m *β* 1.67 m	1.55 m 1.69 m
3	1.21 m, 1.45 m	1.57~1.60 m	*α* 1.33~1.36 m *β* 1.65~1.70 m	*α* 1.81 m *β* 1.43 m	1.59 m 1.66 m
4		2.35~2.40 m	1.77~1.82 m	1.79 m	2.58 m
5	1.32 d(6.0)	1.99 t(9.5)	1.98~2.03 m	2.15 m	2.44 dd(11.0, 9.8)

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Table 9-22-2 (continued)

H	9-22-1	9-22-2	9-22-3	9-22-4	9-22-5
6	3.90 d(6.0)	1.57~1.60 m, 3.22 t(9.8)	5.15 br s	6.88 d(4.6)	4.39 br d(9.8)
7					
8	1.34 m, 1.57 m	0.94 dq(2.5, 12.0) 1.66~1.72 m	*α* 2.25 t(11.5), *β* 1.92~1.97 m	*α* 2.72 dd(5.8, 13.9) *β* 2.18 m	5.89 ddd(6.8, 2.4, 2.4)
9	1.42 m, 1.54 m	1.22~1.27 m 1.40~1.49 m	*α* 2.01~2.07 m *β* 1.70~1.74 m	*α* 1.84 m *β* 1.53 m	*α* 2.58 m *β* 2.24 m
10	1.26 m, 1.42 m	1.15~1.23 m, 1.57~1.60 m	3.28 dd(12.2, 3.5)	3.37 dd(5.8, 10.1)	3.57 m
11	1.97 m		1.51~1.55 m	1.57 m	2.37 m
12	0.68 d(6.9)	1.30 s	0.77 s	0.91 d(6.6)	0.90 d(6.8)
13	0.84 d(7.0)	1.17 s	0.79 s	0.90 d(6.9)	0.92 d(7.1)
14	1.06 s	1.21 d(6.6)	1.70 s		3.82 d(9.0), 4.09 dd(9.0, 1.0)
15	0.91 s	0.85 s	0.74 s	1.02 s	0.82 s

Table 9-22-3: ^{1}H NMR spectroscopic data of salviolane-type sesquiterpenoids **9-22-6** and **9-22-7**.

H	9-22-6	9-22-7	H	9-22-6	9-22-7
2	1.49~1.53 m, 1.94~1.98 m	1.39~1.44 m, 1.84~1.93 m	10	3.25 d(9.0)	3.30 d(9.0)
3	1.32~1.38 m, 1.72~1.80 m	1.29~1.35 m	11	1.49~1.53 m	1.52~1.58 m
4	1.72~1.80 m	1.68~1.75 m	12	0.88 d(6.5)	0.80 d(6.5)
5	2.11 dd(9.5, 5.5)	1.84~1.92 m	13	0.84 d(7.0)	0.87 d(6.5)
6	5.48 d(4.5)	5.45 dd(3.5, 1.5)	14	3.95 s	3.66 s
8	2.39~2.49 m	*α* 2.51 ddd(14.0, 2.0, 1.0) *β* 2.22 td(13.5, 1.5)	15 OAc	0.96 s	0.91 s 1.42 s, 1.49 s
9	3.57 ddd(12.0, 9.0, 3.0)	3.58 ddd(11.0, 8.5, 2.0)			

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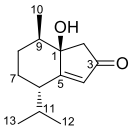
9.23 Some additional sesquiterpenoids

Table 9-23-1: Compounds, MFs, and test solvents of bisnorsesquiterpene-type sesquiterpenoids **9-23-1**~**9-23-3**.

No.	Compounds	MFs	Test solvents	References
9-23-1	(+)-(1*R*,6*S*,9*R*)-1-hydroxyl-6-isopropyl-9-methylbicyclo[4.3.0]non-4-en-3-one	$C_{13}H_{20}O_2$	CD_3COCD_3	[259]
9-23-2	(–)-(1*S*,6*S*,9*R*)-1-hydroxyl-6-isopropyl-9-methylbicyclo[4.3.0]non-4-en-3-one	$C_{13}H_{20}O_2$	CD_3COCD_3	[259]
9-23-3	(+)-(5*S*,6*R*,9*S*)-5-hydroxyl-6-isopropyl-9-methylbicyclo[4.3.0]non-1-en-3-one	$C_{13}H_{20}O_2$	CD_3COCD_3	[259]



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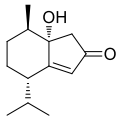

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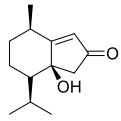

9-23-3

Table 9-23-2: ^{1}H NMR spectroscopic data of bisnorsesquiterpene-type sesquiterpenoids **9-23-1**~**9-23-3**.

H	9-23-1	9-23-2	9-23-3
2*α*	2.42 d(18.5)	2.24 d(18.5)	5.80 s
2*β*	2.28 d(18.5)	2.56 d(18.5)	
4	5.68 d(1.5)	5.83 s	*α* 2.20 d(18.5) *β* 2.80 d(18.5)
6	2.46 ddd(12.5, 6.5, 4.0)	2.29 dd(10.5, 5.5)	1.99 ddd(12.0, 6.5, 5.0)
7*α*	1.13 dddd(12.5, 12.5, 12.5, 4.0)	1.85 ddd(14.0, 4.0, 4.0)	2.02 dddd(12.5, 5.0, 5.0, 4.0)
7*β*	1.98 dddd(12.5, 4.0, 4.0, 4.0)	1.70 dddd(14.0, 14.0, 5.5, 4.0)	1.35 dddd(12.5, 12.5, 12.0, 4.0)
8*α*	1.55 dddd(12.5, 4.0, 4.0, 4.0)	2.38 dddd(14.0, 14.0, 4.5, 4.0)	1.80 dddd(13.5, 12.5, 12.5, 4.0)
8*β*	1.65 dddd(12.5, 12.5, 12.5, 4.0)	1.22 dddd(14.0, 4.0, 4.0, 4.0)	1.71 dddd(12.5, 5.0, 4.0, 4.0)
9	1.47 m	2.24 m	2.83 dq(13.5, 7.0)
10	1.03 d(6.5)	0.83 d(7.0)	1.33 d(7.0)
11	1.94 m	2.42 m	1.87 m
12	0.93 d(7.0)	0.85 d(6.5)	0.73 d(6.5)
13	0.98 d(6.5)	0.96 d(6.5)	0.97 d(6.5)
OH	4.10 s(1-OH)	4.23 br s(1-OH)	4.15 s(5-OH)

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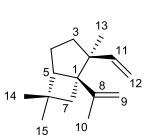
Table 9-23-3: Compounds, MFs, and test solvents of hydrocarbon-type sesquiterpenoids **9-23-4**~**9-23-6**.

No.	Compounds	MFs	Test solvents	References
9-23-4	panaxene	$C_{15}H_{24}$	C_6D_6	[260]
9-23-5	panaginsene	$C_{15}H_{24}$	C_6D_6	[260]
9-23-6	ginsinsene	$C_{15}H_{24}$	C_6D_6	[260]



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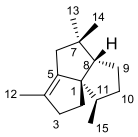
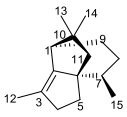


9-23-5



9-23-6

Table 9-23-4: ^{1}H NMR spectroscopic data of hydrocarbon-type sesquiterpenoids **9-23-4**~**9-23-6**.

H	9-23-4	9-23-5	9-23-6
1			1.90 t
2		1.91, 2.1	
3	1.71 m, 1.70 m	2.14, 2.7	
4	1.56 m, 1.74 m		2.35 m, 2.56 m
5	2.47 d(5.4)		1.54 m, 1.93 m
6		1.66, 1.85	
7	1.68 m, 1.78 d(12.0)		1.62 m
8		1.57 m	1.20 m, 1.45 m
9	4.88 m, 4.97 m	1.53, 1.72 sept	1.45 m, 1.70 m
10	1.68 s	1.08, 1.62	
11	5.86 dd(6.6, 28.4)	1.92	0.96 d(13.2), 1.61 m
12	4.95 dd(1.51, 17.5) 4.90 dd(1.6, 10.9)	1.68 s	1.65 s
13	1.03 s	0.97 s	0.99 s
14	1.15 s	0.89 s	1.07 s
15	0.81 s	0.99 d(6.9)	0.81 d(6.6)

Table 9-23-5: Compounds, MFs, and test solvents of isolitseane-type sesquiterpenoids **9-23-7**~**9-23-9**.

No.	Compounds	MFs	Test solvents	References
9-23-7	isolitseane A	$C_{15}H_{24}O_2$	$CDCl_3$	[261]
9-23-8	isolitseane B	$C_{15}H_{24}O_2$	$CDCl_3$	[261]
9-23-9	isolitseane C	$C_{15}H_{24}O_3$	$CDCl_3$	[261]

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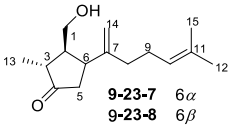


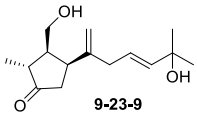
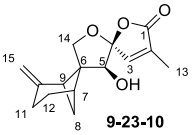


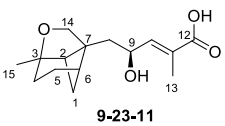
Table 9-23-6: ^{1}H NMR spectroscopic data of isolitseane-type sesquiterpenoids **9-23-7**~**9-23-9**.

H	9-23-7	9-23-8	9-23-9
1	3.73 dd(11.1, 4.2), 3.77 dd(11.1, 3.7)	3.58 dd(11.1, 5.9), 3.64 dd(11.1, 6.5)	3.58 dd(11.0, 6.1), 3.64 dd(11.1, 6.5)
2	1.84 tt(11.2, 3.8)	2.20 quint(6.2)	2.20 quint(6.4)
3	2.16 br dq(11.5, 6.9)	2.32 br quint(7.2)	2.32 br quint(7.3)
5	2.52 dd(18.6, 8.1) 2.10 dd(18.2, 11.8)	2.49 ddd(18.4, 8.6, 1.7) 2.31 dd(18.2, 8.1)	2.50 ddd(18.4, 8.7, 1.6) 2.31 dd(18.4, 8.1)
6	2.70 td(11.4, 8.2)	3.06 br q(7.8)	3.06 br q(8.0)
8	2.02 br t(7.2)	2.08 br t(6.9)	2.79 dd(16.1, 7.1), 2.87 dd(15.5, 5.7)
9	2.14 br q(7.8)	2.14 m	5.59 dt(15.5, 6.8)
10	5.08 t sept(6.8, 1.1)	5.09 t sept(6.9, 1.3)	5.68 d(15.6)
12	1.66 s	1.60 s	1.309 s
13	1.11 dd(7.0, 0.8)	1.14 d(7.4)	1.13 d(7.5)
14	4.90 br s, 4.95 br s	4.78 br s, 4.95 br s	4.78 br s, 4.96 br s
15	1.59 s	1.58 s	1.306 s

Table 9-23-7: Compounds, MFs, and test solvents of massarinolin-type sesquiterpenoids **9-23-10**~**9-23-12**.

No.	Compounds	MFs	Test solvents	References
9-23-10	massarinolin A	$C_{15}H_{18}O_4$	$CDCl_3$	[262]
9-23-11	massarinolin B	$C_{15}H_{22}O_4$	CD_3OD	[262]
9-23-12	massarinolin C	$C_{15}H_{22}O_4$	CD_3OD	[262]





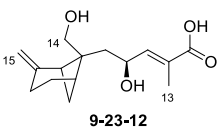


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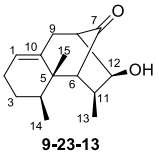
Table 9-23-8: ^{1}H NMR spectroscopic data of massarinolin-type sesquiterpenoids **9-23-10**~**9-23-12**.

H	9-23-10	9-23-11	9-23-12
1		1.50 m, 2.14 m	1.50 m, 2.34 m(ov)
2		2.13 m	2.76 dd(5.3, 5.3)
3	6.95 q(1.3)		
4		1.61 m, 1.87 m	2.34 m(ov), 2.63 m
5	4.22 br s	1.78 m, 1.88 m	1.92 m, 2.03 m
6		2.31 m	2.34 m(ov)
7	2.63 m		
8	1.57 d(10.0), 2.27 ddd(10.0, 5.7, 5.7)	1.83 m, 1.99 dd(14, 3.9)	1.95 dd(15, 8.8), 1.99 dd(15, 3.7)
9	3.14 dd(5.7, 5.7)	4.45 ddd(8.7, 8.6, 4.5)	4.70 ddd(8.8, 8.8, 3.7)
10		6.67 dq(8.6, 1.2)	6.75 m
11	2.22 dddd(17, 9.4, 1.2, 1.2), 2.58 m		
12	1.64 m, 1.98 dddd(12, 12, 4.2, 2.4)		
13	1.94 d(1.5)	1.84 d(1.2)	1.87 d(1.4)
14	3.93 d(9.6), 3.99 d(9.5)	3.60 d(9.6), 3.90 d(9.6)	3.29 d(12), 3.55 d(12)
15	4.84 m, 4.87 m	1.23 s	4.60 br s, 4.64 br s

Table 9-23-9: Compounds, MFs, and test solvents of paralemnanone-type sesquiterpenoids **9-23-13**~**9-23-15**.

No.	Compounds	MFs	Test solvents	References
9-23-13	paralemnone	$C_{15}H_{22}O_2$	$CDCl_3$	[263]
9-23-14	isoparalemnone	$C_{15}H_{22}O_2$	$CDCl_3$	[263]
9-23-15	paralemnol	$C_{15}H_{24}O$	$CDCl_3$	[263]



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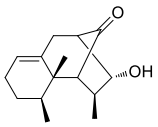

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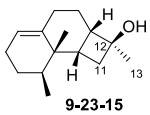

9-23-15

Table 9-23-10: ^{1}H NMR spectroscopic data of paralemnanone-type sesquiterpenoids **9-23-13**~**9-23-15**.

H	9-23-13	9-23-14	9-23-15
1	5.60 br t(2.4)	5.71 t(2.4)	5.41 t(2.4)
2	2.03 m	2.03 m	1.96 m
3	1.44 m	1.45 m	1.38 m
4	1.70 m	1.74 m	1.42 m
6	1.79 br s	1.85 m	2.70 dt(11.1, 7.8)
8	2.28 dt(2.4, 3.6)	2.45 m	α 1.84 m, β 1.35 m

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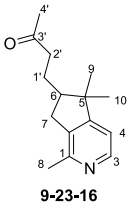
Table 9-23-10 (continued)

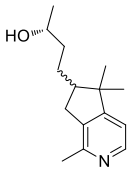
H	9-23-13	9-23-14	9-23-15
9α	2.35 m	2.62 m	1.93 m
9β	2.83 m	2.73 m	2.12 m
11	2.38 m	1.89 m	1.76 m
12	4.03 d(7.5)	3.69 t(4.8)	
13	1.02 d(7.5)	1.06 d(7.2)	1.20 s
14	0.83 d(6.6)	0.82 d(6.9)	0.81 d(6.3)
15	0.90 s	0.91 s	0.94 s

Table 9-23-11: Compounds, MFs, and test solvents of rotundine-type sesquiterpenoids **9-23-16**~**9-23-18**.

No.	Compounds	MFs	Test solvents	References
9-23-16	rotundine A	$C_{15}H_{21}NO$	$CDCl_3$-CF_3COOD	[264]
9-23-17	rotundine B	$C_{15}H_{23}NO$	$CDCl_3$-CF_3COOD	[264]
9-23-18	rotundine C	$C_{15}H_{23}NO$	$CDCl_3$-CF_3COOD	[264]



9-23-16



9-23-17
9-23-18 6-*epi*

Table 9-23-12: ^{1}H NMR spectroscopic data of rotundine-type sesquiterpenoids **9-23-16**~**9-23-18**.

H	9-23-16	9-23-17	9-23-18
3	8.51 d(5.7)	8.60 d(5.3)	8.59 d(5.3)
4	7.22 d(5.7)	7.35 d(5.3)	7.35 d(5.3)
6	2.01 m	2.14 m	2.13 m
7	2.50 dd(10.1, 16.0)	2.58 dd(10.7, 16.3)	2.56 dd(10.0, 16.3)
	3.01 dd(7.8, 16.0)	3.11 dd(7.6, 16.2)	3.11 dd(7.8, 16.3)
8	2.64 s	2.72 s	2.72 s
9	1.03 s	1.05 s	1.05 s
10	1.36 s	1.38 s	1.39 s
1′	1.61 m, 1.93 m	1.40~1.59 m	1.40 m, 1.81 m
2′	2.54 m	1.40~1.59 m	1.49 m, 1.61 m
	2.59 m		
3′		3.86 m	3.86 m
4′	2.18 s	1.25 d(6.2)	1.25 d(6.2)

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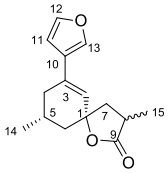
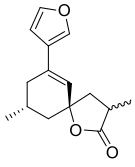
Table 9-23-13: Compounds, MFs, and test solvents of caprariolide-type sesquiterpenoids **9-23-19**~**9-23-22**.

No.	Compounds	MFs	Test solvents	References
9-23-19	caprariolide A	$C_{15}H_{18}O_3$	$CDCl_3$	[265]
9-23-20	caprariolide B	$C_{15}H_{18}O_3$	$CDCl_3$	[265]
9-23-21	caprariolide C	$C_{15}H_{18}O_3$	$CDCl_3$	[265]
9-23-22	caprariolide D	$C_{15}H_{18}O_3$	$CDCl_3$	[265]



9-23-19 15α-Me
9-23-20 15β-Me



9-23-21 15β-Me
9-23-22 15α-Me

Table 9-23-14: ^{1}H NMR spectroscopic data of caprariolide-type sesquiterpenoids **9-23-19**~**9-23-22**.

H	9-23-19	9-23-20	9-23-21	9-23-22
2	6.31 dd(3.1, 2.0)	6.10 dd(2.8, 1.5)	6.37 t(2.9)	6.30 t(2.6)
4ax	2.23 ddd(17.3, 9.5, 3.1)	2.18 ddd(17.5, 8.7, 2.8)	2.05 ddd(17.0, 9.8, 3.1)	2.02 dd(17.4, 10.3)
4eq	2.72 ddt(17.3, 7.3, 2.0)	2.75 ddd(17.5, 8.5, 2.5)	2.89 ddt(17.0, 7.7, 2.0)	2.87 m
5	2.10 m($W_{1/2}$ 16.7)	2.20 m($W_{1/2}$ 17.1)	2.39 m($W_{1/2}$ 17.0)	2.44 m($W_{1/2}$ 16.9)
6ax	1.64 ddd(11.5, 11.5, 1.4)	1.88 dd(11.5, 11.5)	1.41 dd(13.1, 11.5)	1.47 dd(14.4, 11.9)
6eq	2.09 ddd(11.6, 6.8, 3.0)	1.98 dd(11.5, 5.8)	2.25 ddd(13.1, 6.0, 2.0)	2.21 m
7pro *R*	1.85 ddd(12.5, 12.0, 1.4)	1.87 dd(12.5, 1.1)	2.33 dd(13.0, 8.5)	1.98 m
7pro *S*	2.46 dd(12.5, 12.0, 1.4)	2.55 dd(12.5, 9.0)	2.18 dd(13.0, 12.0)	2.72 m
8	2.77 m($W_{1/2}$ 17.9)	2.94 m($W_{1/2}$ 20.6)	2.84 m($W_{1/2}$ 19.5)	3.00 m($W_{1/2}$ 18.3)
11	6.48 dd(2.0, 0.8)	6.45 dd(1.8, 0.9)	6.50 d(1.7)	6.47 d(1.6)
12	7.40 dd(2.0, 2.0)	7.39 dd(1.8, 1.6)	7.41 t(1.5)	7.40 t(1.6)
13	7.45 br s	7.43 s	7.49 br s	7.44 br s
14	1.15 d(6.1)	1.16 d(6.7)	1.12 d(6.6)	1.11 d(6.7)
15	1.30 d(1.2)	1.32 d(6.2)	1.35 d(7.0)	1.34 d(7.2)

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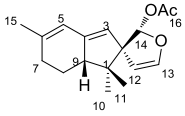
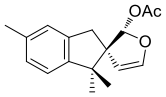
Table 9-23-15: Compounds, MFs, and test solvents of haterumadysin-type sesquiterpenoids **9-23-23**~**9-23-26**.

No.	Compounds	MFs	Test solvents	References
9-23-23	haterumadysin A	$C_{17}H_{22}O_3$	$CDCl_3$	[266]
9-23-24	haterumadysin B	$C_{17}H_{20}O_3$	$CDCl_3$	[266]
9-23-25	haterumadysin C	$C_{17}H_{24}O_5$	$CDCl_3$	[266]
9-23-26	haterumadysin D	$C_{17}H_{24}O_5$	$CDCl_3$	[266]



9-23-23



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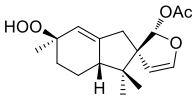

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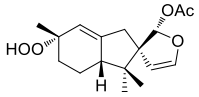

9-23-26

Table 9-23-16: ^{1}H NMR spectroscopic data of haterumadysin-type sesquiterpenoids **9-23-23**~**9-23-26**.

H	9-23-23	9-23-24	9-23-25	9-23-26
3	5.10 br s	*α* 2.83 d(16.0)	*α* 2.36 ddd(18.5, 2.0, 2.0)	*α* 2.40 ddd(18.5, 1.5, 1.5)
		β 3.27 d(16.0)	*β* 2.80 br d(18.5)	*β* 2.79 br d(18.5)
5	5.98 br s	6.98 br s	5.34 br d(2.0)	5.32 br s
7	*α* 2.05 dd(19.3, 5.0)	6.98 br s	*α* 1.79 ddd(13.0, 3.0, 3.0)	*α* 2.23 br d(14.0)
	β 2.15 m		*β* 1.95 ddd(13.0, 13.0, 3.0)	*β* 1.35 ddd(14.0, 14.0, 4.0)
8	*α* 1.35 dddd (12.5, 12.5, 12.5, 5.0)	6.98 br s	*α* 1.28 dddd (13.0, 13.0, 13.0, 3.0)	*α* 1.45 m
	β 1.65 m		*β* 1.72 m	*β* 1.46 m
9	2.36 br d(12.5)		2.18 m	2.00 m
10	0.74 s	1.13 s	0.65 s	0.66 s
11	1.00 s	1.17 s	0.90 s	0.91 s
12	5.00 d(3.0)	4.93 d(3.0)	4.85 d(3.0)	4.85 d(3.0)
13	6.43 d(3.0)	6.34 d(3.0)	6.39 d(3.0)	6.39 d(3.0)
14	6.54 s	6.45 s	6.33 s	6.36 s
15	1.76 s	2.30 s	1.27 s	1.31 s
OAc	2.08 s	2.09 s	2.08 s	2.08 s
OOH			7.32 br s	7.20 br s

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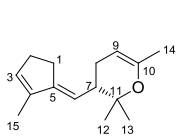
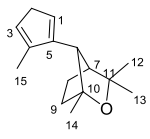
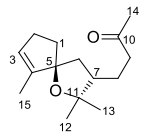
Table 9-23-17: Compounds, MFs, and test solvents of taylopyran-type sesquiterpenoids **9-23-27**~**9-23-30**.

No.	Compounds	MFs	Test solvents	References
9-23-27	(–)-(7*S*)-(*E*)-taylopyran	$C_{15}H_{22}O$	C_6D_6	[267]
9-23-28	(–)-(6*S*,7*S*,10*R*)-taylocyclane	$C_{15}H_{22}O$	C_6D_6	[267]
9-23-29	(5*S**,7*S**)-taylofuran	$C_{15}H_{24}O_2$	C_6D_6	[267]
9-23-30	(1*R**,4*S**,5*R**,6*S**,7*R**,9*R**)-taynudol	$C_{15}H_{22}O$	C_6D_6	[267]







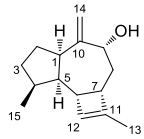


Table 9-23-18: ^{1}H NMR spectroscopic data of taylopyran-type sesquiterpenoids **9-23-27**~**9-23-30**.

H	9-23-27	9-23-28	9-23-29	9-23-30
1	2.41 m	5.89 s	2.00~2.09 m 1.80~1.91 m	3.03 m
2	2.21 m	2.72 s	2.00~2.09 m 2.22 m	*Re* 1.78 m *Si* 1.53~1.64 m
3	5.62 s	6.00 s	5.40 br s	*Re* 1.53~1.64 m *Si* 1.31 m
4				2.11 m
5				2.16 m
6	5.12 d(10.1)	3.00 br s	1.43 d(3.8) 1.45 s	2.55 br d(12.3)
7	2.48 dt(6.0, 9.8)	1.91 s	1.76 m	2.48 d(13.9)
8	*Re* 1.91 ddt(17.0, 9.1, 2.2) *Si* 2.11 br d(16.7)	*Re* 1.52~1.59 m *Si* 1.67~1.73 m	1.30 m 1.52 m	*Re* 1.53~1.64 m *Si* 2.03 ddd(13.1, 7.1, 3.2)
9	4.50 br s	*Re* 1.61~1.67 m *Si* 1.76~1.83 m	1.80~1.91 m	4.03 dd(7.3, 9.5)
12	1.23 s	1.24 s	0.98 s	5.76 br s
13	1.34 s	1.25 s	1.27 s	1.49 d(1.3)
14	1.81 br s	1.47 s	1.68 s	4.81 s, 4.83 s
15	1.68 d(1.3)	1.91 s	1.72 d(1.9)	0.93 d(7.3)

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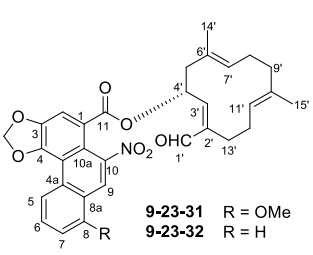
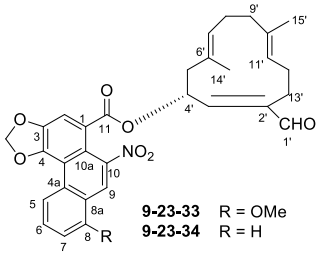
Table 9-23-19: Compounds, MFs, and test solvents of aristoterpane-type sesquiterpenoids **9-23-31**~**9-23-35**.

No.	Compounds	MFs	Test solvents	References
9-23-31	aristoloterpenateI	$C_{32}H_{31}NO_8$	$CDCl_3$	[268]
9-23-32	aristoloterpenateII	$C_{31}H_{29}NO_7$	$CDCl_3$	[268]
9-23-33	aristoloterpenate III	$C_{32}H_{31}NO_8$	$CDCl_3$	[268]
9-23-34	aristoloterpenate IV	$C_{31}H_{29}NO_7$	$CDCl_3$	[268]
9-23-35	manshurolide	$C_{15}H_{20}O_2$	$CDCl_3$	[268]





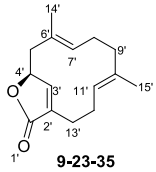


Table 9-23-20: ^{1}H NMR spectroscopic data of aristoterpane-type sesquiterpenoids **9-23-31**~**9-23-35**.

H	9-23-31	9-23-32	9-23-33	9-23-34	9-23-35
2	7.87 s	7.73 s	7.70 s	7.70 s	
5	8.58 d(8.8)	9.13 d(8.4)	8.68 dd(8.5, 3.6)	9.13 d(8.4)	
6	7.64 t(8.8)	7.79 t(8.4)	7.71 t(8.5)	7.81 td(8.4, 2.4)	
7	7.04 d(8.8)	7.70 t(8.4)	7.10 dd(8.5, 3.6)	7.71 td(8.4, 2.4)	
8		8.00 d(8.4)		7.99 dd(8.4, 2.4)	
9	8.79 s	8.35 s	8.84 s	8.34 s	
OCH_2O	6.34 s	6.40 s	6.36 s	6.40 s	
OMe	4.03 s		4.06 s		
1′	10.25 s	10.25 s	9.51 s	9.52 s	
3′	6.08 d(11.2)	6.08 d(10.8)	6.36 d(10.6)	6.36 d(9.6)	6.81 s
4′	6.37 dd(11.2, 4.6)	6.37 m	5.70 td(10.6, 3.6)	5.72 td(9.6, 3.4)	5.10 m
5′	2.72 d(12.2)	2.73 br d(11.4)	2.80 dd(10.6, 3.6)	2.81 dd(12.8, 3.4)	2.42 d(14.0)
	2.39 br d(12.2)	2.40 br d(11.4)	2.43 t(10.6)	2.43 dd(12.8, 9.6)	2.65 dd(14.0, 5.6)
7′	5.04 br d(11.2)	5.05 br d(11.2)	5.10 t(7.0)	5.11 t(7.6)	4.75 dd(12.4, 1.2)
8′	2.30 br t(11.2)	2.32 br t(11.2)	2.14 t(7.0)	2.15 t(7.6)	1.93 m
	1.98 br t(11.2)	2.00 br t(11.2)			2.32 ddd(11.2, 4.0, 1.2)
9′	2.02 m, 2.20 m	2.03 m, 2.18 m	2.05 m	2.06 m	1.95 m, 2.17 m

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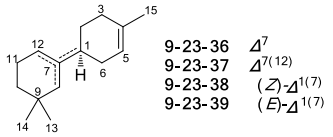
Table 9-23-20 (continued)

H	9-23-31	9-23-32	9-23-33	9-23-34	9-23-35
11′	4.81 br d(8.4)	4.82 br d(8.4)	4.85 t(7.8)	4.85 t(7.6)	4.72 dd(12.4, 1.2)
12′	2.07 m, 2.42 m	2.06 m, 2.42 m	2.21 m, 2.33 m	2.22 m, 2.32 m	2.08 m, 2.57 m
13′	2.84 dt(13.0, 4.0) 1.80 td(13.0, 4.0)	2.85 br d(12.4) 1.80 br t(12.4)	2.63 dd(9.8, 5.1) 2.40 t(9.8)	2.64 dd(9.7, 4.9) 2.40 t(9.7)	2.28 m, 2.54 m
14′	1.61 s	1.61 s	1.68 s	1.69 s	1.58 m
15′	1.34 s	1.34 s	1.40 s	1.41 s	1.43 m

Table 9-23-21: Compounds, MFs, and test solvents of macrocarpane-type sesquiterpenoids **9-23-36**~**9-23-40**.

No.	Compounds	MFs	Test solvents	References
9-23-36	(–)-*α*-macrocarpene	$C_{15}H_{24}$	$CDCl_3$	[269]
9-23-37	(–)-*β*-macrocarpene	$C_{15}H_{24}$	$CDCl_3$	[269]
9-23-38	(*Z*)-*γ*-macrocarpene	$C_{15}H_{24}$	C_6D_6	[269]
9-23-39	(*E*)-*γ*-macrocarpene	$C_{15}H_{24}$	C_6D_6	[269]
9-23-40	(+)-Ar-macrocarpene	$C_{15}H_{22}$	C_6D_6	[269]



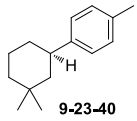


Table 9-23-22: ^{1}H NMR spectroscopic data of macrocarpane-type sesquiterpenoids **9-23-36**~**9-23-40**.

H	9-23-36	9-23-37	9-23-38	9-23-39	9-23-40
1	1.94 m	1.96 m			
2	1.42 dddd(6, 12, 12, 13) 1.70 m	1.44 dddd(6, 12, 12, 13) 1.72 m	2.39 t(6)	2.34 t(6.0)	7.06 s
3	1.86 m, 1.98 m	1.89 m, 2.05 m	1.96 br t(5)	1.97 br t(5.0)	7.06 s
5	5.37 br m	5.39 br m	5.40 br m	5.39 br m	7.06 s
6	1.98 m	1.96 m	2.79 br s	2.83 br s	7.06 s
7					2.62 dddd(3.4, 3.4, 12.7, 12.7)
8	5.09 s	1.705 s, 1.709 s	1.97 s	2.01 s	1.33 br d(12.9), 1.83 br d(12.8)

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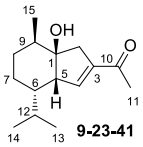
Table 9-23-22 (continued)

H	9-23-36	9-23-37	9-23-38	9-23-39	9-23-40
10	1.35 t(7.0)	1.30 t(7.0)	1.30 m	1.30 m	
11	1.58 m	2.01 m	1.50 m	1.46 m	
12	1.846 t, 1.850 t	5.36 br m	2.15 br t(6.0)	2.09 br t(6)	
13	0.912 s	0.890 s	0.88 s	0.89 s	0.91 s①
14	0.915 s	0.882 s	0.88 s	0.89 s	0.93 s①
15	1.62 br s	1.64 br s	1.63 br m	1.64 br m	2.18 s

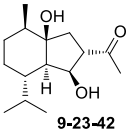
① Assignments may be exchanged.

Table 9-23-23: Compounds, MFs, and test solvents of minor sesquiterpene-type sesquiterpenoids **9-23-41**~**9-23-45**.

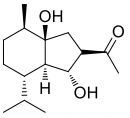
No.	Compounds	MFs	Test solvents	References
9-23-41	(+)-(1*R*,5*S*,6*S*,9*R*)-3-acetyl-1-hydroxy-6-isopropyl-9-methylbicyclo-[4.3.0]non-3-ene	$C_{15}H_{24}O_2$	CD_3COCD_3	[270]
9-23-42	(+)-(1*R*,3*S*,4*S*,5*R*,6*S*,9*R*)-3-acetyl-1,4-dihydroxy-6-isopropyl-9-methylbicyclo[4.3.0]nonane	$C_{15}H_{26}O_3$	CD_3COCD_3	[270]
9-23-43	(+)-(1*R*,3*R*,4*R*,5*R*,6*S*,9*R*)-3-acetyl-1,4-dihydroxy-6-isopropyl-9-methylbicyclo[4.3.0]nonane	$C_{15}H_{26}O_3$	CD_3COCD_3	[270]
9-23-44	(+)-(1*S*,2*R*,6*S*,9*R*)-1-hydroxy-2-(1-hydroxyethyl)-6-isopropyl-9-methylbicyclo[4.3.0]non-4-en-3-one	$C_{15}H_{24}O_3$	CD_3COCD_3	[270]
9-23-45	(–)-(5*S*,6*R*,9*S*)-2-acetyl-5-hydroxy-6-isopropyl-9-methylbicyclo-[4.3.0]non-1-en-3-one	$C_{15}H_{22}O_3$	CD_3COCD_3	[270]



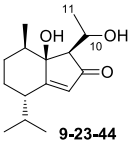
9-23-41



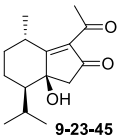
9-23-42



9-23-43



9-23-44



9-23-45

Table 9-23-24: ^{1}H NMR spectroscopic data of minor sesquiterpene-type sesquiterpenoids **9-23-41**~**9-23-45**.

H	9-23-41	9-23-42	9-23-43	9-23-44	9-23-45
2*α*	2.24 ddd(15.5, 3.0, 3.0)	1.63 dd(13.5, 8.5)	1.77 dd(13.5, 11.5)		
2*β*	2.73 d(15.5)	2.23 dd(13.5, 9.0)	1.96 dd(13.5, 2.0)	2.21 d(2.5)	
3		3.22 dd(9.0, 8.5)	2.96 ddd(11.5, 6.0, 2.0)		

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Table 9-23-24 (continued)

H	9-23-41	9-23-42	9-23-43	9-23-44	9-23-45
4	6.88 m	4.32 dd(9.0, 5.0)	4.13 ddd(9.5, 5.5, 5.5)	5.72 br s	α 2.95 d(18.5) β 2.35 d(18.5)
5	3.12 m	1.09 dd(12.0, 5.0)	1.38 dd(11.5, 9.5)		
6	1.26 dddd (12.5, 3.5, 3.0, 2.0)	1.84 dddd (12.5, 12.0, 3.5, 3.0)	1.71 dddd (11.5, 11.5, 3.0, 3.0)	2.48 ddd (13.0, 6.5, 5.0)	2.04 ddd (13.5, 6.5, 5.0)
7α	0.85 dddd (12.5, 12.5, 12.5, 3.0)	1.02 dddd (12.5, 12.5, 12.0, 4.0)	0.95 dddd (12.5, 12.5, 12.5, 4.0)	1.12 dddd (13.0, 13.0, 13.0, 3.5)	2.01 dddd (12.0, 5.0, 5.0, 4.0)
7β	1.79 dddd (12.5, 3.5, 3.0, 3.0)	1.61 dddd (12.5, 3.5, 3.0, 3.0)	1.55 dddd (11.5, 4.0, 3.0, 3.0)	2.00 dddd (13.0, 4.0, 3.5, 3.5)	1.30 dddd (13.5, 12.5, 12.0, 4.0)
8α	1.39 dddd (12.5, 3.5, 3.5, 3.0)	1.44 dddd (12.5, 3.5, 3.5, 3.5)	1.37 dddd (12.5, 4.0, 3.0, 3.0)	1.53 dddd (13.0, 4.0, 3.5, 3.5)	1.72 dddd (14.0, 12.5, 11.5, 4.0)
8β	1.27 dddd (12.5, 12.5, 12.5, 3.0)	1.43 dddd (12.5, 12.5, 12.5, 3.5)	1.36 dddd (12.5, 12.5, 12.5, 4.0)	1.70 dddd (13.0, 13.0, 13.0, 3.5)	1.83 dddd (11.5, 7.0, 5.0, 4.0)
9	1.42 m	1.36 m	1.38 m	1.40 m	3.33 ddq (14.0, 7.0, 7.0)
10				4.25 m	
11	2.23 s	2.19 s	2.25 s	1.46 d(6.5)	2.34 s
12	1.63 m	2.02 m	2.19 m	1.93 m	1.94 m
13	0.97 d(7.0)	0.78 d(7.0)	0.80 d(6.5)	0.94 d(6.5)	0.72 d(6.5)
14	0.91 d(6.5)	0.93 d(6.5)	0.89 d(7.0)	0.98 d(7.0)	0.98 d(7.0)
15	0.90 d(7.0)	0.91 d(6.5)	0.86 d(6.5)	1.02 d(7.0)	1.33 d(7.0)
OH	3.63 s(1-OH)	3.75 s(1-OH) 4.21 br d(8.5, 4-OH)	2.82 s(1-OH) 4.19 br d(5.5, 4-OH)	4.31 s(1-OH)	4.41 s(5-OH)

Table 9-23-25: Compounds, MFs, and test solvents of vibralactone-type sesquiterpenoids **9-23-46**~**9-23-50**.

No.	Compounds	MFs	Test solvents	References
9-23-46	1,5-secovibralactone	$C_{12}H_{16}O_3$	$CDCl_3$	[271]
9-23-47	vibralactone B	$C_{12}H_{16}O_4$	$CDCl_3$	[271]
9-23-48	vibralactone C	$C_{12}H_{14}O_3$	$CDCl_3$	[271]
9-23-49	acetylated vibralactone	$C_{14}H_{18}O_4$	$CDCl_3$	[271]
9-23-50	vibralactone	$C_{12}H_{16}O_3$	$CDCl_3$	[271]

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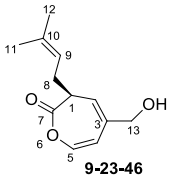
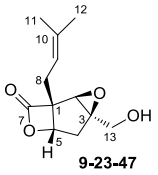
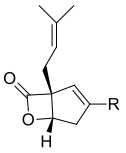






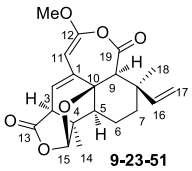
9-23-48 R = CHO
9-23-49 R = CH_2OAc
9-23-50 R = CH_2OH

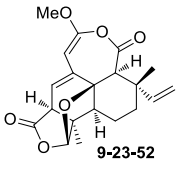
Table 9-23-26: ^{1}H NMR spectroscopic data of vibralactone-type sesquiterpenoids **9-23-46**~**9-23-50**.

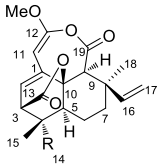
H	9-23-46	9-23-47	9-23-48	9-23-49	9-23-50
1	2.55 m				
2	5.46 d(4.4)	3.55 s	6.68 br s	5.65 br s	5.58 br s
4	5.91 d(6.8)	2.44 d(16.5)	3.05 d(19.3)	2.78 dd(19.2, 3.2)	2.76 dd(18.9, 3.6)
		2.10 dd(16.5, 6.7)	2.90 dd(19.3, 5.7)	2.74 dd(19.2, 2.7)	2.69 d(18.9)
5	6.59 d(6.8)	4.81 d(6.7)	4.90 d(5.7)	4.80 dd(3.2, 2.7)	4.78 d(3.6)
8	2.57 m, 2.68 m	2.65 dd(15.3, 7.2)	2.74 dd(15.1, 7.3)	2.62 dd(15.1, 7.3)	2.59 dd(15.1, 7.3)
		2.51 dd(15.3, 7.5)	2.59 dd(15.1, 7.3)	2.43 dd(15.1, 7.3)	2.41 dd(15.1, 7.3)
9	5.15 m	5.15 m	5.11 t(7.3)	5.11 t(7.3)	5.10 t(7.3)
11	1.68 s	1.66 s	1.66 s	1.64 s	1.62 s
12	1.71 s	1.74 s	1.74 s	1.73 s	1.71 s
13	4.21 d(13.5)	3.82 d(12.8)	9.83 s	4.66 br s	4.20 br s
	4.17 d(13.5)	3.92 d(12.8)			
OAc				2.11 s	

Table 9-23-27: Compounds, MFs, and test solvents of transtaganolide-type sesquiterpenoids **9-23-51**~**9-23-56**.

No.	Compounds	MFs	Test solvents	References
9-23-51	transtaganolide A	$C_{20}H_{22}O_6$	$CDCl_3$	[272]
9-23-52	transtaganolide B	$C_{20}H_{22}O_6$	$CDCl_3$	[272]
9-23-53	transtaganolide D	$C_{20}H_{24}O_5$	$CDCl_3$	[272]
9-23-54	basiliolide B	$C_{21}H_{24}O_7$	$CDCl_3$	[273]
9-23-55	basiliolide C	$C_{22}H_{26}O_7$	$CDCl_3$	[273]
9-23-56	transtaganolide C	$C_{20}H_{24}O_5$	$CDCl_3$	[272]







9-23-53 R = Me
9-23-54 R = COOMe
9-23-55 R = CH_2OAc

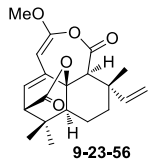


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Table 9-23-28: ^{1}H NMR spectroscopic data of transtaganolide-type sesquiterpenoids **9-23-51**~**9-23-54**.

H	9-23-51	9-23-52	9-23-53	9-23-54
2	5.60 dd(5.9, 1.1)	5.58 dd(6.0, 1.1)	6.08 dd(6.5, 1.2)	6.08 dd(1.2, 6.3)
3	3.11 d(6.0)	3.12 dt(6.0, 0.9)	3.04 d(6.6)	3.67 d(6.3)
5	1.96 dd(12.1, 6.2)	1.95 dd(12.1, 6.3)	1.34 dd(12.6, 5.3)	2.30 dd(5.3, 12.6)
6*α*	1.60 dddd(13.3, 6.2, 2.7, 2.2)	1.73 dddd(12.9, 6.2, 3.7, 2.5)	1.53~1.65 m	1.75 dddd(2.8, 12.6, 12.6, 13.8)
6*β*	1.47 dddd(13.3, 13.3, 12.3, 2.3)	1.51 dddd(13.0, 13.0, 13.0, 2.4)		1.67 m
7*α*	1.39 ddd(13.3, 133, 2.7)	1.43 ddd(13.3, 11.9, 2.3)	1.39 ddd(13.0, 13.0, 3.3)	1.96 ddd(2.8, 3.9, 13.7)
7*β*	1.82 ddd(12.7, 3.7, 2.2)	1.63 ddd(13.3, 3.7, 2.3)	1.89 ddd(13.0, 3.3, 3.3)	1.52 ddd(3.1, 12.6, 13.7)
9	2.99 s	3.09 s	3.14 s	3.18 s
11	4.99 s	4.97 t(0.8)	5.02 d(1.1)	4.97 d(1.2)
14	1.30 s	1.33 s	0.96 s	
15	5.61 s	5.66 t(0.7)	1.02 s	1.31 s
16	6.89 dd(17.9, 11.2)	5.81 dd(17.4, 10.8)	6.98 dd(17.8, 11.2)	7.01 dd(11.2, 17.7)
17	5.11 ddt(11.1, 1.1, 0.6)	5.09 dd(10.8, 0.7)	5.11 dd(11.1, 1.1)	5.16 dd(1.0, 11.2)
	5.03 dd(17.8, 1.1)	5.06 dd(17.4, 0.7)	5.03 dd(17.8, 1.1)	5.07 dd(1.0, 17.7)
18	1.22 s	1.55 s	1.21 s	1.24 s
OMe	3.70 s	3.68 s	3.72 s	3.71 s(15-OMe), 3.72 s(18-OMe)

Table 9-23-29: ^{1}H NMR spectroscopic data of transtaganolide-type sesquiterpenoids **9-23-55** and **9-23-56**.

H	9-23-55	9-23-56	H	9-23-55	9-23-56
2	6.06 dd(1.1, 6.4)	6.08 dd(6.5, 1.1)	14	3.74 d(10.8) 3.70 d(10.8)	0.98 s
3	3.29 d(6.4)	3.07 d(6.5)	15	1.12 s	1.09 s
5	1.29 dd(4.6, 12.9)	1.30 dd(11.5, 6.5)	16	7.00 dd(11.1, 17.7)	5.81 dd(17.4, 10.8)
6	*α* 1.79 dddd(2.8, 12.9, 13.0, 13.8)	1.60~1.70 m	17	5.17 dd(1.0, 11.1)	5.05 br d(10.7)
	β 1.54 dddd(2.8, 3.9, 4.6, 13.8)			5.06 dd(1.0, 17.7)	5.08 br d(17.4)
7*α*	1.94 ddd(2.8, 3.9, 13.7)	1.44 ddd(13.0, 13.0, 3.3)	18	1.24 s	1.61 s
7*β*	1.42 ddd(2.8, 13.0, 13.7)	1.65 m			
9	3.15 s	3.24 s	OMe	3.74 s	3.72 s
11	5.01 d(1.1)	5.01 d(1.1)	OAc	2.09 s	

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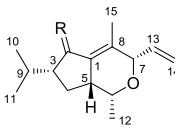
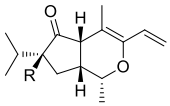
Table 9-23-30: Compounds, MFs, and test solvents of hodgsonox-type sesquiterpenoids **9-23-57**~**9-23-63**.

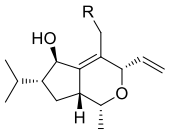
No.	Compounds	MFs	Test solvents	References
9-23-57	hodgsonox B	$C_{15}H_{24}O$	$CDCl_3$	[274]
9-23-58	hodgsonox E	$C_{15}H_{22}O_2$	$CDCl_3$	[274]
9-23-59	hodgsonox C	$C_{15}H_{22}O_3$	$CDCl_3$	[274]
9-23-60	hodgsonox G	$C_{15}H_{22}O_2$	$CDCl_3$	[274]
9-23-61	hodgsonox D	$C_{17}H_{26}O_4$	$CDCl_3$	[274]
9-23-62	hodgsonox F	$C_{15}H_{24}O_3$	C_6D_6	[274]
9-23-63	hodgsonox H	$C_{15}H_{22}O_2$	$CDCl_3$	[274]



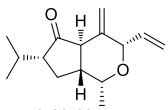
9-23-57 R = H,H
9-23-58 R = O



9-23-59 R = OH
9-23-60 R = H



9-23-61 R = OAc
9-23-62 R = OH



9-23-63

Table 9-23-31: ^{1}H NMR spectroscopic data of hodgsonox-type sesquiterpenoids **9-23-57**~**9-23-60**.

H	9-23-57	9-23-58	9-23-59	9-23-60
1			3.03 br d(7)	2.85 br d(8.5)
2	1.91 ddm(10, 17) 2.52 ddddq(1, 3, 9, 17, 1)			
3	1.64 ddddd(6, 8.5, 9, 10, 12)	2.20 ddd(4.5, 7.5, 12)		2.21 dddd(1, 4.5, 8.5, 12.5)
4	0.91 ddd(11.5, 12, 12) 1.86 br ddd(5.5, 6, 11.5)	1.28 ddd(11.5, 12, 12) 1.94 ddd(7, 7.5, 11.5)	1.77 ddd(1.5, 7.5, 14) 1.89 dd(11.5, 14)	1.73 ddd(11.5, 12.5, 12.5) 1.95 dddd(1, 6.5, 8.5, 12.5)
5	2.59 m	2.76 ddddq(2.5, 6.5, 7, 12.0, 3)	2.66 dddd(2, 7, 7.5, 11.5)	2.39 dddd(2, 6.5, 8.5, 11.5)
6	4.24 dq(6.5, 6.5)	4.27 dq(6.5, 6.5)	3.97 dq(2, 6.5)	3.97 dq(2, 6.5)
7	4.32 br dd(3, 9)	4.40 br ddd(1, 2.5, 8.5)		
9	1.43 dqq(8.5, 6.5, 6.5)	2.25 dqq(4.5, 6.5, 6.5)	1.85 qq(6.5, 6.5)	2.14 dqq(4.5, 6.5, 6.5)
10	0.94 d(6.5)	0.78 d(6.5)	0.63 d(6.5)	0.69 d(6.5)
11	0.95 d(6.5)	1.00 d(6.5)	0.96 d(6.5)	0.94 d(6.5)
12	1.16 d(6.5)	1.18 d(6.5)	1.32 d(6.5)	1.35 d(6.5)
13	5.86 ddd(9, 10, 17)	5.83 ddd(8.5, 10, 17)	6.44 dd(11, 17)	6.47 dd(11, 17)
14	5.18 ddd(0.5, 2, 10) 5.27 ddd(1, 2, 17)	5.29 ddd(0.5, 1.5, 10) 5.35 ddd(1, 1.5, 17)	5.11 ddm(2, 11) 5.59 ddm(2.5, 17)	5.10 br dd(1.5, 11) 5.58 br dd(1.5, 17)
15	1.52 dddd(1.5, 1.5, 1.5, 2.5)	2.07 dd(1, 3)	1.71 br d(1)	1.75 d(1)

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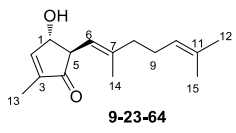
Table 9-23-32: ^{1}H NMR spectroscopic data of hodgsonox-type sesquiterpenoids **9-23-61**~**9-23-63**.

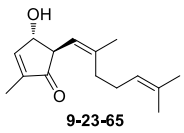
H	9-23-61	9-23-62	9-23-63
1			2.60 dddd(2, 2.5, 2.5, 14.5)
2	4.42 d(4.5)	4.37 ddd(2, 2, 5.5)	
3	1.61 dddd(4.5, 6.5, 8.5, 11.5)	1.52 m	2.18 m
4	0.91 ddd(11.5, 11.5, 13)	0.74 ddd(13, 13, 13)	1.45 ddd(11, 12, 12)
	1.83 ddd(6.5, 6.5, 11.5)	1.53 ddd(10, 10, 10)	
5	2.68 dddd(3, 6.5, 6.5, 13)	2.62 m	2.35 dddd(5.5, 8, 12, 14.5)
6	4.07 dq(6.5, 6.5)	4.01 dq(6.5, 7)	4.38 dq(8, 6.5)
7	4.45 dd(3, 8.5)	4.54 br d(8)	4.48 dm(7)
9	1.53 dqq(8.5, 6.5, 6.5)	1.46 dqq(2, 6.5, 6.5)	2.20 m
10	0.89 d(6.5)	0.84 d(6.5)	0.85 d(8.5)
11	1.03 d(6.5)	1.08 d(6.5)	0.99 d(6.5)
12	1.19 d(6.5)	1.04 d(7)	1.24 d(6.5)
13	5.83 ddd(8.5, 10.5, 17)	5.75 ddd(8, 10, 17)	5.78 ddd(7, 10.5, 17)
14	5.30 ddd(0.5, 1.5, 10.5)	*cis* 5.01 ddd(0.5, 2, 10)	5.23 ddd(1, 1.5, 17)
	5.39 ddd(1, 1.5, 17)	*trans* 5.18 ddd(1, 2, 17)	5.26 ddd(1, 1.5, 10.5)
15	4.40 br d(12)	3.84 br d(13)	4.92 ddd(1, 2, 3)
	5.09 d(12)	4.11 ddd(1.5, 2, 13)	5.72 ddd(1, 2, 2.5)
OAc	2.04 s		
OH	3.30 br s		

Table 9-23-33: Compounds, MFs, and test solvents of litseane-type sesquiterpenoids **9-23-64**~**9-23-71**.

No.	Compounds	MFs	Test solvents	References
9-23-64	litseaverticillol A	$C_{15}H_{22}O_2$	$CDCl_3$	[275]
9-23-65	litseaverticillol B	$C_{15}H_{22}O_2$	$CDCl_3$	[275]
9-23-66	litseaverticillol C	$C_{15}H_{22}O_2$	$CDCl_3$	[275]
9-23-67	litseaverticillol D	$C_{15}H_{22}O_3$	$CDCl_3$	[275]
9-23-68	litseaverticillol E	$C_{15}H_{22}O_3$	$CDCl_3$	[275]
9-23-69	litseaverticillol F	$C_{15}H_{22}O_3$	$CDCl_3$	[275]
9-23-70	litseaverticillol G	$C_{15}H_{22}O_3$	$CDCl_3$	[275]
9-23-71	litseaverticillol H	$C_{15}H_{20}O_3$	$CDCl_3$	[275]



9-23-64



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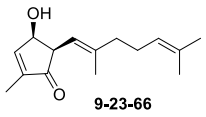

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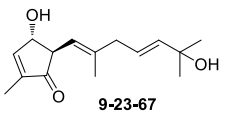
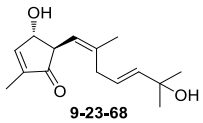
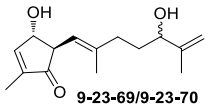


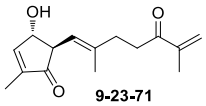
9-23-67



9-23-68



9-23-69/9-23-70



9-23-71

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Table 9-23-34: ^{1}H NMR spectroscopic data of litseane-type sesquiterpenoids **9-23-64**~**9-23-67**.

H	9-23-64	9-23-65	9-23-66	9-23-67
1	4.51 br s	4.53 sext(1.9)	4.80 br d(5.8)	4.54 sext(2.1)
2	7.09 m	7.10 quint(1.5)	7.22 quint(1.5)	7.11 quint(1.6)
5	3.10 dd(9.0, 2.4)	3.13 dd(9.5, 2.5)	3.42 dd(8.6, 6.1)	3.12 dd(9.1, 2.4)
6	4.95 br d(9.0)	5.00 dq(9.5, 1.2)	4.95 br d(8.5)	4.99 dq(9.1, 1.2)
8	2.00 m	2.14 m	2.12 m	2.71 dd(15.9, 6.5)
9	2.04 m	2.10 m, 2.17 m	2.10 m, 2.15 m	5.55 dt(15.6, 6.4)
10	5.04 br t(6.7)	5.14 m	5.02 m	5.61 d(15.6)
12	1.62 s	1.67 s	1.65 s	1.27 s
13	1.73 t(1.6)	1.78 t(1.6)	1.80 t(1.4)	1.76 t(1.6)
14	1.69 s	1.77 d(1.3)	1.70 d(1.2)	1.68 d(1.3)
15	1.54 s	1.61 s	1.57 s	1.27 s

Table 9-23-35: ^{1}H NMR spectroscopic data of litseane-type sesquiterpenoids **9-23-68**~**9-23-71**.

H	9-23-68	9-23-69	9-23-70	9-23-71
1	4.59 sext(2.2)	4.54 sext(2.1)	4.54 sext(2.1)	4.56 sext(1.8)
2	7.13 quint(1.4)	7.12 quint(1.7)	7.12 quint(1.7)	7.12 quint(1.6)
5	3.15 dd(9.1, 2.5)	3.13 dd(9.1, 2.5)	3.13 dd(9.1, 2.5)	3.14 dd(9.1, 2.4)
6	5.03 dq(9.1, 1.4)	5.02 dq(9.1, 2.5)	5.02 dq(9.1, 2.5)	5.02 dq(9.1, 1.2)
8	2.79 dd(16.1, 6.8)	2.09 m	2.09 m	2.36 t(7.7)
9	5.68 dt(15.8, 6.6)	1.63 m	1.63 m	2.85 dd(16.4, 7.7) 2.79 dd(16.4, 7.6)
10	5.59 dt(15.8, 1.2)	4.02 t(7.9)	4.02 t(7.9)	
12	1.32 s	4.79 p(1.5), 4.89 p(0.9)	4.79 p(1.5), 4.89 p(0.9)	5.76 q(1.1), 5.95 br s
13	1.79 t(1.6)	1.76 t(1.6)	1.76 t(1.6)	1.79 t(1.6)
14	1.72 d(1.4)	1.72 d(1.3)	1.72 d(1.3)	1.74 d(1.2)
15	1.32 s	1.68 br s	1.68 br s	1.85 s

Table 9-23-36: Compounds, MFs, and test solvents of metachromin-type sesquiterpenoids **9-23-72**~**9-23-80**.

No.	Compounds	MFs	Test solvents	References
9-23-72	metachromin L	$C_{23}H_{31}NO_5$	$CDCl_3$-CD_3OD(95:5)	[276]
9-23-73	metachromin M	$C_{23}H_{31}NO_5$	$CDCl_3$-CD_3OD(95:5)	[276]
9-23-74	metachromin N	$C_{25}H_{35}NO_6$	CD_3OD	[276]
9-23-75	metachromin O	$C_{25}H_{35}NO_6$	$CDCl_3$- CD_3OD(95:5)	[276]
9-23-76	metachromin P	$C_{24}H_{33}NO_6$	CD_3OD	[276]
9-23-77	metachromin Q	$C_{24}H_{33}NO_6$	CD_3OD	[276]
9-23-78	metachromin R	$C_{29}H_{37}NO_3$	$CDCl_3$	[277]
9-23-79	metachromin S	$C_{26}H_{39}NO_3$	$CDCl_3$	[277]
9-23-80	metachromin T	$C_{23}H_{32}O_4$	$CDCl_3$	[277]

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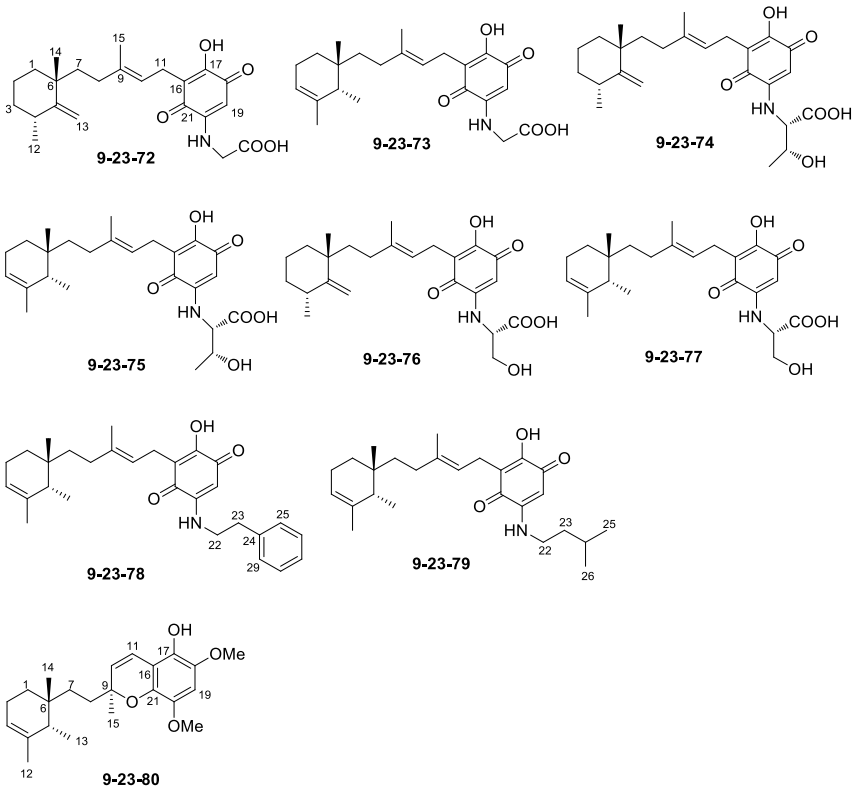

Table 9-23-37: ^{1}H NMR spectroscopic data of metachromin-type sesquiterpenoids **9-23-72**~**9-23-76**.

H	9-23-72	9-23-73	9-23-74	9-23-75	9-23-76
1	1.16 ddd (12.8, 12.8, 4.5) 1.4~1.6 m	1.07 m, 1.37 m	1.28 m, 1.5~1.7 m	1.03 m, 1.33 m	1.30 ddd (12.7, 12.7, 4.0) 1.4~1.6 m
2	0.90 m, 1.4~1.6 m	1.89 m	1.00 m, 1.5~1.7 m	1.85 m	1.00 m 1.4~1.6 m
3	0.93 m, 1.70 m	5.21 br s	1.02 m, 1.80 m	5.18 br s	1.02 m, 1.68 m
4	2.28 m		2.39 m		2.38 m
5		1.57 m		1.54 q(7.3)	
7	1.4~1.6 m	1.15 m, 1.25 m	1.5~1.7 m	1.12 ddd (12.8, 12.8, 5.0) 1.22 ddd (13.0, 13.0, 4.9)	1.4~1.6 m
8		1.89 m		1.85 m	
10	5.12 br t(7.1)	5.10 br t(7.0)	5.21 br t(6.3)	5.07 br t(6.6)	5.21 br t(7.1)

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Table 9-23-37 (continued)

H	9-23-72	9-23-73	9-23-74	9-23-75	9-23-76
11	3.07 br d(7.1)	3.06 br d(7.0)	3.14 br d(6.3)	3.03 br d(7.1)	3.12 br d(7.1)
12	0.98 d(6.3)	1.60 br s	1.06 d(6.3)	1.57 br s	1.06 d(6.7)
13	4.64 s, 4.66 s	0.85 d(7.0)	4.74 s, 4.75 s	0.82 d(6.9)	4.73 s, 4.75 s
14	0.98 s	0.79 s	1.08 s	0.76 s	1.07 s
15	1.71 br s	1.70 br s	1.80 br s	1.67 br s	1.79 br s
19	5.23 s	5.23 s	5.37 s	5.25 s	5.37 s
22	3.82 s	3.82 s	4.02 m	3.81 m	4.16 m
24			4.40 m	4.29 m	3.95 m
25			1.28 d(5.8)	1.19 d(6.0)	

Table 9-23-38: ^{1}H NMR spectroscopic data of metachromin-type sesquiterpenoids **9-23-77**~**9-23-80**.

H	9-23-77	9-23-78	9-23-79	9-23-80
1	1.16 m, 1.47 m	1.40 m, 1.10 m	1.11 m	1.43 m, 1.09 m
2	1.98 m	1.93 m	1.93 m	1.93 br s
3	5.29 br s	5.26 s	5.26 br s	5.24 s
5	1.68 m	1.61 m	1.61 m	1.59 m
7	1.25 m	1.29 dt(13.2, 4.8)	1.40 m	1.39 m
	1.35 m	1.20 dt(13.2, 4.8)	1.30 m	1.28 dt(13.2, 4.8)
8	1.98 m	1.90 m	1.93 m	1.76 td(13.2, 4.8)
				1.66 dt(13.2, 3.6)
10	5.19 br t(7.1)	5.13 t(6.6)	5.14 m	5.63 d(10.2)
11	3.12 br d(7.1)	3.08 d(6.6)	3.09 br d(6.0)	6.70 d(10.2)
12	1.68 br s	1.65 s	1.65 s	1.63 s
13	0.95 d(7.1)	0.89 d(7.2)	0.90 d(7.2)	0.85 d(7.2)
14	0.90 s	0.83 s	0.83 s	0.81 s
15	1.78 br s	1.75 s	1.74 s	1.42 s
19	5.38 s	5.39 s	5.35 s	6.45 d(10.2)
22	4.14 m	3.42 q(6.6)	3.16 m	3.80 s
23		2.95 t(7.2)	1.55 m	3.80 s
24	4.00 m		1.40 m	
25		7.20 d(7.8)	0.94 d(6.6)	
26		7.34 t(7.8)	0.94 d(6.6)	
27		7.27 t(7.8)		
28		7.34 t(7.8)		
29		7.20 d(7.8)		
NH		6.43 m	6.38 m	
OH				5.43 br s

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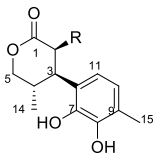
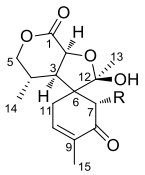
Table 9-23-39: Compounds, MFs, and test solvents of cyclopinol-type sesquiterpenoids **9-23-81**~**9-23-90**.

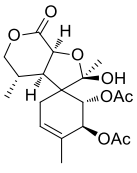
No.	Compounds	MFs	Test solvents	References
9-23-81	*O*-acetylcalopin	$C_{15}H_{18}O_6$	$CDCl_3$	[278]
9-23-82	calopin	$C_{13}H_{16}O_5$	$CDCl_3$	[278]
9-23-83	*O*-acetylcyclocalopin A	$C_{17}H_{22}O_7$	$CDCl_3$	[278]
9-23-84	cyclocalopin A	$C_{15}H_{20}O_6$	$CDCl_3$	[278]
9-23-85	cyclocalopin B	$C_{19}H_{26}O_8$	$CDCl_3$	[278]
9-23-86	cyclocalopin C_1	$C_{15}H_{20}O_6$	$CDCl_3$	[278]
9-23-87	cyclocalopin C_2	$C_{15}H_{20}O_6$	$CDCl_3$	[278]
9-23-88	cyclocalopin D	$C_{23}H_{32}O_{13}$	CD_3OD	[278]
9-23-89	cyclocalopin E	$C_{15}H_{20}O_6$	$CDCl_3$	[278]
9-23-90	cyclocalopin F	$C_{15}H_{18}O_6$	$CDCl_3$	[278]



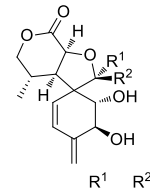
9-23-81 R = OAc
9-23-82 R = OH



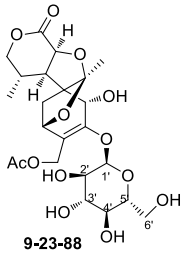
9-23-83 R = OAc
9-23-84 R = OH



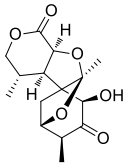
9-23-85



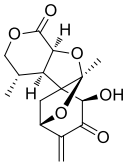
	R^1	R^2
9-23-86	OH	Me
9-23-87	Me	OH



9-23-88



9-23-89



9-23-90

Table 9-23-40: ^{1}H NMR spectroscopic data of cyclopinol-type sesquiterpenoids **9-23-81**~**9-23-85**.

H	9-23-81	9-23-82	9-23-83	9-23-84	9-23-85
2	5.66 d(9.3)	4.71 d(7.6)	4.65 d(10.5)	4.59 d(9.7)	4.61 d(10.6)
3	3.60 dd(9.3, 9.3)	3.53 dd(7.6, 5.2)	2.43 dd(10.5, 10.5)	2.21 m	2.69 dd(10.6, 10.6)
4	2.58 m	2.76 m	2.28 m	2.21 m	2.32 m
5*α*	4.15 dd(11.5, 11.5)	4.02 dd(11.6, 11.6)	3.86 dd(11.2, 11.2)	3.83 dd(11.0, 11.0)	3.94 dd(11.1, 11.1)
5*β*	4.35 dd(11.5, 4.4)	4.51 dd(11.6, 6.6)	4.10 dd(11.2, 3.5)	4.07 dd(2.9, 11.0)	4.14 dd(11.1, 4.3)
7			5.47 s	4.27 s	5.27 d(8.7)
8					5.56 br s

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Table 9-23-40 (continued)

H	9-23-81	9-23-82	9-23-83	9-23-84	9-23-85
10	6.60 d(7.8)	6.71 d(8.0)	6.68 m	6.72 m	5.56 br s
11	6.49 d(7.8)	6.53 d(8.0)	*α* 2.76 ddq(4.3, 1.5, 20.8) *β* 2.58 ddd(2.6, 20.8, 1.5)	*α* 2.72 ddm(5.7, 10.8) *β* 2.55 ddd(2.6, 10.8)	*α* 2.41 dm(19.9) *β* 2.20 dm(19.9)
13	1.77 s		1.47 s	1.67 s	1.46 s
14	1.02 d(6.7)	1.11 d(6.8)	0.81 d(6.4)	0.77 d(6.4)	0.95 d(6.6)
15	2.22 s	2.22 s	1.84 m	1.85 m	1.63 s
OAc			2.21 s		2.01 s(7-OAc) 2.07 s(8-OAc)
OH			2.67 br s(12-OH)	3.90 br s(7-OH) 2.98 br s(12-OH)	

Table 9-23-41: ^{1}H NMR spectroscopic data of cyclopinol-type sesquiterpenoids **9-23-86**~**9-23-90**.

H	9-23-86	9-23-87	9-23-88	9-23-89	9-23-90
2	4.68 d(10.2)	4.59 d(10.8)	4.77 d(10.7)	4.50 d(11.2)	4.56 d(11.4)
3	3.49 dd(10.2, 10.2)	2.76 dd(10.8, 10.8)	2.81 dd(10.7, 10.7)	3.09 dd(11.2, 10.6)	3.18 dd(11.4, 10.0)
4	2.02 m	2.30 m	2.05 m	2.05 m	ca. 2.06 m(ov)
5*α*	3.93 dd(11.6, 11.6)	3.87 dd(9.9, 9.9)	4.03 dd(11.5, 11.5)	3.96 dd(11.3, 11.2)	3.98 dd(11.4, 11.2)
5*β*	4.15 dd(11.6, 4.2)	4.14 dd(9.9, 3.5)	4.15 dd(11.5, 4.4)	4.19 dd(11.2, 3.8)	4.20 dd(11.2, ov)
7	3.76 d(10.7)	3.71 d(10.3)	4.40 br s	4.29 s	4.25 s
8	4.31 d(10.7)	4.23 d(10.3)			
9				2.49 m	2.46 m (ov)
10	6.32 d(10.2)	6.35 d(10.2)	4.62 d(5.1)	4.45 br d(6.1)	4.93 d(6.1)
11	5.10 d(10.2)	5.84 d(10.2)	*α* 2.09 d(11.3) *β* 1.68 dd(11.3, 5.1)	*α* 1.89 d(12.2) *β* 2.40 dd(12.2, 6.1)	*α* 1.84 d(12.3) *β* 2.46 dd(12.3, 6.1)
13	1.48 s	1.50 s	1.35 s	1.26 s	1.38 s
14	1.15 d(6.6)	0.91 d(6.5)	1.26 d(6.6)	1.20 d(6.8)	1.19 d(6.8)
15	5.15 s 5.46 s	5.16 s 5.46 s	4.80 d(12.3) 4.70 d(12.3)	1.25 d(7.0)	5.42 s 5.98 s
1′			5.75 d(3.5)		
2′			3.53 dd(9.3, 3.5)		
3′			3.78 dd(9.3, 9.3)		
4′			3.44 dd(9.3, 9.3)		
5′			3.72 m		
6′			3.73 m, 3.75 m		
OAc			2.02 s(15-OAc)		
OH				3.70 br s(7-OH)	3.59 br s(7-OH)

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