Molecules **2014**, *19*, 17478-17535; doi:10.3390/molecules191117478

OPEN ACCESS

molecules

ISSN 1420-3049

www.mdpi.com/journal/molecules

Review

A Comprehensive Review of the Structure Elucidation and Biological Activity of Triterpenoids from *Ganoderma* spp.

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External Editor: Derek J. McPhee

Received: 11 July 2014; in revised form: 13 August 2014 / Accepted: 15 August 2014 / Published: 30 October 2014

Abstract: *Ganoderma* triterpenes (GTs) are the major secondary metabolites of *Ganoderma lucidum*, a traditional Chinese medicine, popularly used for complementary cancer therapy. GTs are lanostane-tetracyclic triterpenes. They have been reported to possess anti-tumor, anti-inflammation, antioxidant, antimicrobial and blood fat reducing effects. To date, 316 GTs have been found and their similar chemical structures have proved difficult to elucidate. This paper compiles 316 naturally occurring triterpenes from *Ganoderma* based on the literature published through January 2013 along with their structures, physiological activities and ^{13}C-NMR spectral data.

Keywords: *Ganoderma*; triterpenes; chemical structure; ^{13}C-NMR data; bioactivity

1. Introduction

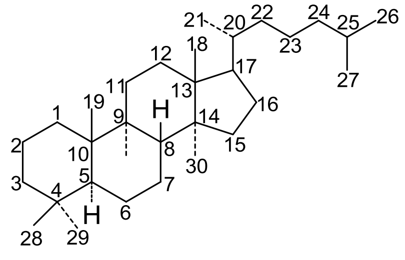
Ganoderma lucidum (Leyss. ex Fr.) Karst, a medicinal fungus called "Lingzhi" in China, is one of the most highly regarded medicinal fungi in the world. It is ranked as rare and precious in the ancient Chinese medical encyclopedias "Shen Nong's Ben Cao Jing" and "Ben Cao Gang Mu". The main Lingzhi-producing regions are East China, Southwest China and the provinces of Hebei, and Guangxi. It can be used in the prevention and treatment of various types of disease, such as cancer, hepatopathy, arthritis, hypertension, neurasthenia, debility, *etc.* Its the most attractive characteristics are its immunomodulatory and antitumor activities [1–8]. *Ganoderma* contains many bioactive natural components, including triterpenes (GTs), polysaccharides, proteins, and unsaturated fatty acids. The triterpenes and polysaccharides are deemed to be the primary bioactive compounds of *Ganoderma*.

Kubota isolated ganoderic acid A and ganoderic acid B from *Ganoderma lucidum* (FR.) KARST in 1982 [9]. Since then, more than 316 triterpenes have been isolated from the fruiting bodies, spores, gills, and mycelia of many *Ganoderma* mushrooms. This total was derived from our investigation of the references. As reported, the majority of GTs exhibit a wide range of biological activities, including antitumor, anti-HIV-1, antihypertensive, antiangiogenic, immunomodulatory, antiandrogenic, antihepatitis B, antioxidant, anticomplement, and antimicrobial activities [10–13]. All GTs are tetracyclic triterpenes. Their chemical structures are more complex than those of other lanostanes, owing to their highly oxidized state. Generally, GTs contain 30 or 27 carbon atoms, and some have 24. The numbers of substituents as well as the positions increase the structural complexity. In this paper, all 316 triterpenes are listed. In accordance with the number of carbon atoms and their molecular features, they can be divided into different structural groups. The ^{13}C-NMR data of those triterpenes, elucidation of the compounds' structures and their bioactivities are discussed. We aim at providing a useful and fast way for identifying GTs. Finally, possible trends and perspectives for future investigation of these mushrooms are also included.

2. Ganoderma Triterpenes

Triterpenes are widely distributed in traditional Chinese medicines. Their structures are considered to be derived from the acyclic precursor squalene. More than 20,000 triterpenes have been isolated and identified from Nature, including squalene, lanostane, dammarane, lupine, oleanane, ursane, and hopane structure types [14,15]. The Ganoderma triterpenes belong to the lanostane triterpenes (Figure 1).

Figure 1. A prototypical lanostane triterpenoid skeleton.



Most of them contain 30 or 27 carbon atoms. A few have 24 carbon atoms. These compounds possesses the same skeleton, namely a *trans* configuration of rings A/B, B/C, C/D and and 10β, 13β, 14α, 17β substituents. Moreover, substituents are always found at the C-3, 7, 11, 12, 15, 22, 23, 24 and 25 positions of the parent nucleus.

On the basis of the substituent groups and double bonds in the same position, they are classified into different types. Compounds **1**–**221** (Figures 2–21) possess 30 carbon atoms. Among them, **1**–**37** (Figure 2) contain double bonds between C-8 and C-9, a keto group at C-23, and substituent groups at C-3, 7, 11, 12, 15, 25. In this figure, compounds **1**, **3**, **4**, **7**, **8**, **11**–**14**, **17**, **18**, **20**, **25**, **26**, **28**, **31**, **32**, **34**, and **35** possess β-hydroxy groups at C-3, and the others possess a keto group, except 3β-oxo-formyl-7β, 12β-dihydroxy-5α-lanost-11,15,23-trioxo-8-en(*E*)-26-oic acid (**21**) with a formyl located at the C-3 position. Compounds **2**, **3**, **9**–**17**, **19**–**23**, **25**, **27**, **31**, **34**–**36** have hydroxy groups at C-7, and furthermore, **19**, **20**, **22** have α-configurations. What's more, compounds **1**, **4**, **18**, **24**, **26**, **28**–**30**, **32**, **33**, and **37** have a carbonyl at C-7. In this group, C-11 mainly has a carbonyl substituent except in ganoderic acid Df (**27**) with a β-hydroxyl at this position. The majority of these compounds do not have any substituents at C-12, while compounds **1**, **4**, **24**, **25**, **28**, **29**, **31** possess β-acetyloxy and compounds **21**, **35**–**37** possess β-hydroxyls. All of these compounds display carbonyls or β-hydroxyls at C-15. As to other configurations, both α- and β-C-21, 17β (compounds **5**–**16**, **21**, **28**–**30**, **35**) and 20 α-configurations can be found in this group. Carboxyl, formyl, ethanoyl or butyryl moieties can be found at C-25, most commonly carboxyl. These compounds have extensive biological activities.

Compared with the compounds in Figure 2, compounds **38**–**70** in Figure 3 possess double bonds between C-24 and C-25, and have a hydroxy or no substituent at C-23, instead of a carbonyl. Some other substituents are also found at C-3, 7, 11, 12, 15, 23, 25. In this group, lucialdehyde C (**46**) displays strong antitumor activity and ganoderic acid β (**53**) reveals great anti-HIV-1 protease activity. Compounds **71**–**84** (Figure 4) get an acetate substituent at C-22 and no substituent at C-11. Meanwhile, compounds **85**–**98** (Figure 5) have double bonds at C-20(22) and keto groups at C-11. From all the listed structures, we can clearly identify compounds **99**–**105** in Figure 6 by the carboxymethyl substitution at C-25, carbonyl substituent at C-11, a keto group at C-23, and β-configuration of C-21. Compounds **106**–**110** are assigned to the same group owing to the methyl at C-20, carbonyl substituent at C-11, and carboxyl at C-25. Lucidumol A (**111**), ganoderiol C-H (**112**–**115**), and ganoderitriol M (**116**) differ from the others on account of the hydroxy at C-24 and C-25. As is shown in Figures 9–17, compounds **117**–**123**, **124**–**126**, **127**–**130**, **131**–**133**, **134**–**135**, **136**–**139**, **140**–**141**, **142**–**145** and **146**–**147** possess extremely similar skeletons. Because of their distinctive skeletons, **148**–**155** are listed independently. There are no double bonds between C-8 and C-9 in compounds **156**–**221**, and two double bonds at C-7(8) and C-9(11), respectively. Among the compounds above, ganoderic acid Jc (**187**), ganoderiol F (**190**), and 15α,26-dihydroxy-5α-lanosta-7,9,24(*E*)-trien-3-one (**212**) showed remarkable antitumor activity. Significant anti-HIV-1 protease activity has been expressed in ganoderic acid S1 (**159**) and ganodermic acid T-Q (**183**). Compounds **156**–**196** (Figure 19) have the same skeleton with substituents at C-3, 15, 16, 20, 22, 23, 25 and double bonds at C-24(25). In this group, 3α, 16α-dihydroxylanosta-7,9(11),24-trien-21-oic acid (**157**), 3α, 16α, 26-trihydroxylanosta-7,9(11), 24-trien-21-oic acid (**158**) and 16α-hydroxy-3-oxolanosta-7,9(11),24-trien-21-oic acid (**196**) possess a hydroxyl at C-16 and carboxyl at C-20. Compounds **197**–**213** (Figure 20) have the same position of substituents. They possess an α- or β-configuration at C-21. The majority have double bonds between C-24 and C-25, except some with hydroxyl, acetoxyl or no substituents at C-24 and C-25. Compounds **214**–**219** (Figure 21) have a hydroxy or acetoxyl at C-22, while epoxyganoderiol B (**220**) and C (**221**) (Figure 22) possess an epoxy at C-24(25). Compounds **222**–**266** have the basic skeleton of 27 carbon atoms. Furthermore, they are also subdivided into different groups due to the difference of substituents and position of double bonds. The C-8(9) double bonds are the same in compounds **222**–**260** (Figure 23). 4,4,14α-Trimethyl-5α-chol-7,9(11)-dien-3-oxo-24-oic acid (**261**) and ganoderic acid Jd (**262**) (Figure 24) get two double bonds at C-7(8) and C-9(11), respectively. Compared with the compounds in Figure 22, compounds **263**–**266** in Figure 25 have hydroxy substituents at C-29. Compounds **267**–**287** are divided into different groups on account of their characteristic skeletons. We list the structures of compounds **288**–**307** successively, in consideration of the number of substituents and the substituents' complicated positions. Fornicatin B(**308**), G(**309**), A(**310**), H(**311**) and australic acid (**312**) are 3,4-*seco*-trinorlanostane triterpenoids. In addition, compounds **313**–**316** only have 24 carbon atoms. The names, corresponding plant resources and references of the compounds are compiled in Tables 1–11.

Table 1. *Ganoderma* triterpenes **1**–**37** in Figure 2.

No.	Compound Name	Source	Ref.
1	*n*-Butyl ganoderate H (*n*-butyl 12β-acetoxy-3β-hydroxy-7,11,15,23-tetraoxo-5α-lanost-8-en-26-oate)	*G. lucidum* (fruit bodies)	[16]
2	Butyl ganoderate A	*G. lucidum* (fruit bodies)	[17]
3	Butyl ganoderate B	*G. lucidum* (fruit bodies)	[17]
4	Ganoderic acid α (12β-acetoxy-3β, 15β-dihydroxy-7,11,23-trioxo-5α-lanosta-8-en-26-oic acid)	*G. lucidum* (fruit bodies)	[18]
5	Ganolucidic acid A	*G. lucidum* (gill surface)	[19]
6	Methyl ganolucidate A (methyl 15α-hydroxy-3,11,23-trioxo-5α-lanost-8-en-26-oate)	*G. lucidum* (gill surface)	[19,20]
7	Ganolucidic acid B	*G. lucidum* (gill surface)	[19]
8	Methyl ganolucidate B	*G. lucidum* (gill surface)	[19,20]
9	Ganoderic acid A (7β, 15α-dihydroxy-3,11,23-trioxo-5α-lanost-8-en-26-oic acid)	*G. lucidum*	[9,21]
10	Methyl ganoderate A (methyl 7β, 15α-dihydroxy-3,11,23-trioxo-5α-lanost-8-en-26-oate)	*G. lucidum*	[21]
11	Ganoderic acid B (3β, 7β-dihydroxy-11,15,23-trioxo-5α-lanost-8-en-26-oic acid)	*G. lucidum*	[21]
12	Methyl ganoderate B (methyl 3β, 7β-dihydroxy-11,15,23-trioxo-5α-lanost-8-en-26-oate)	*G. lucidum*	[9,21]
13	Ganoderic acid C (3β, 7β, 15α-trihydroxy-11,23-dioxo-5α-lanost-8-en-26-oic acid)	*G. lucidum*	[21]
14	Methyl ganoderate C	*G. lucidum*	[21]
15	Ganoderic acid D (7β-hydroxy-3,11,15,23-tetraoxo-5α-lanost-8-en-26-oic acid)	*G. lucidum*	[21]
16	Methyl ganoderate D	*G. lucidum*	[21]
17	Methyl ganoderate C_2 (methyl 3β, 7β, 15α-trihydroxy-11,23-dioxo-5α-lanost-8-en-26-oate)	*G. lucidum* (gills)	[22]
18	Methyl ganoderate K	*G. lucidum* (gills)	[22,23]
19	Compound B_8	*G. lucidum* (gills)	[22]
20	Compound B_9	*G. lucidum* (gills)	[22]

Table 1. *Cont.*

No.	Compound Name	Source	Ref.
21	3β-Oxo-formyl-7β, 12β-dihydroxy-5α-lanost-11,15,23-trioxo-8-en(*E*)-26-oic acid	*G. lucidum* (fruit bodies)	[24]
22	Ganoderic acid B_8	*G. lucidum* (fruit bodies)	[25]
23	Ganoderic acid C_1	*G. lucidum* (fruit bodies)	[25]
24	12β-Acetoxy-3,7,11,15,23-pentaoxo-5α-lanosta-8-en-26-oic acid ethyl ester	*G. lucidum*	[26]
25	3β, 7β-Dihydroxy-12β-acetoxy-11,15,23-trioxo-5α-lanosta-8-en-26-oic acid methyl ester	*G. lucidum*	[27]
26	3β-Hydroxy-7,11,12,15,23-pentaoxolanost-8-en-26-oic acid	*G. lucidum* (fruit bodies)	[28]
27	Ganoderic acid Df (7β, 11β-dihydroxy-3,15,23-trioxo-5α-lanosta-8-en-26-oic acid)	*G. lucidum*	[29]
28	Ganoderic acid H	*G. lucidum* (gill surface)	[30]
29	Ganoderic acid F (12β-acetoxy-3,7,11,15-pentaoxo-5α-lanost-8-en-26-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
30	Ganoderic acid E (3,7,11,15,23-pentaoxo-5α-lanost-8-en-26-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
31	Ganoderic acid K	*G. lucidum* (fruit bodies)	[32]
32	Ganoderic acid AM_1	*G. lucidum* (fruit bodies)	[32]
33	Ganoderic acid J	*G. lucidum* (fruit bodies)	[32]
34	Ganoderic acid C_2 (3β, 7β, 15α-trihydroxy-11,23-dioxo-5α-lanosta-8-en-26-oic acid)	*G. lucidum* (gills)	[22]
35	Ganoderic acid G (3β, 7β, 15β-trihydroxy-11,15,23-trioxo-5α-lanosta-8-en-26-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
36	7β, 12β-Dihydroxy-3,11,15,23-tetraoxo-5α-lanosta-8-en-26-oic acid	*G. lucidum*	[26]
37	12β-Hydroxy-3,7,11,15,23-pentaoxo-5α-lanosta-8-en-26-oic acid	*G. lucidum*	[26]

Table 2. *Ganoderma* triterpenes (**38**–**70**) in Figure 3.

No.	Compound Name	Source	Ref.
38	Ganoderic acid GS-1 (7β-hydroxy-3,11,15-trioxolanosta-8,24(*E*)-dien-26-oic acid)	*G. sinense* (fruit bodies)	[33]
39	Ganoderic acid GS-2 (7β, 15α-dihydroxy-3,11-dioxolanosta-8,24(*E*)-dien-26-oic acid)	*G. sinense* (fruit bodies)	[33]
40	Ganoderic acid GS-3 (12β-acetoxy-3β, 7β-dihydroxy-11,15-dioxo-lanosta-8,24(*E*)-dien-26-oic acid)	*G. sinense* (fruit bodies)	[33]
41	Ganoderic acid AP_2 (12β, 15α-diacetoxy-3β-hydroxy-11-oxolanost-8,24(*E*)-dien-26-oic acid)	*G. applanatum* (fruit bodies)	[34]
42	23*S*-Hydroxy-3,7,11,15-tetraoxolanost-8,24*E*-diene-26-oic acid	*G. lucidum* (fruit bodies)	[32]
43	7-Oxoganoderic acid Z (3β-hydroxy-7-oxo-5α-lanosta-8,24(*E*)-dien-26-oic acid)	*G. lucidum* (fruit bodies)	[35]
44	Ganoderic acid LM_2 ((23*S*) 7β,-dihydroxy-3,11,15-trioxo-5α-lanosta-8,24-dien-26-oic acid)	*G. lucidum* (fruit bodies)	[36]
45	Lucialdehyde B ((24*E*)-3,7-dioxo-5α-lanosta-8,24-dien-26-al)	*G. lucidum* (fruit bodies)	[25]
46	Lucialdehyde C ((24*E*)-3β-hydroxy-7-oxo-5α-lanosta-8,24-dien-26-al)	*G. lucidum* (fruit bodies)	[25]
47	Ganoderic acid γ ((23*S*)-7β, 15α, 23-trihydroxy-3,11-dioxolanosta-8,24(*E*)-diene-26-oic acid)	*G. lucidum* (spores)	[37]

Table 2. *Cont.*

No.	Compound name	Source	Ref.
48	Ganoderic acid *δ* ((23*S*)-7α, 15α, 23-trihydroxy-3,11-dioxolanosta-8,24(*E*)-diene-26-oic acid)	*G. lucidum* (spores)	[37]
49	Ganoderic acid *ε* ((23*S*)-3β, 7β, 23-trihydroxy-11,15-dioxolanosta-8,24(*E*)-diene-26-oic acid)	*G. lucidum* (spores)	[37]
50	Ganoderic acid *ζ* ((23*S*)-3β, 23-dihydroxy-7,11,15-trioxolanosta-8,24(*E*)-diene-26-oic acid)	*G. lucidum* (spores)	[37]
51	Ganoderic acid *η* ((23*S*)-3β, 7β, 12β, 23-tetrahydroxy-11,15-dioxolanosta-8,24(*E*)-diene-26-oic acid)	*G. lucidum* (spores)	[37]
52	Ganoderic acid *θ* ((23*S*)-3β, 12β, 23-trihydroxy-7,11,15-trioxolanosta-8,24(*E*)-diene-26-oic acid)	*G. lucidum* (spores)	[37]
53	Ganoderic acid β (3β, 7β-dihydroxy-11,15-dioxolanosta-8,24(*E*)-dien-26-oic acid)	*G. lucidum* (spores)	[38]
54	Ganolucidic acid E (15α-hydroxy-3,11-dioxo-5α-lanosta-8,24*E*-dien-26-oic acid)	*G. lucidum* (fruit bodies)	[39]
55	Ganoderal B (7α-hydroxy-3-oxo-5α-lanosta-8,24*E*-dien-26-al)	*G. lucidum*	[40]
56	Ganoderic acid Ma (3α, 7α-diacetoxy-15α-hydroxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (fruit bodies)	[41]
57	Lucialdehyde D (3,7,11-trioxo-5α-lanosta-8,24-diene-26-al)	*G. pfeifferi* (fruit bodies)	[42]
58	Ganoderone A (5α-lanosta-8,24-diene-26-hydroxy-3,7-dione)	*G. pfeifferi* (fruit bodies)	[42]
59	ganoderic acid Mi (3α-acetoxy-15α-hydroxy-7α-methoxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (mycelial mat)	[43]
60	11α-Hydroxy-3,7-dioxo-5α-lanosta-8,24(*E*)-dien-26-oic acid	*G. lucidum*	[26]
61	11β-Hydroxy-3,7-dioxo-5α-lanosta-8,24(*E*)-dien-26-oic acid	*G. lucidum*	[26]
62	Lucidadiol (5α-lanosta-8,24-dien-3β, 26-dihydroxy-7-one)	*G. lucidum*	[44]
63	Lucidal (5α-lanosta-8,24*E*-dien-3β-hydroxy-7-on-26-al)	*G. lucidum*	[44]
64	Ganoderic acid DM (3,7-dioxo-8,24(*E*)-dien-lanosta-26-oic acid)	*G. lucidum* (cultured fruit bodies)	[45]
65	Ganoderic acid V	*G. orbiforme*	[46]
66	Ganolucidic acid γa (3β, 7β, 15α, 23-tetrahydroxy-11-oxo-5α-lanosta-8,24-dien-26-oic acid)	*G. sinense* (fruit bodies)	[47]
67	Ganolucidate F (3β, 15α, 23-trihydroxy-11-oxo-5α-lanosta-8,24-dien-26-oic acid)	*G. sinense* (fruit bodies)	[47]
68	Lucialdehyde E (7β, 15α-dihydroxy-3,11-dioxo-5α-lanosta-8,24-dien-26-al)	*G. lucidum* (spores)	[48]
69	Ganolucidic acid D	*G. lucidum* (spores)	[37]
70	Ganoderic acid W	*G. lucidum* (fruit bodies)	[41]

Figure 2. Structures of compounds **1**–**37**.

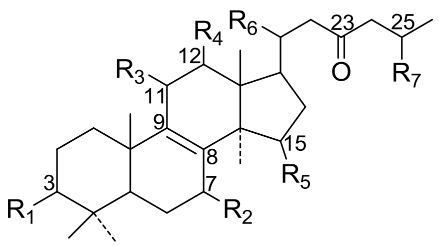
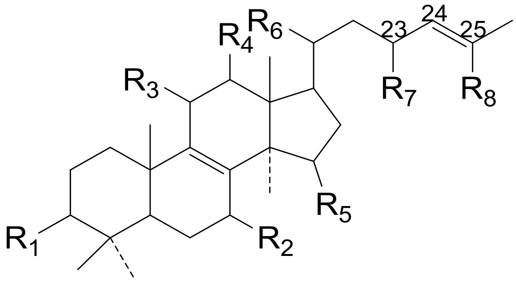


Figure 2. *Cont.*

Cpd	R1	R2	R3	R4	R5	R6	R7
1	β-OH	=O	=O	β-*O*-Ac	=O	α-CH_3	COOBu
2	=O	β-OH	=O	H	α-OH	α-CH_3	COOBu
3	β-OH	β-OH	=O	H	=O	α-CH_3	COOBu
4	β-OH	=O	=O	β-*O*-Ac	α-OH	α-CH_3	COOH
5	=O	H	=O	H	α-OH	β-CH_3	COOH
6	=O	H	=O	H	α-OH	β-CH_3	$COOCH_3$
7	β-OH	H	=O	H	α-OH	β-CH_3	COOH
8	β-OH	H	=O	H	α-OH	β-CH_3	$COOCH_3$
9	=O	β-OH	=O	H	α-OH	β-CH_3	COOH
10	=O	β-OH	=O	H	α-OH	β-CH_3	$COOCH_3$
11	β-OH	β-OH	=O	H	=O	β-CH_3	COOH
12	β-OH	β-OH	=O	H	=O	β-CH_3	$COOCH_3$
13	β-OH	β-OH	=O	H	α-OH	β-CH_3	COOH
14	β-OH	β-OH	=O	H	α-OH	β-CH_3	$COOCH_3$
15	=O	β-OH	=O	H	=O	β-CH_3	COOH
16	=O	β-OH	=O	H	=O	β-CH_3	$COOCH_3$
17	β-OH	β-OH	=O	H	α-OH	α-CH_3	$COOCH_3$
18	β-OH	=O	=O	H	α-OH	α-CH_3	$COOCH_3$
19	=O	α-OH	=O	H	α-OH	α-CH_3	$COOCH_3$
20	β-OH	α-OH	=O	H	α-OH	α-CH_3	$COOCH_3$
21	*O*-CHO	β-OH	=O	β-OH	=O	β-CH_3	COOH
22	=O	α-OH	=O	H	α-OH	α-CH_3	COOH
23	=O	β-OH	=O	H	=O	α-CH_3	COOH
24	=O	=O	=O	β-*O*-$COCH_3$	=O	α-CH_3	COOEt
25	β-OH	β-OH	=O	β-*O*-$COCH_3$	=O	α-CH_3	$COOCH_3$
26	β-OH	=O	=O	=O	=O	α-CH_3	COOH
27	=O	β-OH	β-OH	H	=O	α-CH_3	COOH
28	β-OH	=O	=O	β-*O*-Ac	=O	β-CH_3	COOH
29	=O	=O	=O	β-*O*-Ac	=O	β-CH_3	COOH
30	=O	=O	=O	H	=O	β-CH_3	COOH
31	β-OH	β-OH	=O	β-*O*-Ac	=O	α-CH_3	COOH
32	β-OH	=O	=O	H	=O	α-CH_3	COOH
33	=O	=O	=O	H	α-OH	α-CH_3	COOH
34	β-OH	β-OH	=O	H	α-OH	α-CH_3	COOH
35	β-OH	β-OH	=O	β-OH	=O	β-CH_3	COOH
36	=O	β-OH	=O	β-OH	=O	α-CH_3	COOH
37	=O	=O	=O	β-OH	=O	α-CH_3	COOH

Figure 3. Structures of compounds **38**–**70**.

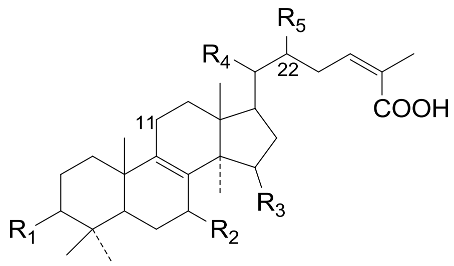


Cpd	R1	R2	R3	R4	R5	R6	R7	R8
38	=O	β-OH	=O	H	=O	α-CH_3	H	COOH
39	=O	β-OH	=O	H	α-OH	α-CH_3	H	COOH
40	β-OH	β-OH	=O	β-*O*-Ac	=O	α-CH_3	H	COOH
41	β-OH	H	=O	β-*O*-Ac	α-*O*-Ac	α-CH_3	H	COOH
42	=O	=O	=O	H	=O	α-CH_3	β-OH	COOH
43	β-OH	=O	H	H	H	β-CH_3	H	COOH
44	=O	OH	=O	H	=O	α-CH_3	OH	COOH
45	=O	=O	H	H	H	α-CH_3	H	CHO
46	β-OH	=O	H	H	H	α-CH_3	H	CHO
47	=O	β-OH	=O	H	α-OH	α-CH_3	β-OH	COOH
48	=O	α-OH	=O	H	α-OH	α-CH_3	β-OH	COOH
49	β-OH	β-OH	=O	H	=O	α-CH_3	β-OH	COOH
50	β-OH	=O	=O	H	=O	α-CH_3	β-OH	COOH
51	β-OH	β-OH	=O	β-OH	=O	α-CH_3	β-OH	COOH
52	β-OH	=O	=O	β-OH	=O	α-CH_3	β-OH	COOH
53	β-OH	β-OH	=O	H	=O	α-CH_3	H	COOH
54	=O	H	=O	H	α-OH	β-CH_3	H	COOH
55	=O	α-OH	H	H	H	β-CH_3	H	CHO
56	α-*O*-Ac	α-*O*-Ac	H	H	α-OH	β-CH_3	H	COOH
57	=O	=O	=O	H	H	α-CH_3	H	CHO
58	=O	=O	H	H	H	α-CH_3	H	CH_2OH
59	α-*O*-Ac	α-*O*-CH_3	H	H	α-OH	β-CH_3	H	COOH
60	=O	=O	α-OH	H	H	α-CH_3	H	COOH
61	=O	=O	β-OH	H	H	α-CH_3	H	COOH
62	β-OH	=O	H	H	H	α-CH_3	H	CH_2OH
63	β-OH	=O	H	H	H	α-CH_3	H	CHO
64	=O	=O	H	H	H	α-CH_3	H	COOH
65	=O	α-OH	H	H	α-*O*-Ac	α-CH_3	H	COOH
66	β-OH	β-OH	=O	H	α-OH	α-CH_3	β-OH	COOH
67	β-OH	H	=O	H	α-OH	α-CH_3	β-OH	COOH
68	=O	β-OH	=O	H	α-OH	α-CH_3	H	CHO
69	=O	H	=O	H	α-OH	α-CH_3	β-OH	COOH
70	α-*O*-Ac	α-OH	H	H	α-*O*-Ac	β-CH_3	H	COOH

Table 3. *Ganoderma* triterpenes **71–98** in Figures 4 and 5.

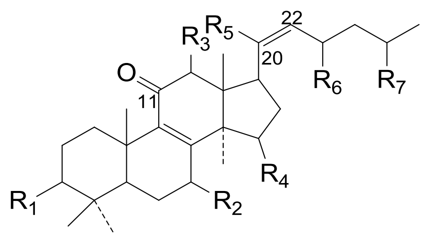
No.	Compound Name	Source	Ref.
71	Ganoderic acid Mb (3α, 15α, 22-triacetoxy-7α-hydroxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (fruit bodies)	[41]
72	Ganoderic acid Mc (3α, 7α, 22-triacetoxy-15α-hydroxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (fruit bodies)	[41]
73	Ganoderic acid Md (3α, 22-diacetoxy-7α-methoxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (fruit bodies)	[41]
74	Ganoderic acid Mg (3α, 22-diacetoxy-15α-hydroxy-7α-methoxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (mycelial mat)	[43]
75	Ganoderic acid Mh (3α, 22-diacetoxy-7α, 15α-dihydroxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (mycelial mat)	[43]
76	Ganoderic acid Mj (22-acetoxy-3α-hydroxy-7α-methoxy-5α-lanost-8,24*E*-dien-26-oic acid)	*G. lucidum* (mycelial mat)	[43]
77	3α, 22β-Diacetoxy-7α-hydroxyl-5α-lanost-8,24*E*-dien-26-oic acid	*G. lucidum* (mycelial mat)	[49]
78	Ganorbiformin B	*G. orbiforme*	[46]
79	Ganorbiformin C	*G. orbiforme*	[46]
80	Ganorbiformin D	*G. orbiforme*	[46]
81	Ganorbiformin E	*G. orbiforme*	[46]
82	Ganorbiformin F	*G. orbiforme*	[46]
83	Ganoderic acid O ((22*S*, 24*E*)-3α, l5α, 22-triacetoxy-7α-hydroxy-5α-lanosta-7,24-dien-26-oic acid)	*G. lucidum* (cultured mycelium)	[50]
84	7-*O*-Methylganoderic acid O ((22*S*, 24*E*)-3α, l5α, 22-triacetoxy-7α-methoxy-5α-lanosta-8,24-dien-26-oic acid)	*G. Lucidum* (cultured mycelium)	[50]
85	12β-Acetoxy-3β-hydroxy-7,11,15,23-tetraoxo-lanost-8,20*E*-diene-26-oic acid	*G. lucidum* (fruit bodies)	[32]
86	23-Dihydroganoderenic acid D (7β, 23ξ-dihydroxy-3,11,15-trioxolanosta-8,20*E*(22)-dien-26-oic acid)	*G. applanatum* (fruit bodies)	[51]
87	Methyl ganoderenate D (7β-hydroxy-3,11,15,23-tetraoxolanosta-8,20*E*(22)-dien-26-oic acid methyl ester)	*G. applanatum* (fruit bodies)	[51]
88	Ganoderenic acid A ((20*E*)-7β, 15α-dihydroxy-3,11,23-trioxo-5α-lanost-8,20-dien-26-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
89	Ganoderenic acid B ((20*E*)-3β, 7β-dihydroxy-11,15,23-trioxo-5α-lanost-8,20-dien-26-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
90	Ganoderenic acid C ((20*E*)-3β, 7β, 15α-trihydroxy-11,23-dioxo-5α-lanost-8,20-dien-26-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
91	Ganoderenic acid D ((20*E*)-7β-hydroxy-3,11,15,23-tetraoxo-5α-lanost-8,20-dien-26-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
92	12β-Acetoxy-7β-hydroxy-3,11,15,23-tetraoxo-5α-lanosta-8,20-dien-26-oic acid	*G. lucidum*	[26]
93	Ganoderenic acid F (3,7,11,15,23-pentaoxo-5α-lanosta-8,20*E*-dien-26-oic acid)	*G. applanatum* (fruit bodies)	[52]
94	Ganoderenic acid G (15α-hydroxy-3,7,11,23-tetraoxo-5α-lanosta-8,20*E*-dien-26-oic acid)	*G. applanatum* (fruit bodies)	[52]
95	Methy ganoderenate H (methyl 3β-hydroxy-7,11,15,23-tetraoxo-5α-lanosta-8,20*E*-dien-26-oate)	*G. applanatum* (fruit bodies)	[52]
96	Methyl ganoderenate I (3β, 15α-dihydroxy-7,11,23-trioxo-5α-lanosta-8,20*E*-dien-26-oate)	*G. applanatum* (fruit bodies)	[52]
97	Ganoderenic acid H	*G. lucidum* (fruit bodies)	[32]
98	12β-Acetoxy-3β, 7β-dihydroxy-11,15,23-trioxo-5α-lanosta-8,20-dien-26-oic acid	*G. lucidum*	[26]

Figure 4. Structures of compounds **71–84**.



Cpd	R1	R2	R3	R4	R5
71	α-*O*-Ac	α-OH	α-*O*-Ac	β-CH_3	ξ-*O*-Ac
72	α-*O*-Ac	α-*O*-Ac	α-OH	β-CH_3	ξ-*O*-Ac
73	α-*O*-Ac	α-*O*-CH_3	H	β-CH_3	ξ-*O*-Ac
74	α-*O*-Ac	α-*O*-CH_3	α-OH	β-CH_3	ξ-*O*-Ac
75	α-*O*-Ac	α-OH	α-OH	β-CH_3	ξ-*O*-Ac
76	α-OH	α-*O*-CH_3	H	β-CH_3	ξ-*O*-Ac
77	α-*O*-Ac	α-OH	H	α-CH_3	β-*O*-Ac
78	β-*O*-Ac	=O	H	α-CH_3	β-*O*-Ac
79	β-OH	=O	H	α-CH_3	β-*O*-Ac
80	=O	α-OH	α-*O*-Ac	α-CH_3	β-*O*-Ac
81	=O	α-OH	H	α-CH_3	β-*O*-Ac
82	=O	α-*O*-CH_3	H	α-CH_3	β-*O*-Ac
83	α-*O*-Ac	α-OH	α-*O*-Ac	α-CH_3	β-*O*-Ac
84	α-*O*-Ac	α-*O*-CH_3	α-*O*-Ac	α-CH_3	β-*O*-Ac

Figure 5. Structures of compounds **85–98**.

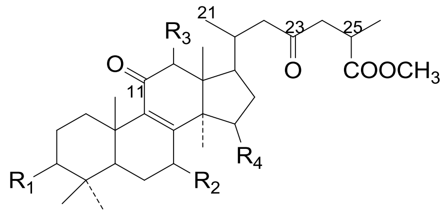


Cpd	R1	R2	R3	R4	R5	R6	R7
85	β-OH	=O	β-*O*-Ac	=O	β-CH_3	=O	COOH
86	=O	β-OH	H	=O	β-CH_3	ξ-OH	ξ-COOH
87	=O	β-OH	H	=O	β-CH_3	=O	ξ-$COOCH_3$
88	=O	β-OH	H	α-OH	β-CH_3	=O	COOH
89	β-OH	β-OH	H	=O	β-CH_3	=O	COOH
90	β-OH	β-OH	H	α-OH	β-CH_3	=O	COOH
91	=O	β-OH	H	=O	β-CH_3	=O	COOH
92	=O	β-OH	β-*O*-Ac	=O	β-CH_3	=O	COOH
93	=O	=O	H	=O	β-CH_3	=O	COOH
94	=O	=O	H	α-OH	β-CH_3	=O	COOH
95	β-OH	=O	H	=O	β-CH_3	=O	$COCH_3$
96	β-OH	=O	H	α-OH	β-CH_3	=O	$COCH_3$
97	β-OH	=O	H	=O	β-CH_3	=O	COOH
98	β-OH	β-OH	β-*O*-Ac	=O	α-CH_3	=O	COOH

Table 4. *Ganoderma* triterpenes **99–123** in Figures 6–9.

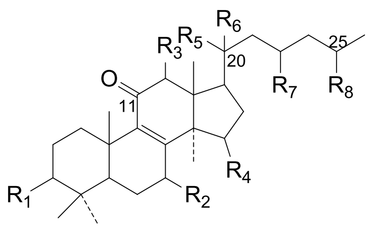
No.	Compound Name	Source	Ref.
99	Methyl ganoderate D (methyl 3β, 7β, 15α-trihydroxy-11,23-dioxo-5α-lanost-8-en-26-oate)	*G. lucidum* (fruit bodies)	[53,54]
100	Methyl ganoderate E (methyl 3β, 7β, 15α-trihydroxy-11,23-dioxo-5α-lanost-8-en-26-oate)	*G. lucidum* (gills)	[54,55]
101	Methyl ganoderate F (methyl 12β-acetoxy-3,7,11,15,23-pentaoxo-5α-lanost-8-en-26-oate)	*G. lucidum* (gills)	[56]
102	Methyl ganoderate H (methyl 3β-hydroxy-12β-acetoxy-7,11,15,23-tetraoxo-5α-lanost-8-en-26-oate)	*G. lucidum* (gills)	[30,56]
103	Methyl ganoderate G (methyl 3β, 7β, 12β-trihydroxy-11,15,23-trioxo-5α-lanost-8-en-26-oate)	*G. lucidum*	[20]
104	Compound C_5	*G. lucidum* (gill surface)	[30]
105	Compound C_6	*G. lucidum* (gill surface)	[30]
106	Ganoderic acid AP_3 (15α, 20ξ-dihydroxy-3,7,11,23-tetraoxolanost-8-en-26-oic acid)	*G. applanatum* (fruit bodies)	[34]
107	23-Dihydroganoderic acid I (3β, 7β, 20,23ξ-tetrahydroxy-11,15-dioxolanosta-8-en-26-oic acid)	*G. applanatum* (fruit bodies)	[51]
108	23-Dihydroganoderic acid N (7β, 20,23ξ-trihydroxy-3,11,15-trioxolanosta-8-en-26-oic acid)	*G. applanatum* (fruit bodies)	[51]
109	20-Hydroxylganoderic acid G	*G. lucidum* (fruit bodies)	[57]
110	Ganoderic acid I	*G. lucidum* (gills)	[22]
111	Lucidumol A ((24*S*)-24,25-dihydroxylanost-8-ene-3,7-dione)	*G. lucidum* (spores)	[38]
112	Ganoderiol C (7α-ethoxy-24,25,26-trihydroxy-5α-lanost-8-en-3-one)	*G. lucidum* (fruit bodies)	[39]
113	Ganoderiol D (24,25,26-trihydroxy-5α-lanost-8-en-3,7-dione)	*G. lucidum* (fruit bodies)	[39]
114	Ganoderiol G (24,25,26-trihydroxy-7α-methoxy-5α-lanost-8-en-3-one)	*G. lucidum* (fruit bodies)	[39]
115	Ganoderiol H (3β, 24,25,26-tetrahydroxy-5α-lanost-8-en-7-one)	*G. lucidum (fruit bodies)*	[39]
116	Ganoderitriol M ((24*S*)-lanosta-7-oxo-8-en-3β, 24,25-triol)	*G. lucidum* (fruit bodies)	[58]
117	Sinensoic acid (3,26-dihydroxy-5-lanosta-8,24*E*-dien-21-oic acid)	*G. sinense* (fruit bodies)	[59]
118	Tsugarioside B (3α-acetoxy-5α-lanosta-8,24-diene-21-*O*-β-D-xyloside)	*G. tsugae* (fruit bodies)	[60]
119	Tsugaric acid A (3α-acetoxy-5α-lanosta-8,24-dien-21-oic acid)	*G. tsugae*	[61]
120	Ganosinoside A (3-oxo-5α-lanosta-8,24-dien-21-oic acid ester β-D-glucoside)	*G. sinense* (fruit bodies)	[47]
121	Tsugarioside A (3α-acetoxy-5α-lanosta-8,24-dien-21-oic acid ester β-D-glucoside)	*G. tsugae* (fruit bodies)	[60]
122	3-Oxo-5α-lanosta-8,24-dien-21-oic acid	*G. resinaceum* (fruit bodies)	[62]
123	3β-Hydroxy-5α-lanosta-8,24-dien-21-oic acid	*G. tsugae* (fruit bodies)	[60]

Figure 6. Structures of compounds **99**–**105**.



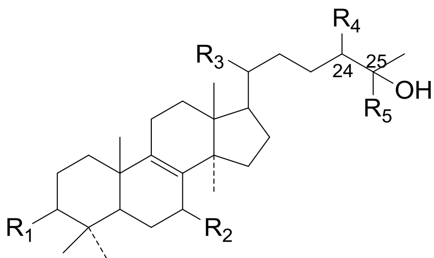
Cpd	R1	R2	R3	R4
99	β-OH	β-OH	H	α-OH
100	=O	=O	H	=O
101	=O	=O	β-*O*-Ac	=O
102	β-OH	=O	β-*O*-Ac	=O
103	β-OH	β-OH	β-OH	=O
104	=O	β-OH	OH	=O
105	β-OH	=O	OH	=O

Figure 7. Structures of compounds **106**–**110**



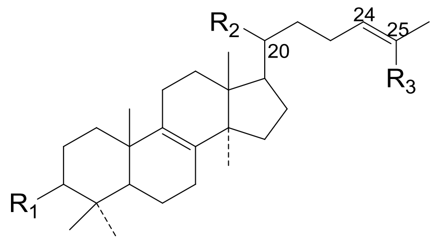
Cpd	R1	R2	R3	R4	R5	R6	R7	R8
106	=O	=O	H	α-OH	β-CH_3	ξ-OH	=O	COOH
107	β-OH	β-OH	H	=O	α-CH_3	β-OH	ξ-OH	ξ-COOH
108	=O	β-OH	H	=O	α-CH_3	β-OH	ξ-OH	ξ-COOH
109	β-OH	β-OH	β-OH	=O	β-CH_3	β-OH	=O	COOH
110	β-OH	β-OH	=O	=O	α-CH_3	ξ-OH	=O	COOH

Figure 8. Structures of compounds **111**–**116**



Cpd	R1	R2	R3	R4	R5
111	=O	=O	α-CH_3	α-OH	CH_3
112	=O	α-*O*-Et	β-CH_3	ξ-OH	CH_2OH
113	=O	=O	β-CH_3	ξ-OH	CH_2OH
114	=O	α-*O*-CH_3	β-CH_3	ξ-OH	CH_2OH
115	β-OH	=O	β-CH_3	ξ-OH	CH_2OH
116	β-OH	=O	α-CH_3	α-OH	CH_3

Figure 9. Structures of compounds **117–123**.



Cpd	R1	R2	R_3
117	β-OH	α-COOH	CH_2OH
118	α-*O*-Ac	CH_2O-β-D-xylosyl	CH_3
119	α-*O*-$COCH_3$	α-COOH	CH_3
120	=O	α-COO-β-D-glucopyranosyl	CH_3
121	α-*O*-Ac	α-COOH	CH_3
122	=O	α-COOH	CH_3
123	β-OH	α-COOH	CH_3

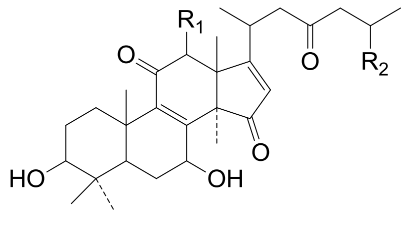
Table 5. *Ganoderma* triterpenes **124–147** in Figures 10–17 and *Ganoderma* triterpenes **148–155** in Figure 18.

No.	Compound Name	Source	Ref.
124	3β, 7β-Dihydroxy-11,15,23-trioxolanost-8,16-dien-26-oic acid	*G. lucidum* (fruit bodies)	[63]
125	3β, 7β-Dihydroxy-11,15,23-trioxolanost-8,16-dien-26-oic acid methyl ester	*G. lucidum* (fruit bodies)	[63]
126	12β-Acetoxy-3β, 7β-dihydroxy-11,15,23-trioxolanost-8,16-dien-26-oic acid	*G. lucidum* (fruit bodies)	[63]
127	Methyl ganoderate I	*G. lucidum*	[20,22]
128	Methyl ganoderate AP (methyl 12β, l5α, 20-trihydroxy-3,7,11,23- tetraoxo-5α-lanost-8-en-26-oate)	*G. applanatum* (fruit bodies)	[52]
129	Methyl ganoderate N (Methyl 7β, 20-dihydroxy-3,11,15,23-tetraoxo-5α-lanost-8-en-26-oate)	*G. lucidum* (fruit bodies)	[64]
130	Methyl ganoderate M (methyl 7β, 12α-dihydroxy-3,11,15,23-tetraoxo-5α-lanost-8-en-26-oate)	*G. lucidum* (fruit bodies)	[64]
131	Ganoderiol E (3β, 26,27-trihydroxy-5α-lanosta-8,24-dien-7-one)	*G. lucidum* (fruit bodies)	[39]
132	Ganoderiol I (15α, 26,27-trihydroxy-5α-lanosta-8,24-dien-3-one)	*G. lucidum* (fruit bodies)	[39]
133	Ganoderiol J (26,27-dihydroxy-5α-lanosta-8,24-dien-3,7-dione)	*G. sinense* (fruit bodies)	[47]
134	Epoxyganoderiol A (24*S*, 25*S*-epoxy-7α, 26-dihydroxy-5α-lanost-8-en-3-one)	*G. lucidum*	[40]
135	Ganoderone C (5α-lanosta-8-ene-24,25-epoxy-26-hydroxy-3,7-dione)	*G. pfeifferi* (fruit bodies)	[42]
136	3-*O*-Acetylganoderic acid B (3β-acetoxy-7β-hydroxy-11,15,23-trioxolanost-8-en-26-oic acid)	*G. lucidum* (mycelia)	[65]
137	3-*O*-Acetylganoderic acid K (3β-acetyloxy-15α-hydroxy-7,11,23-trioxolanost-8-en-26-oic acid)	*G. lucidum* (mycelia)	[65]
138	Ethyl 3-*O*-acetylganoderate B	*G. lucidum* (mycelia)	[65]
139	Ethyl ganoderate J	*G. lucidum* (mycelia)	[65]
140	Applanoxidic acid G (15β, 20-dihydroxy-7α, 8α-epoxy-3,12,23-trioxo-5α-lanosta-9(11),16-dien-26-oic acid)	*G. applanatum*	[66]
141	Applanoxidic acid H (3β, 12α, 20-trihydroxy-7α, 8α-epoxydioxo-5α-lanosta-9(11),16-dien-26-oic acid)	*G. applanatum*	[66]

Table 5. *Cont.*

No.	Compound Name	Source	Ref.
142	8β, 9α-Dihydroganoderic acid J	*G. lucidum* (fruit bodies)	[57]
143	Methyl 8β, 9α-dihydroganoderate J	*G. lucidum* (fruit bodies)	[57]
144	Ganosporeric acid A (3,7,11,12,15,23-hexaoxo-5α-lanosta-8-en-26-oic acid)	*G. lucidum* (spores)	[67]
145	24ξ-Methyl-5α-lanosta-25-one	*G. applanatum* (fruit bodies)	[68]
146	3α-Carboxyacetoxy-24-methylene-23-oxolanost-8-en-26-oic acid	*G. applanatum* (fruit bodies)	[69]
147	3α-Carboxyacetoxy-24-methyl-23-oxolanost-8-en-26-oic acid	*G. applanatum* (fruit bodies)	[69]
148	Fornicatin C ((3β)-3-hydroxy-18(13→12β)-*abeo*-lanosta-13(17),24-dien-18-oic acid)	*G. fornicatum* (fruit bodies)	[70]
149	3-Epipachymic acid (3α-acetoxy-16α-hydroxy-24-methylene-5α-lanost-8-en-21-oic acid)	*G. resinaceum* (fruit bodies)	[62]
150	3β, 15α-Diacetoxylanosta-8,24-dien-26-oic acid	*G. lucidum* (mycelia)	[71]
151	Tsugaric acid C ((24*R*,*S*)-3α-acetoxy-24-hydroxy-5α-lanosta-8,25-dien-21-oic acid)	*G. tsugae* (fruit bodies)	[60]
152	Ganoderic acid V1 ((24*E*)-3β, 20ξ-dihydroxy-7,11,15-trioxo-5α-lanosta-8,24-dien-26-oic acid)	*G. lucidum*	[72]
153	Tsugaric acid B (3α-acetoxy-16α-hydroxy-24ξ-methyl-5α-lanosta-8,25-dien-21-oic acid)	*G. tsugae*	[61]
154	Methyl ganoderenate E (7β, 12β-dihydroxy-3,11,15,23-tetraoxo-5α-lanosta-8,20*E*-dien-26-oate)	*G. lucidum* (fruit bodies)	[64]
155	8β, 9α-Dihydroganoderic acid C	*G. lucidum* (mycelia)	[65]

Figure 10. Structures of compounds **124**–**126**.



Cpd	R1	R2
124	H	COOH
125	H	$COOCH_3$
126	β-*O*-Ac	COOH

Figure 11. Structures of compounds **127**–**130**.

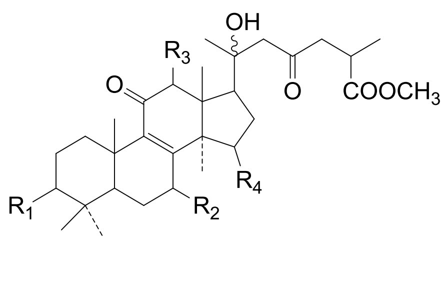
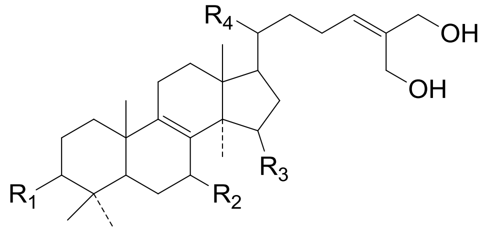


Figure 11. *Cont.*

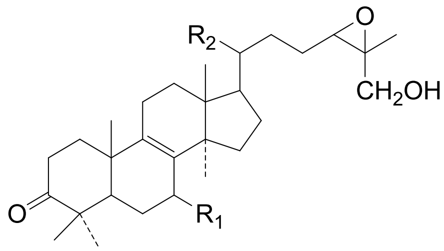
Cpd	R1	R2	R3	R4
127	β-OH	β-OH	H	=O
128	=O	=O	β-OH	α-OH
129	=O	β-OH	H	=O
130	=O	β-OH	α-OH	=O

Figure 12. Structures of compounds **131**–**133**.



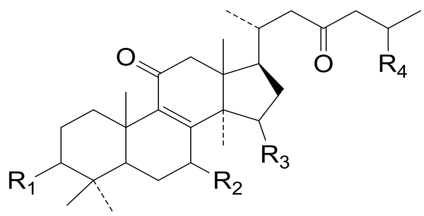
Cpd	R1	R2	R3	R4
131	β-OH	=O	H	β-CH_3
132	=O	β-CH_3	α-OH	β-CH_3
133	=O	=O	H	α-CH_3

Figure 13. Structures of compounds **134** and **135**.



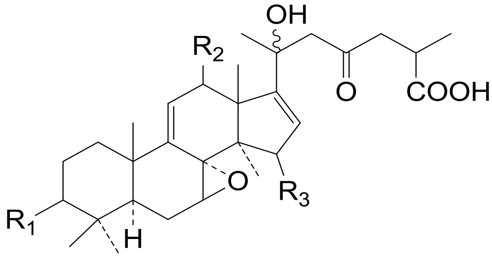
Cpd	R1	R2
134	α-OH	β-CH_3
135	=O	α-CH_3

Figure 14. Structures of compounds **136**–**139**.



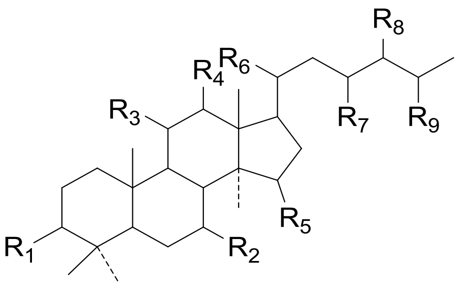
Cpd	R1	R2	R3	R4
136	β-*O*-Ac	β-OH	=O	COOH
137	β-*O*-Ac	=O	α-OH	COOH
138	β-*O*-Ac	β-OH	=O	COOEt
139	=O	=O	α-OH	COOEt

Figure 15. Structures of compounds **140**–**141**.



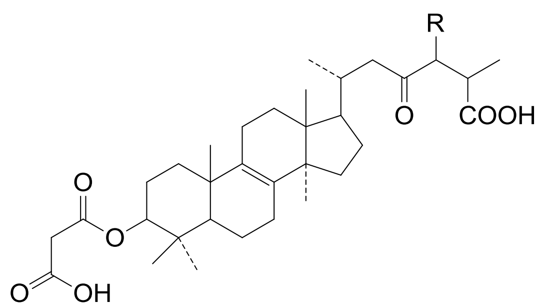
Cpd	R1	R2	R3
140	=O	=O	β-OH
141	β-OH	α-OH	=O

Figure 16. Structures of compounds **142**–**145**.



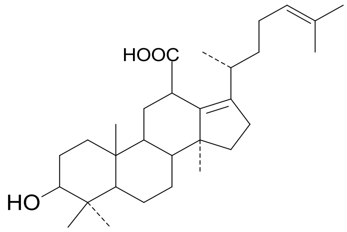
Cpd	R1	R2	R3	R4	R5	R6	R7	R8	R9
142	=O	=O	=O	H	α-OH	β-CH_3	=O	H	COOH
143	=O	=O	=O	H	α-OH	β-CH_3	=O	H	$COOCH_3$
144	=O	=O	=O	=O	=O	β-CH_3	=O	H	COOH
145	H	H	H	H	H	α-CH_3	H	ξ-CH_3	=O

Figure 17. Structures of compounds **146**–**147**.

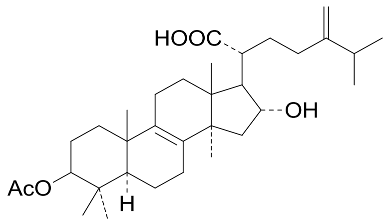


Cpd	R
146	CH_2
147	α-CH_3

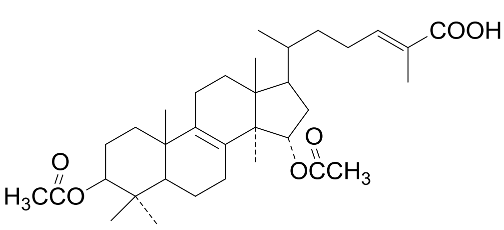
Figure 18. Structures of compounds **148**–**155**.



148



149



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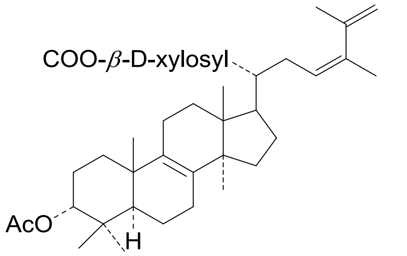

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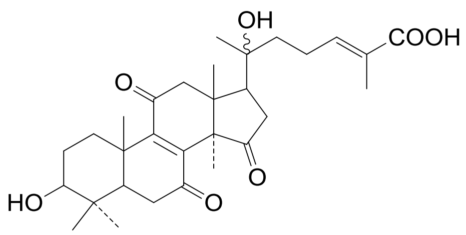
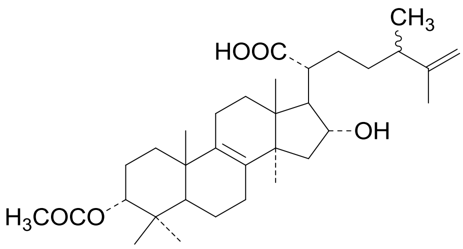
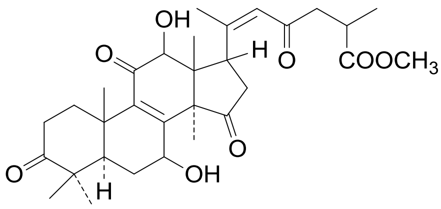


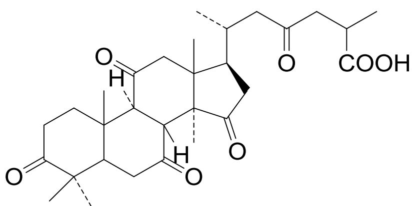
152



153



154



155

Table 6. *Ganoderma* triterpenes **156**–**196** in Figure 19.

No.	Compound Name	Source	Ref.
156	15-Hydroxy-ganoderic acid S (15α-hydroxy-3-oxo-5α-lanosta-7,9(11),24(*E*)-trien-26-oic acid)	*G. lucidum* (fruit bodies)	[35]
157	3α, 16α-Dihydroxylanosta-7,9(11),24-trien-21-oic acid	*G. applanatum* (fruit bodies)	[69]
158	3α, 16α, 26-Trihydroxylanosta-7,9(11),24-trien-21-oic acid	*G. applanatum* (fruit bodies)	[69]
159	Ganoderic acid S_1	*G. lucidum* (fruit bodies)	[73]
160	Ganoderic acid SZ (3-oxo-lanosta-7,9(11),24(*Z*)-trien-26-oic acid)	*G. lucidum* (fruit bodies)	[74]
161	5α-Lanosta-7,9(11),24-triene-15α-26-dihydroxy-3-one	*G. concinna*	[75]
162	Ganoderic acid Me (3α, 15α-diacetoxy-5α-lanost-7,9(11),24*E*-trien-26-oic acid)	*G. lucidum* (cultured mycelial mat)	[41]
163	Ganoderic acid Mf (3α-acetoxy-15α-hydroxy-5α-lanost-7,9(11),24*E*-trien-26-oic acid)	*G. lucidum* (cultured mycelial mat)	[41]

Table 6. *Cont.*

No.	Compound Name	Source	Ref.
164	Ganodermenonol (26-hydroxy-5α-lanosta-7,9(11),24-trien-3-one)	*G. lucidum* (dried fruit bodies)	[76]
165	Ganodermadiol (5α-lanosta-7,9(11),24-triene-3β, 26-diol)	*G. lucidum* (dried fruit bodies)	[76]
166	Ganodermatriol (5α-lanosta-7,9(11),24-triene-3β, 26,27-triol)	*G. lucidum* (fruit bodies)	[77]
167	Ganodermic acid S (lanosta-7,9(11),24-trien-3β, 15α-diacetoxy-26-oic acid)	G. *lucidum*	[78]
168	Carnosodione (26,27-dihydroxylanosta-7,9(11),24-trien-3,16-dione)	G. carnosum (fruit bodies)	[79]
169	Canoderol B ((24*E*)-5α-lanosta-7,9(11),24-trien-3,26-diol)	*G. lucidum*	[23]
170	Ganoderic acid Mk (3α, 22-diacetoxy-15α-hydroxy-5α-lanost-7,9(11),24*E*-trien-26-oic acid)	*G. lucidum* (mycelia mat)	[43]
171	Ganoderiol B (15α, 26,27-trihydroxy-5α-lanosta-7,9(11),24-trien-3-one)	*G. lucidum* (fruit bodies)	[77]
172	Ganoderic acid T ((22*S*, 24*E*)-3α, 15α, 22-triacetoxy-5α-lanosta-7,9,(11),24-trien-26-oic acid)	*G. lucidum* (cultured mycelia)	[80]
173	Ganoderic acid S ((22*S*, 24*E*)-22-acetoxy-3α-hydroxy-5α-lanosta-7,9(11),24-trien-26-oic acid)	*G. lucidum* (cultured mycelia)	[23,80]
174	Ganoderic acid R ((22*S*, 24*E*)-3α, 22-diacetoxy-5α-lanosta-7,9,(11),24-trien-26-oic acid)	*G. lucidum* (cultured mycelia)	[80]
175	Ganorbiformin G	*G. orbiforme*	[46]
176	Lanosta-7,9(11),24-trien-3β, 15α, 22β-triacetoxy-26-oic acid	*G. lucidum*	[81]
177	Lanosta-7,9(11),24-trien-15α-acetoxy-3α-hydroxy-23-oxo-26-oic acid	*G. lucidum*	[81]
178	Lanosta-7,9(11),24-trien-3α, l5α-diacetoxy-23-oxo-26-oic acid	*G. lucidum*	[81]
179	Lanosta-7,9(11),24-trien-3α, 15α-hydroxy-23-oxo-26-oic acid	*G. lucidum*	[81]
180	Lanosta-7,9(11),24-trien-3α-acetoxy-15α, 22β-dihydroxy-26-oic acid	*G. lucidum*	[81]
181	Ganodermic acid T-N (3β-hydroxy-15α-acetoxy-lanosta-7,9(11),24-trien-26-oic acid)	*G. lucidum* (mycelia)	[82]
182	Ganodermic acid T-O (3β-acetoxy-15α-hydroxy-lanosta-7,9(11),24-trien-26-oic acid)	*G. lucidum* (mycelia)	[82]
183	Ganodermic acid T-Q (3β-oxo-15α-acetoxy-lanosta-7,9(11),24-trien-26-oic acid)	*G. lucidum* (mycelia)	[82]
184	Compound 10	*G. orbiforme*	[46]
185	Ganoderic acid P ((22*S*, 24*E*)-15α, 22-diacetoxy-3α-hydroxy-5α-lanosta-7,9(11),24-trien-26-oic acid)	*G. lucidum* (cultured mycelium)	[50]
186	Ganoderic acid Q ((22*S*, 24*E*)-3α, 22-diacetoxy-15α-hydroxy-5α-lanosta-7,9(11),24-trien-26-oic acid)	*G. lucidum* (cultured mycelium)	[50]
187	Ganoderic acid Jc (15α, 23-dihydroxy-3-oxo-5α-lanosta-7,9(11),24-trien-26-oic acid)	*G. sinense* (fruit bodies)	[47]
188	Ganodermatetraol (3β, 15α, 26,27-tetrahydroxy-5α-lanosta-7,9(11),24-triene)	*G. sinense* (fruit bodies)	[47]
189	5α-Lanosta-7,9(11),24-triene-3β-hydroxy-26-al	*G. concinna*	[75]
190	Ganoderiol F (26,27-dihydroxy-5α-lanosta-7,9(11),24-trien-3-one)	*G. lucidum* (fruit bodies)	[39]
191	26,27-Dihydroxy-5α-lanosta-7,9(11),24-triene-3,22-dione	*G. lucidum* (basidiocarp)	[83]
192	26-Hydroxy-5α-lanosta-7,9(11),24-triene-3,22-dione	*G. lucidum* (basidiocarp)	[83]
193	Ganodermic acid P1 (lanosta-7,9(11),24-trien-3α, 22β-diacetoxy-15α-hydroxy-26-oic acid)	*G. lucidum* (mycelia)	[84]

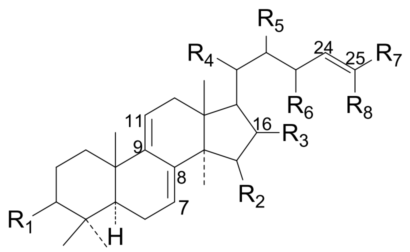
Table 6. *Cont.*

No.	Compound Name	Source	Ref.
194	Ganodermic acid P_2 (lanosta-7,9(11),24-trien-15α, 22β-diacetoxy-3β-hydroxy-26-oic acid)	*G. lucidum* (mycelia)	[84]
195	Lanosta-7,9(11),24-trien-3β, 15α, 22-triacetoxy-26-oic acid	*G. amboinense* (fruit bodies)	[85]
196	16α-Hydroxy-3-oxolanosta-7,9(11),24-trien-21-oic acid	*G. applanatum* (fruit bodies)	[69]

Table 7. *Ganoderma* triterpenes (**197–213**) in Figure 20.

No.	Compound Name	Source	Ref.
197	Lucialdehyde A ((24*E*)-3β-hydroxy-5α-lanosta-7,9(11),24-trien-26-al)	*G. lucidum* (fruit bodies)	[25]
198	Ganoderiol a triacetate (3β, 24,26-triacetoxy-5α-lanosta-7, 9(11)-dien-25-ol)	*G. sinense* (fruit bodies)	[86]
199	Ganoderal A	*G. lucidum*	[23]
200	Ganoderol A	*G. lucidum*	[23]
201	Lucidumol B ((24*S*)-lanosta-7,9(11)-diene-3β, 24,25-triol)	*G. lucidum* (spores)	[38]
202	Ganodermanontiol (24,25,26-trihydroxy-5α-lanosta-7,9(11)-dien-3-one)	*G. lucidum* (spores)	[67]
203	Ganoderiol A (5α-lanosta-7,9(11)-dien-3β, 24,25,26-tetraol)	*G. lucidum* (fruit bodies)	[77]
204	Ganodermanondiol	*G. lucidum* (fruit bodies)	[87]
205	Ganoderic acid X (3α-hydroxy-15α-acetoxy-lanosta-7,9(11),24-trien-26-oic acid)	*G. amboinense*	[88]
206	Ganoderic acid TR	*G. lucidum*	[89]
207	Ganodermic acid Ja (lanosta-7,9(11),24-trien-3α, 15α-dihydroxy-26-oic acid)	*G. lucidum* (mycelia)	[84]
208	Ganodermic acid Jb (lanosta-7,9(11),24-trien-3β, 15α-dihydroxy-26-oic acid)	*G. lucidum* (mycelia)	[84]
209	Ganodermic acid R (lanosta-7,9(11),24-trien-3α, 15α-diacetoxy-26-oic acid)	*G. lucidum*	[78]
211	15α-Hydroxy-3-oxo-5α-lanosta-7,9,24(*E*)-triene-26-oic acid	*G. lucidum*	[26]
212	15α, 26-Dihydroxy-5α-lanosta-7,9,24(*E*)-trien-3-one	*G. lucidum*	[26]
213	3β-Hydroxy-5α-lanosta-7,9,24(*E*)-trien-26-oic acid	*G. lucidum*	[26]

Figure 19. Structures of compounds **156–196**.



Cpd	R1	R2	R3	R4	R5	R6	R7	R8
156	=O	α-OH	H	β-CH_3	H	H	COOH	CH_3
157	α-OH	H	α-OH	α-COOH	H	H	CH_3	CH_3
158	α-OH	H	α-OH	α-COOH	H	H	CH_2OH	CH_3
159	=O	H	H	α-CH_3	H	H	COOH	CH_3
160	=O	H	H	β-CH_3	H	H	COOH	CH_3
161	=O	α-OH	H	α-CH_3	H	H	CH_2OH	CH_3
162	α-*O*-Ac	α-*O*-Ac	H	β-CH_3	ξ-H_2	H	COOH	CH_3
163	β-*O*-Ac	α-OH	H	β-CH_3	ξ-H_2	H	COOH	CH_3
164	=O	H	H	α-CH_3	H	H	CH_2OH	CH_3

Figure 19. *Cont.*

Cpd	R1	R2	R3	R4	R5	R6	R7	R8
165	β-OH	H	H	α-CH_3	H	H	CH_2OH	CH_3
166	β-OH	H	H	α-CH_3	H	H	CH_2OH	CH_2OH
167	β-*O*-Ac	α-*O*-Ac	H	β-CH_3	H	H	COOH	CH_3
168	=O	H	O	β-CH_3	H	H	CH_2OH	CH_2OH
169	β-OH	H	H	β-CH_3	H	H	CH_2OH	CH_3
170	α-*O*-Ac	α-OH	H	β-CH_3	ξ-*O*-Ac	H	COOH	CH_3
171	=O	α-OH	H	α-CH_3	H	H	CH_2OH	CH_2OH
172	α-*O*-Ac	α-*O*-Ac	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
173	α-OH	H	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
174	α-*O*-Ac	H	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
175	=O	H	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
176	β-*O*-Ac	α-*O*-Ac	H	β-CH_3	β-*O*-Ac	H	COOH	CH_3
177	α-OH	α-*O*-Ac	H	β-CH_3	H	=O	COOH	CH_3
178	α-*O*-Ac	α-*O*-Ac	H	β-CH_3	H	=O	COOH	CH_3
179	α-*O*-Ac	α-OH	H	β-CH_3	H	=O	COOH	CH_3
180	α-*O*-Ac	α-OH	H	β-CH_3	H	H	COOH	CH_3
181	β-OH	α-*O*-Ac	H	β-CH_3	H	H	COOH	CH_3
182	β-*O*-Ac	α-OH	H	β-CH_3	H	H	COOH	CH_3
183	=O	α-*O*-Ac	H	β-CH_3	H	H	COOH	CH_3
184	=O	α-*O*-Ac	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
185	α-OH	α-*O*-Ac	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
186	α-*O*-Ac	α-OH	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
187	=O	α-OH	H	α-CH_3	H	OH	COOH	CH_3
188	β-OH	α-OH	H	α-CH_3	H	H	CH_2OH	CH_2OH
189	β-OH	H	H	α-CH_3	H	H	CHO	CH_3
190	=O	H	H	β-CH_3	H	H	CH_2OH	CH_2OH
191	=O	H	H	α-CH_3	=O	H	CH_2OH	CH_2OH
192	=O	H	H	α-CH_3	=O	H	CH_2OH	CH_3
193	α-*O*-Ac	α-OH	H	β-CH_3	*O*-Ac	H	COOH	CH_3
194	β-OH	α-*O*-Ac	H	β-CH_3	*O*-Ac	H	COOH	CH_3
195	β-*O*-Ac	α-*O*-Ac	H	α-CH_3	β-*O*-Ac	H	COOH	CH_3
196	=O	H	α-OH	α-COOH	H	H	CH_3	CH_3

Figure 20. Structures of compounds **197**–**213**.

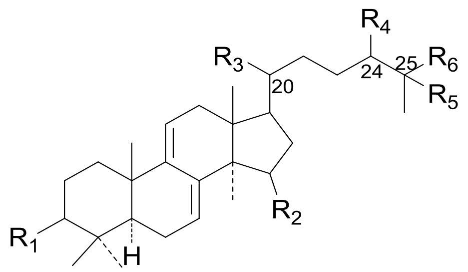


Figure 20. *Cont.*

Cpd	R1	R2	R3	R4	R5	R6
197	β-OH	H	α-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	CHO
198	β-*O*-Ac	H	α-CH_3	OAc	OH	CH_2-*O*-Ac
199	=O	H	β-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	CHO
200	=O	H	β-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	CH_2OH
201	β-OH	H	α-CH_3	α-OH	OH	CH_3
202	=O	H	β-CH_3	α-OH	H	CH_2OH
203	β-OH	H	α-CH_3	OH	OH	CH_2OH
204	=O	H	α-CH_3	OH	OH	CH_3
205	β-OH	α-*O*-Ac	β-CH_3	H	H	COOH
206	=O	α-OH	α-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	COOH
207	α-OH	α-OH	β-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	COOH
208	β-OH	α-OH	β-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	COOH
209	α-*O*-Ac	α-*O*-Ac	β-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	COOH
210	=O	H	α-CH_3	OH	OH	CH_2OH
211	=O	α-OH	α-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	COOH
212	=O	α-OH	α-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	CH_2OH
213	β-OH	H	α-CH_3	$\Delta^{24,25}$	$\Delta^{24,25}$	COOH

Table 8. *Ganoderma* triterpenes (**214**–**221**) in Figures 21 and 22.

No.	Compound Name	Source	Ref.
214	3α, 15α, 22α-Trihydroxylanosta-7,9(11),24-trien-26-oic acid	*G. lucidum* (mycelia)	[71]
215	3β, 15α, 22β-Trihydroxylanosta-7,9(11),24-trien-26-oic acid	*G. lucidum* (mycelia)	[71]
216	3α, 15α-Diacetoxy-22α-hydroxylanosta-7,9(11),24-trien-26-oic acid	*G. lucidum* (mycelia)	[71]
217	3β, 15α-Diacetoxy-22α-hydroxylanosta-7,9(11),24-trien-26-oic acid	*G. lucidum* (mycelia)	[71]
218	22β-Acetoxy-3α, 15α-dihydroxylanosta-7,9(11),24-trien-26-oic acid	*G. lucidum* (mycelia)	[71]
219	22β-Acetoxy-3β, 15α-dihydroxylanosta-7,9(11),24-trien-26-oic acid	*G. lucidum* (mycelia)	[71]
220	Epoxyganoderiol B (24*S*, 25*S*-epoxy-26-hydroxy-5α-lanosta-7,9(11)-diene-3-one)	*G. lucidum*	[40]
221	Epoxyganoderiol C (24*S*, 25*S*-epoxy-5α-lanosta-7,9(11)-diene-3β, 26-diol)	*G. lucidum*	[40]

Figure 21. Structures of compounds **214**–**219**.

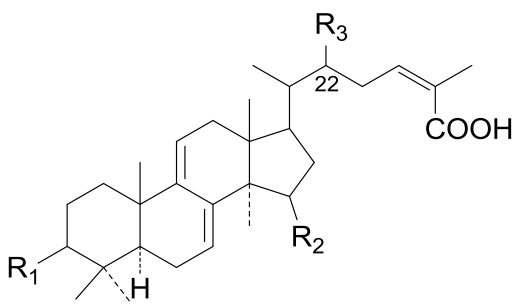
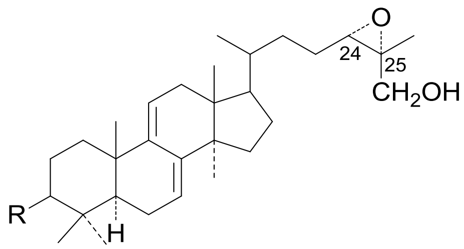


Figure 21. *Cont.*

Cpd	R1	R2	R3
214	α-OH	α-OH	α-OH
215	β-OH	α-OH	β-OH
216	α-*O*-Ac	α-*O*-Ac	α-OH
217	β-*O*-Ac	α-*O*-Ac	α-OH
218	α-OH	α-OH	β-*O*-Ac
219	β-OH	α-OH	β-*O*-Ac

Figure 22. Structure of compounds **220**–**221**.



Cpd	R1
220	β-OH
221	=O

Table 9. *Ganoderma* triterpenes (**222**–**260**) in Figure 23.

No.	Compound Name	Source	Ref.
222	Butyl lucidenate N	*G. lucidum* (fruit bodies)	[17]
223	Butyl lucidenate A	*G. lucidum* (fruit bodies)	[17]
224	20(21)-Dehydrolucidenic acid N (3β, 7β-dihydroxy-11,15-dioxo-25,26,27- trinorlanosta-8,20-dien-24-oic acid)	*G. sinense* (fruit bodies)	[33]
225	20-Hydroxylucidenic acid A (7β, 20ξ-dihydroxy-3,11,15-trioxo-25,26,27-trinorlanost-8-en-24-oic acid)	*G. sinense* (fruit bodies)	[33]
226	Methyl lucidenate D (methyl 12β-acetoxy-3,7,11,15-tetraoxo-5α-lanost-8-en-24-oate)	*G. lucidum* (fruit bodies)	[53,54]
227	20(21)-Dehydrolucidenic acid A (7β-Hydroxy-3,11,15-trioxo-25,26,27-trisnorlanosta-8,20(21)-dien-24-oic acid)	*G. lucidum* (fruit bodies)	[90]
228	Methyl 20(21)-dehydrolucidenate A (methyl 7β-hydroxy-3,11,15-trioxo-25,26,27-trisnorlanosta-8,20(21)-dien-24-oate)	*G. lucidum* (fruit bodies)	[90]
229	Lucidenic acid N (3,7-dihydroxy-4,4,14-trimethyl-11,15-dioxo-5-chol-8-en-24-oic acid)	*G. lucidum* (dried fruit bodies)	[91,92]
230	Lucidenic acid D (12β-acetoxy-4,4,14α-trimethyl-3,7,11,15-tetraoxo-5α-chol-8-en-24-oic acid)	*G. lucidum* (dried fruit bodies)	[31]
231	Methyl lucidenate E	*G. lucidum* (gills)	[54]

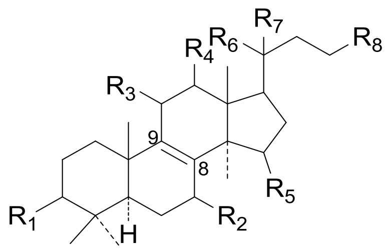
Table 9. *Cont.*

No.	Compound Name	Source	Ref.
232	Methyl lucidenate F	*G. lucidum* (gills)	[23,54]
233	Ethyl lucidenates A (ethyl 7β-hydroxy-4,4,14α-trimethyl-3,11,15-trioxo-5α-chol-8-en-24-oate)	*G. lucidum* (fruit bodies)	[93]
234	3β-Oxo-formyl-7β, 12β-dihydroxy-4,4,14α-trimethyl-5α-chol-11,15-dioxo-8-en(*E*)-24-oic acid	*G. lucidum*	[24]
235	Lucidenic acid A (7β-hydroxy-4,4,14α-trimethyl-3,11,15-trioxo-5α-chol-8-en-24-oic acid)	*G. lucidum* (dried fruit bodies)	[94]
236	Lucidenic acid B (7β, 12-dihydroxy-4,4,14α-trimethyl-3,11,15-trioxo-5α-chol-8-en-24-oic acid)	*G. lucidum* (dried fruit bodies)	[94]
237	Lucidenic acid C (3β, 7β, 12-trihydroxy-4,4,14α-trimethyl-11,15-dioxo-5α-chol-8-en-24-oic acid)	*G. lucidum* (dried fruit bodies)	[94]
238	4,4,14α-Trimethyl-3,7-dioxo-5α-chol-8-en-24-oic acid	*G. lucidum*	[26]
239	Lucidenic acid P (3β, 7β-dihydroxy-12β-acetoxy-25,26,27-trinor-11,15-dioxo dioxolanost-8-en-24-oic acid)	*G. lucidum* (fruit bodies)	[95]
240	Methyl lucidenate P	*G. lucidum* (fruit bodies)	[95]
241	Methyl lucidenate Q (methyl-7β, 15α-dihydroxy-25,26,27-trinor-3,11-dioxolanost-8-en-24-oate)	*G. lucidum* (fruit bodies)	[95]
242	3β-Hydroxy-4,4,14-trimethyl-7,11,15-trioxochol-8-en-24-oic acid	*G. lucidum* (fruit bodies)	[28]
243	Methyl lucidenate D_2	*G. lucidum* (gill surface)	[30]
244	Methyl lucidenate E_2	*G. lucidum* (gill surface)	[30]
248	Methyl lucidenate N (methyl 3β, 7β-dihydroxy-4,4,14α-trimethyl-11,15-dioxo-5α-chol-8-en-24-oate)	*G. lucidum* (fruit bodies)	[96]
249	*t*-Butyl lucidenate B (*t*-butyl 7β, 12β-dihydroxy-4,4,14α-trimethyl-3,11,15-trioxo-5α-chol-8-en-24-oate)	*G. lucidum* (fruit bodies)	[96]
250	Methyl lucidenate A	*G. lucidum* (fruit bodies)	[93]
251	Lucidenic acid D_2	*G. lucidum* (fruit bodies)	[95]
252	20-Hydroxylucidenic acid D_2 ((20ξ)-12β-acetoxy-20-hydroxy-3,7,11,15-tet-raoxo-25,26,27-trisnorlanost-8-en-24-oic acid)	*G. lucidum* (fruit bodies)	[90]
253	20-Hydroxylucidenic acid F ((20ξ)-20-hydroxy-3,7,11,15-tetraoxo-25,26,27-trisnorlanost-8-en-24-oic acid)	*G. lucidum* (fruit bodies)	[90]
254	20-Hydroxylucidenic acid E_2 (12β-acetoxy-3β-hydroxy-7,11,15-trioxo-25,26,27-trisnorlanost-8-en-24-oic acid)	*G. lucidum* (fruit bodies)	[90]
255	20-Hydroxylucidenic acid N ((20ξ)-3β, 7β, 20-trihydroxy-11,15-dioxo-25,26,27-trisnorlanost-8-en-24-oic acid)	*G. lucidum* (fruit bodies)	[90]

Table 9. *Cont.*

No.	Compound Name	Source	Ref.
256	20-Hydroxylucidenic acid P ((20ξ)-12β-acetoxy-3β, 7β, 20-trihydroxy-11,15-dioxo-25,26,27-trisnorlanost-8-en-24-oic acid)	*G. lucidum* (fruit bodies)	[90]
257	Lucidenic acid F	*G. lucidum* (gills)	[22]
258	Methyl lucidenate C	*G. lucidum*	[26]
259	Lucidenic acid E_2	*G. lucidum* (fruit bodies)	[95]
260	Lucideric acid A	*G. lucidum*	[26]

Figure 23. Structures of compounds **222**–**260**.



Cpd	R1	R2	R3	R4	R5	R6	R7	R8
222	β-OH	β-OH	=O	H	=O	α-CH_3	H	COOBu
223	=O	β-OH	=O	H	=O	α-CH_3	H	COOBu
224	β-OH	β-OH	=O	H	=O	CH_2	$\Delta^{20,21}$	COOH
225	=O	β-OH	=O	H	=O	β-CH_3	ξ-OH	COOH
226	=O	=O	=O	β-*O*-Ac	=O	β-CH_3	H	$COOCH_3$
227	=O	β-OH	=O	H	=O	CH_2	$\Delta^{20,21}$	COOH
228	=O	β-OH	=O	H	=O	CH_2	$\Delta^{20,21}$	$COOCH_3$
229	β-OH	β-OH	=O	H	=O	α-CH_3	H	COOH
230	=O	=O	=O	β-*O*-Ac	=O	β-CH_3	H	COOH
231	β-OH	=O	=O	β-*O*-Ac	=O	β-CH_3	H	$COOCH_3$
232	=O	=O	=O	H	=O	β-CH_3	H	$COOCH_3$
233	=O	OH	=O	H	=O	α-CH_3	H	COOEt
234	β-*O*-CHO	β-OH	=O	OH	=O	β-CH_3	H	COOH
235	=O	β-OH	=O	H	=O	β-CH_3	H	COOH
236	=O	β-OH	=O	β-OH	=O	β-CH_3	H	COOH
237	β-OH	β-OH	=O	β-OH	=O	β-CH_3	H	COOH
238	=O	=O	H	H	H	α-CH_3	H	COOH
239	β-OH	β-OH	=O	β-*O*-Ac	=O	α-CH_3	H	COOH
240	β-OH	β-OH	=O	β-*O*-Ac	=O	α-CH_3	H	$COOCH_3$
241	=O	β-OH	=O	H	α-OH	α-CH_3	H	$COOCH_3$
242	β-OH	=O	=O	H	=O	α-CH_3	H	COOH
243	=O	=O	=O	*O*-Ac	=O	β-CH_3	H	$COOCH_3$
244	β-OH	=O	=O	*O*-Ac	=O	β-CH_3	H	$COOCH_3$
245	=O	=O	=O	α-OH	=O	β-CH_3	H	$COOCH_3$
246	β-OH	=O	=O	β-OH	=O	β-CH_3	H	$COOCH_3$
247	β-OH	α-OH	=O	H	α-OH	β-CH_3	H	$COOCH_3$

Figure 23. *Cont.*

Cpd	R1	R2	R3	R4	R5	R6	R7	R8
248	β-OH	β-OH	=O	H	=O	α-CH_3	H	$COOCH_3$
249	=O	β-OH	=O	β-OH	=O	α-CH_3	H	COOBu
250	=O	β-OH	=O	H	=O	α-CH_3	H	$COOCH_3$
251	=O	=O	=O	β-*O*-Ac	=O	α-CH_3	H	COOH
252	=O	=O	=O	β-*O*-Ac	=O	β-CH_3	ξ-OH	COOH
253	=O	=O	=O	H	=O	β-CH_3	ξ-OH	COOH
254	β-OH	=O	=O	β-*O*-Ac	=O	β-CH_3	ξ-OH	COOH
255	β-OH	β-OH	=O	H	=O	β-CH_3	ξ-OH	COOH
256	β-OH	β-OH	=O	β-*O*-Ac	=O	β-CH_3	ξ-OH	COOH
257	=O	=O	=O	H	=O	α-CH_3	H	COOH
258	β-OH	β-OH	=O	H	=O	α-CH_3	H	$COOCH_3$
259	β-OH	=O	=O	β-*O*-Ac	=O	α-CH_3	H	COOH
260	=O	β-OH	=O	H	=O	α-CH_3	H	COOH

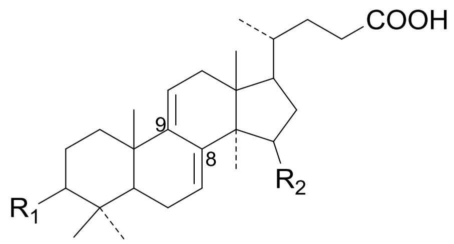
Table 10. *Ganoderma* triterpenes **261**–**280** in Figures 24–31.

No.	Compound Name	Source	Ref.
261	4,4,14α-Trimethyl-5α-chol-7,9(11)-dien-3-oxo-24-oic acid	*G. lucidum* (dried fruit bodies)	[73]
262	Ganoderic acid Jd (15α-hydroxy-3-oxo-5α-lano-sta-7,9(11)-dien-24-oic acid)	*G. sinense* (fruit bodies)	[47]
263	Methyl lucidenate H (methyl 3β, 7β-dihydroxy-4α-hydroxymethyl-4β, 14α-dimethyl-11,15-dioxo-5α-chol-8-en-24-oate)	*G. lucidum* (fruit bodies)	[64]
264	Methyl lucidenate I (3β-hydroxy-4α-hydroxymethyl-4β, 14α-dimethyl-7,11,15-trioxo-5α-chol-8-en-24-oate)	*G. lucidum* (fruit bodies)	[64]
265	Methyl lucidenate J (3β, 12β-dihydroxy-4α-hydroxymethyl-4β, 14α-dimethyl-7,11,15-trioxo-5α-chol-8-en-24-oate)	*G. lucidum* (fruit bodies)	[64]
266	Methyl lucidenate Ha	*G. sinense* (fruit bodies)	[47]
267	Colossolactone I ((22S)-3-β-hydroxylanosta-8,24-dien-26,22-olide)	*G. colossum*	[97]
268	Colossolactone II ((22S)-1,3-β-dihydroxylanosta-8,24-dien-26,22-olide)	*G. colossum*	[97]
269	Colossolactone D	*G. colossum* (fruit bodies)	[98]
270	Colossolactone E	*G. colossum* (fruit bodies)	[98]
271	Colossolactone F	*G. colossum* (fruit bodies)	[98]
272	Colossolactone G	*G. colossum* (fruit bodies)	[98]
273	Ganosporelactone A	*G. lucidum* (spores)	[99]
274	Ganosporelactone B	*G. lucidum* (spores)	[99]
275	Ganosinensin B (ganodermanontriol 24-*O*-{(2*Z*, 5*E*, 9*E*)-2-[2-(2,5-dihydroxyphenyl)-2-oxo-ethylidene]-11-hydroxy-6,10-dimethylundeca-5,9-dienate)	*G. sinense* (fruit bodies)	[100]
276	Ganosinensin C (ganodermanontriol 24-*O*-{(2*Z*, 5*E*, 9*E*)-2-[2-(2,5-dihydroxyphenyl)ethylidene]-11-hydroxy-6,10-dimethylundeca-5,9-dien-ate)	*G. sinense* (fruit bodies)	[100]
277	Ganodermacetal (methyl 7β, 15α-isopropylide-nedioxy-3β-hydroxy-11,23-dioxo-5α-lanost-8-en-26-oate)	*G. amboinense* (fruit bodies)	[85]

Table 10. *Cont.*

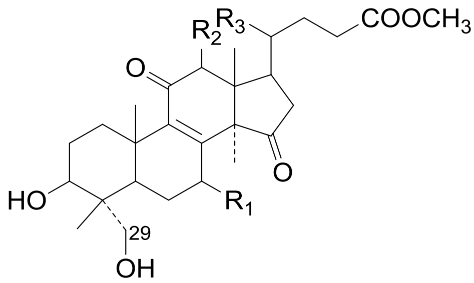
No.	Compound Name	Source	Ref.
278	Methyl ganoderate A acetonide (methyl 7β, 15α-isopropylidenedioxy-3,11,23-trioxo-5α-lanost-8-en-26-oate)	*G. lucidum* (fruit bodies)	[16]
279	Applanoxidic acid A (15α-hydroxy-7α, 8α-epoxy-3,12,23-trioxo-5α-lanosta-9(11),20*E*-dien-26-oic acid)	*G. applanatum*	[101]
280	Applanoxidic acid B (3β-hydroxy-7α, 8α-epoxy-12,15,23-trioxo-5α-lanosta-9(11),20*E*-dien-26-oic acid)	*G. applanatum*	[101]

Figure 24. Structures of compounds **261**–**262**.



Cpd	R1	R2
261	=O	H
262	=O	α-OH

Figure 25. Structures of compounds **263**–**266**.



Cpd	R1	R2	R3
263	β-OH	H	β-CH3
264	=O	H	β-CH3
265	=O	β-OH	β-CH3
266	β-OH	H	α-CH3

Figure 26. Structures of compounds **267**–**268**.

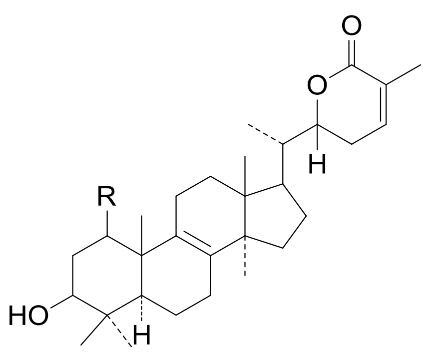
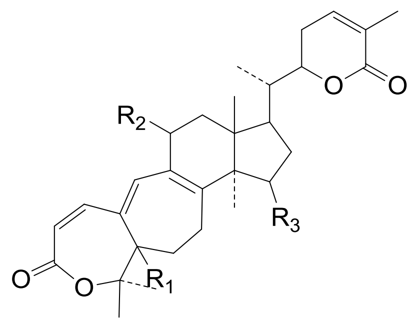


Figure 26. *Cont.*

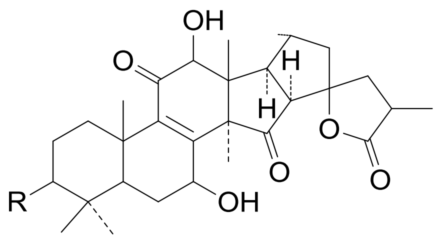
Cpd	R
267	H
268	β-OH

Figure 27. Structures of compounds **269**–**272**.



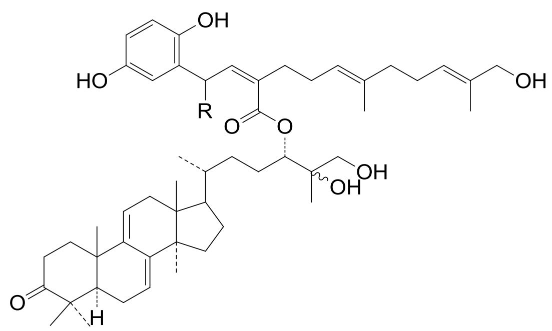
Cpd	R1	R2	R3
269	α-H	β-H	β-OH
270	α-H	β-H	β-*O*-Ac
271	α-H	β-OH	β-*O*-Ac
272	ξ-OH	H	β-*O*-$COCH_3$

Figure 28. Structures of compounds **273**–**274**.



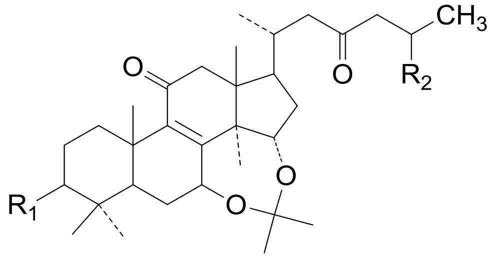
Cpd	R
273	=O
274	β-OH

Figure 29. Structures of compounds **275**–**276**.



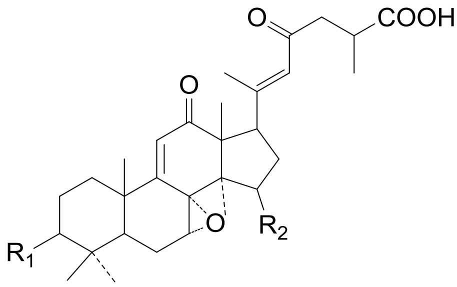
Cpd	R
275	=O
276	H

Figure 30. Structures of compounds **277**–**278**.



Cpd	R1	R2
277	β-OH	COOH
278	=O	$COOCH_3$

Figure 31. Structures of compounds **279**–**280**.



Cpd	R1	R2
279	=O	α-OH
280	β-OH	=O

Table 11. *Ganoderma* triterpenes **281**–**287**, **288**–**307**, **308**–**311**, **312**, **313**–**315**, **316** in Figures 32–40.

No.	Compound Name	Source	Ref.
281	Applanoxidic acid C (20-hydroxy-7α, 8α-epoxy-3,12,15,23-tetraoxo-5α-lanosta-9(11),16-dien-26-oic acid)	*G. applanatum*	[101]
282	Applanoxidic acid D (3β, 20-dihydroxy-7α, 8α-epoxy-12,15,23-trioxo-5α-lanosta-9(11),16-dien-26-oic acid)	*G. applanatum*	[101]
283	Lanosta-7,9(11),24-trien-3-one15,26-dihydroxy	*G. zonatum Murill.*	[27]
284	Lanosta-7,9(11),24-trien-26-oic,3-hydroxy	*G. zonatum Murill.*	[27]
285	Ganoderic acid Y ((24*E*)-3-ol-5α-lanosta-7,9(11),24-trien-26-oic acid)	*G. zonatum Murill.*	[27]
286	Applanoxidic acid E (15β-hydroxy-7α, 8α-epoxy-3,12,23-trioxo-5α-lanosta-9(11),20*E*-dien-26-oic acid)	*G. applanatum*	[66]
287	Applanoxidic acid F (7α, 8α-epoxy-3,12,15,23-tetraoxo-5α-lanosta-9(11),20*E*-dien-26-oic acid)	*G. applanatum*	[66]
288	Ganosinensin A (ganodermanontriol 26-*O*-{(2*Z*, 5*E*, 9*E*)-2-[2-(2,5-dihydroxyphenyl)-2-oxo-ethylidene]-11-hydroxy-6,10-dimethylundeca-5,9-dienate})	*G. sinense* (fruit bodies)	[100]
289	Colossolactone III ((22*S*)-3β, 19-epoxy-lanosta-8,24-dien-26,22-olide)	*G. colossum*	[97]
290	Colossolactone IV ((22*S*)-A,B-dihomo-19-nor-4-oxalanosta-8,24-dien-26,22-olide)	*G. colossum*	[97]
291	Colossolactone VIII ((22*S*, 23*R*)-A,B-dihomo-19-nor-15-β-acetoxy-23-hydroxy-4-oxa-3-oxolanosta-1,8,19,24-tetraen-26,22-olide)	*G. colossum*	[102]

Table 11. *Cont.*

No.	Compound Name	Source	Ref.
292	Austrolactone ((23*S*, 25*S*)-12α, 23-epoxy-3β, 15β, 20α-trihydroxy-7,11-dioxo-5α-lanosta-8,16-dien-23,26-olide)	*G. australe*	[103]
293	Ganolactone B (3β, 7β-dihydroxy-11,15-dioxolanosta-8-en-24→20 lactone)	*G. sinense* (fruit bodies)	[86]
294	Ganolactone (7β-hydroxy-3,11,15-trioxo-lanosta-8-en-24→20s lactone)	*G. lucidum* (fruit bodies)	[104]
295	Colossolactone B	*G. colossum* (fruit bodies)	[98]
296	Colossolactone C	*G. colossum* (fruit bodies)	[98]
297	3α-(3-Hydroxy-5-methoxy-3-methyl-1,5-dioxopentyloxy)-24-methylene-5α-lanost-8-en-21-oic acid	*G. resinaceum* (fruit bodies)	[62]
298	Colossolactone A	*G. colossum* (fruit bodies)	[98]
299	Methyl ganosinensate A	*G. sinense* (fruit bodies)	[56]
300	Ganosinensic acid A	*G. sinense* (fruit bodies)	[56]
301	Ganosinensic acid B	*G. sinense* (fruit bodies)	[56]
302	Tsugarioside C (3α-acetoxy-(*Z*)-24-methyl-5α-lanosta-8,23,25-trien-21-oic acid ester β-D-xyloside)	*G. tsugae* (fruit bodies)	[60]
303	Ganorbiformin A	*G. colossum* (fruit bodies)	[46]
304	Colossolactone V ((22*R*)-3,4-seco-19,22-diacetoxy-4-hydroxylanosta-8,24(*Z*)-dien-3,26-dioic acid 3-methyl-ester)	*G. colossum* (fruit bodies)	[102]
305	Colossolactone VI ((22*R*)-3,4-seco-19,22-diacetoxy-4-hydroxylanosta-7,9(11),24(*Z*)-trien-3,26-dioic acid 3-methyl ester)	*G. colossum* (fruit bodies)	[102]
306	Colossolactone VII ((22*S*)-3,4-seco-19-acetoxy-4-hydroxylanosta-8,24-dien-26,22-olide 3-methyl ester)	*G. colossum* (fruit bodies)	[102]
307	Furanoganoderic acid (21,23-epoxy-15α-hydroxy-3,7,1l-trioxo-5α-lanosta-8,20(21),22-trien-26-oic acid)	*G. applanatum* (fruit bodies)	[52]
308	Fornicatin B (7β-hydroxy-11-oxo-3,4-seco-25,26,27-trinorlanosta-4(28),8-dien-3,24-dioic acid)	*G. fornicatum* (fruit bodies)	[105]
309	Fornicatin G (7β-hydroxy-11-oxo-3,4-seco-25,26,27-trinorlanosta-4(28),8-dien-24-oic-3-acetyl ester)	*G. cochlear* (sporophore)	[106]
310	Fornicatin A (4, 7β-epoxy-28-hydroxy-11-oxo-3,4-seco-25,26,27-trinorlanosta-8-en-3,24-dioic acid)	*G. fornicatum* (fruit bodies)	[105]
311	Fornicatin H (4, 7β-epoxy-28-hydroxy-11-oxo-3,4-seco-25,26,27-trinorlansta-8-en-3,24-diester)	*G. cochlear* (sporophore)	[106]
312	Australic acid ((20*Z*, 23*R*, 25*R*)-15α-acetyl-7α, 8α-epoxy-12-oxo-3,4-seco-5α-lanosta-4(28),9,20(22)-trien-23,26-olid-3-oic acid)	*G. australe*	[103]
313	Lucidone A	*G. tsugae*	[107]
314	Lucidenol	*G. tsugae*	[107]
315	Ganosineniol A	*G. sinense* (fruit bodies)	[47]
316	8α, 9α-Epoxy-4,4,14α-trimethyl-3,7,11,15,20-pentaoxo-5α-pregnane	*G. concinna*	[75]

Figure 32. Structures of compounds **281**–**282**.

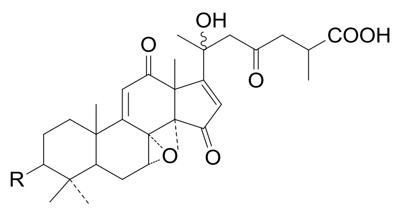
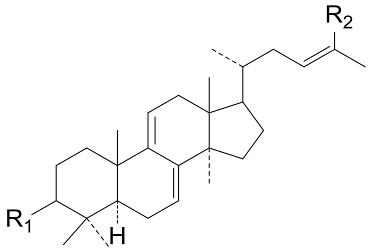


Figure 32. *Cont.*

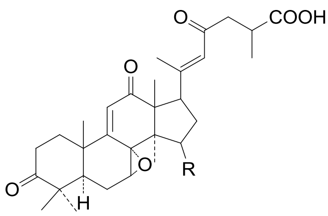
Cpd	R
281	=O
282	β-OH

Figure 33. Structures of compounds **283**–**285**.



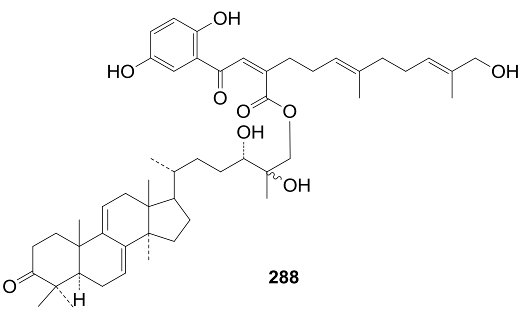
Cpd	R	R2
283	α-OH	COOH
284	=O	CH_2OH
285	β-OH	COOH

Figure 34. Structures of compounds **286**–**287**.

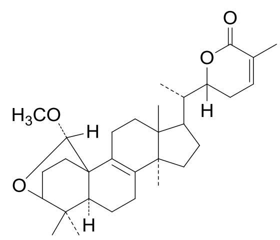


Cpd	R
286	α-OH
287	=O

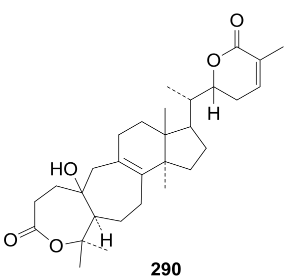
Figure 35. Structures of compounds **288**–**307**.



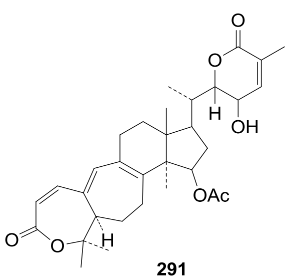
288



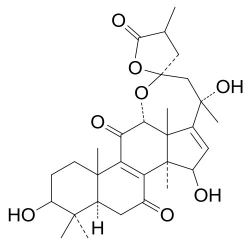
289



290

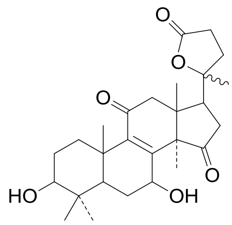


291

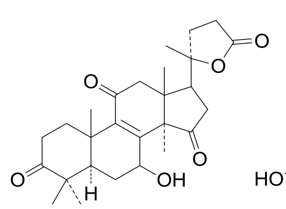


292

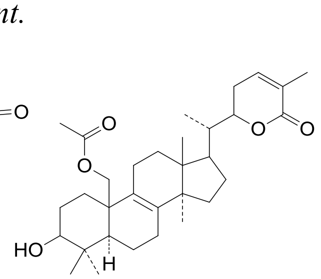
Figure 35. *Cont.*



293



294



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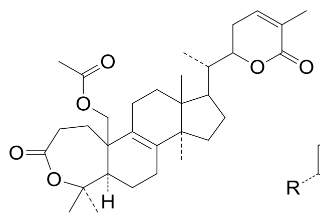

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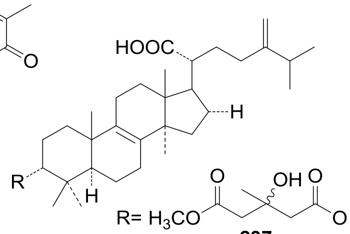

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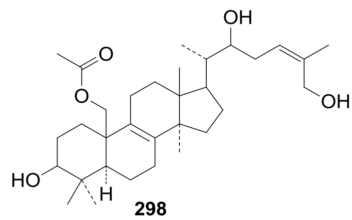

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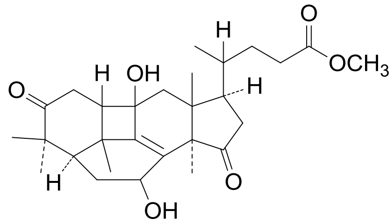

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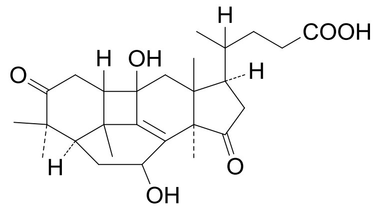

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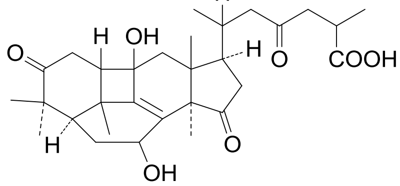

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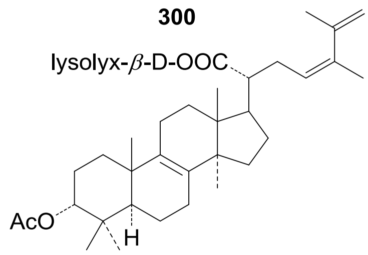

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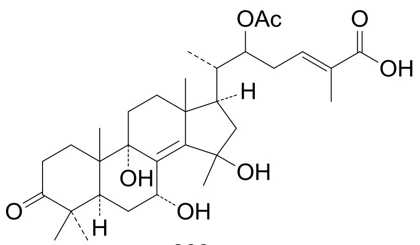

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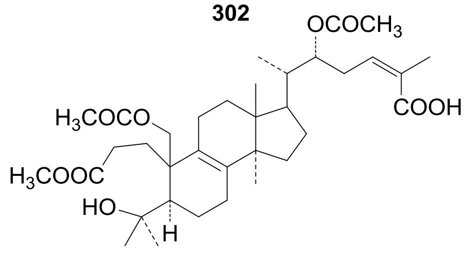

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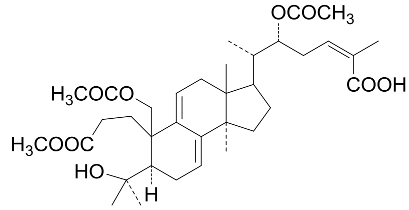
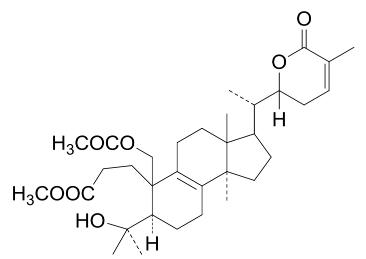


305



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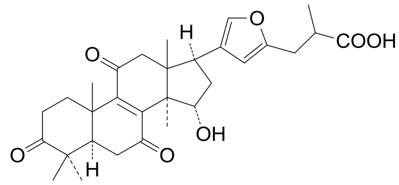
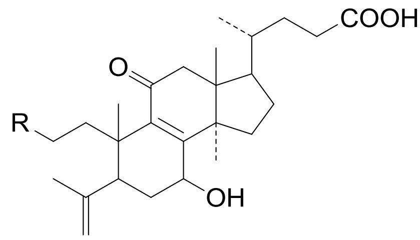


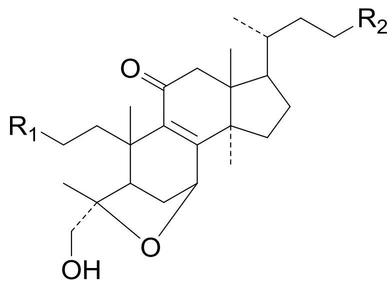
307

Figure 36. Structures of compounds **308**–**309**.



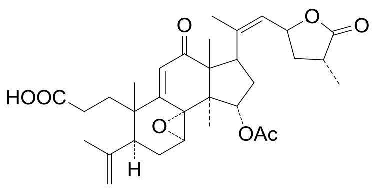
Cpd	R
308	COOH
309	$COOCH_2CH_3$

Figure 37. Structure of compounds **310**–**311**.



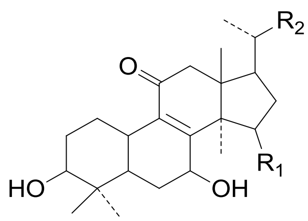
Cpd	R1	R2
310	COOH	COOH
311	$COOCH_3$	$COOCH_3$

Figure 38. Structure of compound **312**.



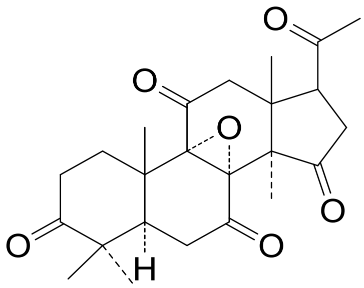
312

Figure 39. Structures of compounds **313**–**315**.



Cpd	R1	R2
313	=O	=O
314	=O	OH
315	α-OH	CH_2OH

Figure 40. Structure of compound **316**.



316

3. ^{13}C-NMR Data of *Ganoderma* Triterpenes

The reported GTs ^{13}C-NMR data are shown in Table 12. For compounds **5**, **7**, **22**, **23**, **28**, **31**–**34**, **36**, **37**, **54**, **55**, **59**, **89**, **95**, **97**, **98**, **110**, **112**, **114**, **121**–**123**, **130**–**132**, **146**, **147**, **154**, **159**, **169**, **195**, **199**, **200**, **206**, **211**–**213**, **235**–**237**, **240**, **245**–**247**, **250**, **251**, **257**–**260**, **265**, **283**–**285**, **313** and **314** have no ^{13}C-NMR data reported or cannot be researched.

As summarized above, a large number of triterpenes together with their potential pharmacological activities are described from *Ganoderma*. Being inclined to complement the prior reviews, we summarized the triterpenes from *Ganoderma*. They contain 30 or 27 carbon atoms, including some with 24 carbon atoms. The great majority of the triterpenes possess double bonds on the ring, at C-8 (9), with hydroxy and carbonyl substituted at C-3, C-7, C-11, and C-15 generally. For this type, the carbon atoms mentioned above are usually a characteristic for its structural determination. The ^{13}C-NMR data of hydroxy substituted C-3 appear from 77–80 ppm, while the data of carbonyl substituted increase to 208–218 ppm. As to the double bonds, the resonance of C-8 arises at 131–165 ppm and the C-9 signal arises at 134–165 ppm, fluctuated for the neighbouring substituent groups.

In the other type, with double bonds located at C-7(8) and C-9(11), the resonance of C-7 appears from 119 ppm to 121 ppm, while the C-8 signal increases to 140–143 ppm. The C-9 signal appears at 144–147 ppm, while the C-11 signal moves to 115–118 ppm. C-23 tends to be oxidized to a carbonyl with ^{13}C-NMR signals appearing at 206 ppm to 217 ppm, or to hydroxy with signals in the 65–67 ppm range. When double bonds appear between C-20 and C-22, the C-23 signal will move to 197–200 ppm. Moreover, C-24 and C-25 are sometimes linked by double bonds in some *Ganoderma* triterpenes. In this case, the ^{13}C-NMR peaks of C-24 appear at 144–156 ppm and those of C-25 appear at 126–140 ppm. According to the compiled ^{13}C-NMR data, this review should provide a useful and fast way for the identification of GTs.

Table 12. The ^{13}C-NMR spectural data of compounds **1–316** except those which have no reported ^{13}C-NMR data.

NO.	1[b)]	2[b)]	3[b)]	4[b)]	6[b)]	8[b)]	9[b)]	10[b)]	11[b)]	12[b)]	13[b)]	14[b)]	15[b)]	16[b)]	17[b)]	18[b)]	19[b)]	20[b)]
C1	33.4	35.7	35.0	33.1	35.1	34.4	35.7	35.6	34.8	34.8	35.0	34.7	35.7	35.7	34.6	34.3	34.8	34.2
C2	27.5	34.5	27.9	27.2	34.2	28.0	34.4	34.4	27.6	28.3	28.0	28.2	34.3	34.3	27.8	27.7	34.1	27.3
C3	77.5	217.1	78.5	77.3	217.7	78.7	208.4	208.7	78.3	78.5	77.5	78.2	217.5	217.5	78.2	77.5	217.8	78.5
C4	40.6	46.8	39.0	39.0	47.0	39.0	47.0	46.7	38.8	39.0	38.9	38.6	46.8	46.8	38.6	40.2	47.2	39.1
C5	51.5	49.0	49.3	51.2	51.7	51.8	49.2	48.8	49.2	45.7	49.5	49.1	49.0	49.0	49.1	49.8	45.2	47.7
C6	36.8	29.3	26.7	36.6	18.7	17.4	29.2	29.1	26.6	27.8	27.6	27.8	27.7	27.8	28.2	36.5	27.9	28.0
C7	199.1	69.1	67.1	199.0	29.6	30.4	69.1	68.9	66.9	67.0	69.5	69.5	66.4	66.3	69.5	205.3	66.7	68.0
C8	151.9	159.1	157.1	145.6	163.2	162.9	159.6	159.5	156.8	155.0	159.6	158.0	157.8	157.8	158.1	154.6	159.3	158.8
C9	145.9	140.5	142.9	151.7	138.6	140.0	140.6	140.1	142.7	142.9	142.2	142.0	141.3	141.3	141.9	149.8	140.0	141.6
C10	39.3	38.2	38.8	40.3	37.1	37.8	46.8	46.8	38.6	45.4	38.9	38.6	38.3	38.3	38.5	38.9	38.0	38.6
C11	194.2	199.6	198.0	193.9	198.1	198.3	200.0	199.7	197.9	200.0	201.2	199.8	197.6	197.6	199.9	201.3	199.1	199.4
C12	79.3	51.9	50.5	79.1	51.7	52.1	51.9	51.8	50.3	51.0	52.3	52.0	50.2	50.2	51.9	52.3	51.8	52.2
C13	48.1	47.0	45.5	47.9	46.8	47.2	38.2	38.0	45.4	38.8	47.4	47.1	45.0	45.0	47.1	48.0	46.4	46.1
C14	58.7	54.1	59.6	58.5	53.6	53.5	54.2	54.1	59.4	58.5	54.4	54.0	59.4	59.4	54.0	52.8	53.4	53.5
C15	205.9	72.7	217.7	66.2	72.9	73.0	72.6	72.4	217.5	207.5	72.4	72.4	216.6	216.4	72.5	72.1	72.4	72.3
C16	38.1	36.7	41.1	38.0	38.6	38.7	36.2	36.3	40.9	41.0	35.9	36.2	41.0	41.0	36.1	36.3	37.8	37.8
C17	44.9	48.4	45.8	44.6	48.7	48.7	48.3	48.2	45.6	49.2	48.5	48.1	45.7	45.8	48.1	48.2	49.0	49.0
C18	12.3	17.5	17.6	12.1	17.2	17.1	17.4	17.3	17.4	17.2	17.2	17.1	17.7	17.7	17.1	17.4	17.5	17.3
C19	18.1	19.5	18.7	17.9	19.0	19.0	19.6	19.4	18.5	17.6	19.6	19.5	18.2	18.2	19.6	17.6	17.5	17.3
C20	29.6	32.8	32.1	29.4	32.6	32.5	32.8	32.8	32.0	32.1	33.0	32.7	32.0	32.0	32.7	32.4	32.5	32.5
C21	21.8	19.7	19.8	21.5	19.4	19.4	19.4	19.7	19.6	19.8	19.7	19.6	19.6	19.7	19.6	19.5	19.3	19.3
C22	48.6	49.9	49.4	48.5	49.6	49.7	49.8	49.7	49.0	49.3	50.0	49.8	49.0	49.1	49.7	49.5	49.6	49.6
C23	207.7	208.6	207.9	206.1	208.3	208.3	217.3	217.4	207.6	215.9	210.0	208.5	207.5	207.6	208.7	208.2	208.3	208.3
C24	46.8	46.9	46.8	46.6	46.8	46.8	46.7	46.8	46.6	46.9	46.9	46.7	46.6	46.8	46.7	46.8	46.9	46.9
C25	34.9	35.0	35.1	35.1	34.7	34.6	34.8	34.8	34.6	34.9	35.0	34.7	34.5	34.7	34.6	34.7	34.7	34.7
C26	175.9	176.0	175.9	181.0	176.2	176.1	27.4	27.5	180.3	26.8	178.5	176.2	180.3	176.1	176.3	176.1	176.2	176.4
C27	17.3	17.3	17.3	17.1	17.1	17.1	180.1	176.3	16.9	176.2	17.2	17.1	16.9	17.1	17.1	17.1	17.1	17.1
C28	28.1	27.5	28.4	27.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C29	15.7	20.9	15.6	15.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C30	21.5	19.8	24.6	21.2	27.8	28.3	17.0	17.2	28.2	15.5	28.3	28.2	27.0	27.0	28.2	27.8	27.6	28.2
	$OCOCH_3$	Bu1'	Bu1'	CH_3CO	C31	C31	C31	C31	C31	C31	C31	C31	C31	C31	C31	C31	C31	C31
	170.4	64.8	64.8	170.2	20.6	15.7	20.8	20.8	15.5	24.5	15.9	15.7	20.8	20.8	15.7	15.4	20.5	15.8
	$OCOCH_3$	Bu 2'	Bu 2'	CH_3CO	C32	C32	C32	C32	C32	C32	C32	C32	C32	C32	C32	C32	C32	C32
	21.0	30.9	30.9	20.9	18.8	18.8	19.8	19.7	24.4	18.7	19.5	19.4	24.7	24.7	19.4	20.3	21.1	21.1
	N-BU1'	Bu 3'	Bu3'		OCH_3	OCH_3		$COOCH_3$		$COOCH_3$		$COOCH_3$		$COOCH_3$	OCH_3	OCH_3	OCH_3	OCH_3
	64.8	19.3	19.3		51.9	51.8		52.0		51.7		51.9		51.9	51.9	51.9	51.9	51.9

Table 12. *Cont.*

NO.	21 [b)]	24 [b)]	25 [b)]	26 [b)]	27 [c)]	29 [b)]	30 [b)]	35 [c)]	38 [b)]	39 [b)]	40 [b)]	41 [b)]	42 [d)]	43 [b)]	44 [a)]	45 [b)]	46 [b)]	47 [c)]
C1	34.5	33.9	34.4	34.5	35.4	37.4	37.2	35.2	35.6	35.7	34.4	33.8	34.0	34.8	36.0	35.4	34.8	35.2
C2	24.0	33.6	27.4	28.4	34.7	34.1	34.6	27.6	34.4	34.5	27.4	27.5	33.5	27.4	34.5	34.3	28.8	33.9
C3	79.9	215.1	78.2	78.4	221.0	214.9	215.4	78.0	216.8	218.0	78.2	78.5	215.5	78.0	215.9	214.6	78.0	218.6
C4	38.0	46.8	38.6	40.7	47.2	46.9	47.0	39.1	46.2	47.0	38.5	38.8	38.7	39.0	47.0	47.2	39.8	46.4
C5	49.2	50.8	49.1	53.0	45.7	51.0	50.9	49.8	48.8	49.0	49.1	51.3	49.7	49.9	48.7	50.4	50.7	48.3
C6	26.6	37.4	36.7	37.8	28.1	33.7	33.8	27.4	27.6	29.2	26.6	17.3	36.8	36.6	28.8	37.1	36.7	28.1
C7	66.1	198.6	66.2	201.1	67.1	198.6	199.4	67.0	66.3	69.2	66.2	29.3	199.6	199.1	66.0	198.0	199.0	68.2
C8	157.4	149.8	155.8	151.9	161.8	149.9	149.8	157.3	157.8	159.2	155.9	161.5	146.1	138.9	159.7	139.8	138.9	160.4
C9	141.6	145.9	142.9	153.6	140.2	146.1	146.8	143.1	141.2	140.6	142.0	140.1	149.0	164.9	140.9	162.6	164.7	139.6
C10	37.5	39.2	38.5	42.4	38.4	39.4	39.3	38.9	38.2	38.2	38.5	37.5	46.4	39.8	38.4	39.4	38.9	37.6
C11	199.3	194.1	192.0	195.0	72.0	194.1	199.4	200.3	197.7	200.1	192.1	191.6	199.8	23.7	198.2	23.8	23.6	200.3
C12	77.9	78.9	79.5	199.8	52.4	79.0	48.9	78.4	50.1	52.0	79.8	80.1	48.5	30.2	50.9	30.1	30.2	51.5
C13	51.9	47.6	49.6	62.2	47.6	47.7	43.9	52.4	44.9	46.9	49.9	51.5	56.8	45.0	45.2	45.0	45.0	46.3
C14	60.3	58.7	60.6	61.3	54.1	58.7	57.2	60.9	59.3	54.1	60.5	53.9	43.5	47.8	59.0	47.8	49.0	53.7
C15	216.8	205.6	216.2	207.5	201.0	205.5	207.0	217.8	218.1	72.9	216.4	74.6	207.8	32.0	217.0	28.7	27.5	71.6
C16	38.3	37.8	37.9	40.8	35.3	37.8	39.8	38.6	41.2	36.7	37.3	33.6	39.9	28.8	42.0	31.8	32.0	35.6
C17	45.7	44.3	45.2	40.7	49.5	44.5	44.3	46.6	46.7	48.7	46.1	48.6	44.4	49.0	46.8	49.0	49.9	48.5
C18	12.0	12.0	12.0	13.5	17.8	12.1	16.0	12.3	17.7	17.4	13.4	12.3	15.4	15.8	17.8	15.9	15.3	16.6
C19	18.8	18.7	18.6	18.6	17.9	18.7	18.6	19.1	18.2	19.6	18.6	19.0	18.4	18.4	18.2	17.9	18.4	18.9
C20	28.7	29.4	28.2	33.8	33.2	29.5	32.1	29.1	35.5	36.2	35.5	34.1	32.9	36.2	33.9	36.2	36.3	33.1
C21	21.3	21.6	21.9	20.4	19.5	21.6	19.8	21.8	18.2	18.5	20.8	19.7	19.7	18.6	19.8	18.6	18.6	19.0
C22	48.3	48.4	47.9	50.2	50.0	48.4	48.8	48.7	34.5	34.8	33.1	33.7	42.8	34.8	43.8	34.7	34.8	42.9
C23	208.1	207.6	207.4	211.1	210.7	207.3	207.6	210.3	25.6	25.9	26.5	26.3	65.4	25.9	66.5	26.0	26.0	65.9
C24	46.1	46.6	46.6	48.0	47.2	46.4	46.5	46.9	144.1	145.3	143.2	144.2	144.4	145.6	145.0	155.2	155.3	143.2
C25	34.2	34.7	34.6	36.6	37.4	34.6	34.6	35.4	127.0	127.2	127.1	127.2	126.9	126.6	128.8	139.2	139.2	128.4
C26	180.5	175.6	176.1	180.7	179.0	180.8	180.9	178.8	171.2	172.0	171.0	172.7	169.0	172.4	170.7	195.3	195.3	170.2
C27	16.9	17.1	17.1	18.0	17.4	16.9	16.9	17.3	12.1	12.3	12.1	12.0	12.7	12.0	13.4	9.2	9.2	12.3
C28	27.9	27.6	28.0	28.7	27.8	--	--	--	24.7	19.7	24.1	28.2	27.0	25.0	27.0	25.4	27.5	27.0
C29	16.4	20.3	15.4	16.6	20.7	--	--	--	26.9	27.6	28.1	15.7	19.9	27.5	20.8	21.4	15.8	20.1
C30	23.0	20.7	24.0	24.9	21.4	27.6	27.6	28.4	20.7	20.9	15.4	19.8	20.0	15.3	25.1	24.9	25.0	19.0
	C31	CH_3CO	CH_3CO			C31	C31	C31			CH_3CO	12-$COCH_3$						
	161.0	170.2	170.4			20.4	20.3	15.8			170.1	170.5						
		CH_3CO	CH_3CO			C32	C32	C32			CH_3CO	12-$COCH_3$						
		20.9	20.9			20.8	21.0	23.5			20.7	21.0						
		OCH_2CH_3	OCH_3			$OCOCH_3$						15-$COCH_3$						
		60.7	51.9			170.2						170.6						

Table 12. *Cont.*

NO	**48** [c)]	**49** [c)]	**50** [c)]	**51** [c)]	**52** [c)]	**53** [b)]	**56** [b)]	**57** [b)]	**58** [b)]	**60** [b)]	**61** [b)]	**62** [b)]	**63** [b)]	**64** [b)]	**65** [b)]	**66** [a)]	**67** [a)]	**68** [a)]
C1	34.9	35.7	33.6	34.4	33.2	34.7	30.1	35.0	35.3	34.8	34.5	34.7	34.6	35.4	35.2	35.5	35.2	35.2
C2	34.3	28.0	26.9	27.1	26.7	27.6	23.3	34.1	34.3	34.6	34.4	27.3	27.3	34.4	34.3	29.0	28.9	34.1
C3	219.5	78.7	77.2	78.0	76.8	78.3	77.3	215.5	214.6	214.4	214.9	77.8	77.8	214.6	217.2	77.6	77.9	218.4
C4	46.6	39.7	39.0	38.4	40.0	38.8	36.2	46.9	47.2	47.5	47.4	38.8	38.8	47.2	46.6	39.3	39.7	45.9
C5	45.3	50.0	50.8	49.0	51.2	49.1	40.5	49.8	50.4	50.8	51.6	49.7	49.8	49.0	44.8	49.9	52.4	48.6
C6	27.7	27.6	36.2	26.5	36.4	26.6	26.1	37.1	37.1	37.5	37.2	36.5	36.5	37.2	28.4	28.8	30.9	28.8
C7	66.6	67.7	199.9	66.2	199.5	66.8	70.0	201.3	198.1	199.4	199.8	199.0	198.9	198.0	66.2	69.4	17.9	68.6
C8	160.9	158.4	148.6	156.6	146.2	156.9	131.1	151.5	139.6	142.1	139.7	138.9	138.8	139.6	134.8	160.5	164.8	159.8
C9	139.7	143.9	151.8	142.0	151.0	142.7	145.1	149.8	162.7	158.7	160.6	164.8	164.6	162.8	140.1	141.3	139.8	140.3
C10	37.9	39.4	40.4	38.1	38..8	38.6	38.3	38.8	39.4	40.1	39.7	39.7	39.7	39.4	38.1	39.1	38.3	37.5
C11	200.1	200.1	200.1	199.5	201.4	198.0	21.4	201.8	23.8	65.8	67.2	23.6	23.5	23.8	20.8	200.1	198.6	199.8
C12	52.0	51.2	49.6	78.2	77.6	50.3	31.2	51.2	30.1	44.6	42.7	30.0	30.1	30.2	31.2	52.9	52.9	51.6
C13	47.0	46.4	44.2	51.7	49.5	45.3	45.8	46.7	44.9	47.6	43.4	44.8	44.9	45.0	45.3	47.6	47.4	46.2
C14	53.4	60.3	57.0	60.1	57.5	59.3	52.1	48.7	47.8	48.1	48.9	47.7	47.7	47.8	51.2	54.7	54.0	53.7
C15	71.7	218.5	209.0	217.4	207.6	217.9	72.4	31.9	31.9	32.6	31.9	31.9	31.9	28.7	76.4	72.4	72.1	72.1
C16	37.5	42.0	45.6	36.8	36.7	41.1	39.7	27.43	28.7	27.9	28.7	28.7	28.7	31.9	36.4	37.5	39.6	36.2
C17	49.7	47.2	42.7	46.2	45.5	46.1	48.8	49.1	49.0	49.7	48.1	48.9	48.9	50.5	49.3	49.5	49.9	47.5
C18	17.3	17.6	15.9	11.9	10.6	17.4	16.3	16.9	15.9	16.9	17.3	15.7	15.7	15.9	16.6	17.4	17.0	17.0
C19	17.5	18.8	17.6	18.6	17.6	18.4	17.7	17.9	17.9	19.2	19.5	18.2	18.2	17.9	17.3	19.9	19.4	19.3
C20	33.5	34.0	33.1	28.5	29.4	35.5	36.2	36.1	36.2	36.0	36.2	36.1	36.1	36.2	36.2	34.6	34.4	35.9
C21	19.2	20.0	19.3	22.0	21.3	18.2	18.4	18.3	18.7	18.4	18.6	18.6	18.5	18.4	18.2	20.2	19.9	18.4
C22	43.3	43.7	40.4	41.3	41.8	37.4	34.7	34.5	35.9	34.6	34.6	35.8	34.7	34.7	34.6	44.5	44.4	34.4
C23	66.4	66.8	65.9	67.0	66.5	25.6	25.8	25.92	24.5	25.8	25.8	24.4	25.9	25.9	25.9	67.0	66.9	26.0
C24	142.4	144.2	142.8	142.7	142.2	143.9	145.2	154.6	126.8	145.3	145.3	126.8	155.1	145.5	144.9	145.4	145.4	156.3
C25	130.2	129.6	128.8	129.3	129.0	127.5	126.8	139.4	134.4	126.8	126.7	134.3	139.1	126.5	126.7	128.7	128.7	138.6
C26	172.0	171.2	170.8	170.8	175.0	172.3	172.4	195.2	69.0	172.7	172.7	69.0	195.3	172.5	171.2	170.8	170.8	194.4
C27	13.1	13.1	12.6	12.8	12.6	12.1	12.0	9.2	13.6	11.9	11.9	13.5	9.0	12.0	12.1	13.5	13.5	9.2
C28	27.5	28.6	27.5	27.9	27.4	28.1	27.2	27.44	25.4	25.1	25.1	24.9	24.9	25.0	26.5	28.8	28.9	20.8
C29	20.5	16.1	15.3	15.2	15.2	15.4	22.7	20.3	21.4	21.6	21.8	27.3	27.3	25.9	21.2	16.7	16.7	27.5
C30	21.0	24.9	21.6	22.9	20.1	24.4	17.9	25.87	24.9	25.3	24.9	15.2	15.2	21.4	20.1	20.2	19.8	19.1
							$COCH_3$ 171.9											
							$COCH_3$ 21.9											

Table 12. *Cont.*

NO.	**69**[c)]	**70**[b)]	**71**[b)]	**72**[b)]	**73**[b)]	**74**[b)]	**75**[b)]	**77**[b)]	**78**[b)]	**79**[b)]	**80**[b)]	**81**[b)]	**82**[b)]	**83**[h)]	**84**[b)]	**85**[b)]	**86**[b)]	**87**[b)]
C1	34.9	30.3	30.3	30.1	30.2	30.3	30.3	30.3	34.5	34.8	35.2	35.3	35.3	31.3	30.0	33.3	35.9	35.6
C2	34.0	23.3	23.3	23.3	23.4	23.2	23.3	23.3	23.8	27.4	34.2	34.3	34.3	24.3	23.3	27.3	34.5	34.2
C3	219.6	77.5	77.5	77.3	77.6	77.3	77.5	77.6	79.6	77.9	217.2	217.4	217.4	77.7	77.2	77.4	216.7	216.4
C4	46.8	36.3	36.3	36.2	36.4	36.5	36.4	36.3	37.8	38.9	46.6	46.7	46.7	37.2	36.3	39.1	47.0	46.7
C5	51.3	40.1	40.0	40.5	40.4	40.1	40.5	40.2	49.9	49.8	44.7	45.0	45.0	40.8	39.6	51.2	49.2	48.8
C6	18.4	27.4	27.4	26.0	22.4	21.3	28.1	28.9	36.4	36.6	28.4	30.0	23.3	28.5	21.3	36.5	27.9	27.6
C7	29.3	66.5	66.5	69.9	76.5	76.3	66.8	67.0	198.6	198.9	66.1	66.7	76.1	67.1	75.9	198.5	66.5	66.2
C8	165.1	133.9	133.8	131.1	134.3	132.8	134.5	135.6	138.9	138.8	134.6	136.4	135.3	141.7	142.9	145.8	157.8	157.3
C9	137.9	141.8	141.8	145.0	141.3	143.6	141.7	141.3	164.4	164.6	140.1	139.4	139.5	135.1	132.7	151.9	141.4	141.2
C10	36.8	38.4	38.4	38.3	38.1	38.4	38.1	38.2	39.6	39.8	38.1	37.9	37.8	39.2	38.7	40.5	38.6	38.3
C11	199.1	20.7	20.7	21.2	21.0	20.9	20.6	21.0	23.6	23.6	20.7	21.3	21.0	21.5	21.1	193.5	197.5	196.8
C12	51.6	31.2	31.2	31.2	31.1	31.4	31.7	31.0	30.1	30.1	31.2	31.0	31.1	32.1	30.7	78.5	49.2	48.9
C13	46.4	45.5	45.3	45.6	45.0	46.2	45.7	45.0	44.9	44.9	45.1	45.0	44.9	46.0	45.6	57.8	45.9	45.9
C14	53.3	51.2	51.3	52.1	50.0	52.8	52.4	49.7	47.8	47.8	51.2	49.7	49.9	52.4	51.7	48.7	58.8	58.6
C15	72.0	76.5	76.0	72.2	30.2	72.0	72.4	29.8	31.9	31.9	75.9	29.9	30.1	76.0	75.2	204.6	217.3	216.6
C16	38.1	36.6	36.3	39.3	27.9	37.3	38.1	27.9	28.5	28.5	36.1	27.9	27.8	37.3	37.1	37.6	38.1	37.8
C17	49.0	49.3	45.9	45.5	47.2	46.4	46.4	47.1	45.6	45.7	45.9	47.1	47.2	46.9	45.2	48.9	48.3	49.7
C18	16.7	16.5	16.3	16.2	15.9	16.6	16.4	15.9	15.6	15.6	16.4	16.0	16.0	17.0	16.1	13.3	19.2	19.0
C19	18.6	17.5	17.5	17.7	17.5	17.2	17.3	17.3	18.5	18.4	17.3	17.3	17.4	18.0	17.6	17.8	18.4	18.1
C20	33.1	36.3	39.9	39.5	39.8	39.3	39.5	39.7	39.5	39.5	39.9	39.7	39.7	41.0	39.9	154.7	138.5	153.3
C21	18.8	18.2	12.7	12.9	12.9	13.0	12.9	12.8	13.1	13.1	12.6	12.8	12.8	13.6	12.7	21.1	18.3	21.0
C22	42.9	34.7	74.4	74.6	74.8	74.9	74.7	74.7	74.8	74.8	74.3	74.7	74.7	74.8	74.3	126.0	126.9	124.7
C23	66.0	25.9	31.9	31.7	31.9	31.9	31.9	31.8	31.8	31.8	31.9	31.8	31.8	32.8	31.8	197.8	74.5	197.9
C24	142.4	145.0	138.9	139.1	139.6	139.1	139.1	139.4	139.4	139.4	138.8	139.6	139.5	140.0	139.1	47.5	37.2	47.7
C25	129.5	126.8	129.5	129.3	129.1	129.3	129.3	129.2	129.0	129.0	129.5	129.2	129.0	130.2	129.3	34.4	34.5	34.8
C26	171.5	172.2	172.0	171.7	172.1	172.0	171.4	172.4	171.3	171.2	171.9	172.0	171.7	172.9	172.2	180.2	179.8	176.3
C27	12.7	12.0	12.3	12.3	12.3	12.3	12.4	12.3	12.3	12.3	12.3	12.3	12.3	13.1	12.3	17.0	16.0	17.2
C28	27.5	27.4	27.4	27.2	27.3	27.3	27.4	27.4	27.4	27.4	26.5	26.5	26.5	--	--	27.9	27.3	27.0
C29	20.2	21.9	22.0	21.9	22.2	22.0	21.9	22.0	16.3	15.3	21.2	21.3	21.3	--	--	15.5	21.0	20.8
C30	18.7	20.2	20.2	18.0	25.6	18.5	19.2	26.3	25.1	25.0	26.1	26.1	25.4	28.2	27.3	21.3	24.8	24.7
		$OCOCH_3$	$COCH_3$	$COCH_3$	$COCH_3$	$COCH_3$	$COCH_3$	CO	3-OC-	22-OC-	15-OC-	22-OC-	7-OCH_3	C31	C31	C31		OCH_3
		170.9	170.9	171.9	171.1	170.9	170.9	170.9	OCH_3	OCH_3	OCH_3	OCH_3	55.8	22.6	22.2	170.3		51.9
		$OCOCH_3$	$COCH_3$	$COCH_3$	$COCH_3$	$COCH_3$	$COCH_3$	CO	170.8	170.6	170.5	170.7		C32	C32	C32		
		21.4	21.4	21.7	21.6	21.5	21.4	170.7						21.1	19.0	20.5		

Table 12. *Cont.*

NO.	88[c)]	89[c)]	90[b)]	91[b)]	92[b)]	93[h)]	94[h)]	96[h)]	99[b)]	100[b)]	101[b)]	102[b)]	103[b)]	104[b)]	105[b)]	106[b)]	107[b)]	108[b)]
C1	35.5	34.8	34.8	35.6	35.1	34.9	35.2	34.5	35.7	37.3	37.5	36.6	34.6	35.2	33.4	35.0	35.1	35.9
C2	34.3	27.7	27.8	34.2	34.1	34.7	33.9	27.9	34.3	34.7	34.1	27.3	27.6	34.3	27.4	33.9	28.0	34.5
C3	217.4	78.3	78.1	216.5	215.9	213.3	213.0	77.0	217.5	217.2	214.8	77.3	78.3	216.8	77.5	215.4	78.6	216.8
C4	46.7	39.0	38.8	46.8	46.8	46.8	46.3	40.4	46.8	43.9	46.9	40.4	38.6	47.0	40.3	46.4	39.1	47.0
C5	48.8	49.2	50.0	48.9	49.2	48.5	49.0	50.1	49.0	50.9	51.0	51.4	49.2	49.5	51.5	49.0	49.4	49.2
C6	29.0	26.7	27.6	27.7	27.6	36.1	36.8	36.5	27.8	33.8	33.7	33.2	26.9	27.8	36.8	36.8	26.9	27.9
C7	68.9	66.9	69.4	66.3	65.8	198.4	204.5	205.0	66.3	199.3	198.7	198.7	66.2	65.8	198.8	204.6	67.1	66.5
C8	159.1	156.6	158.8	157.4	156.7	146.9	150.3	149.6	157.8	149.7	149.9	151.6	157.4	158.3	150.5	150.4	156.9	157.9
C9	140.3	142.8	142.0	141.4	141.6	149.5	152.6	154.6	141.3	146.8	146.1	145.7	141.9	140.5	147.1	152.3	142.7	141.3
C10	38.1	38.7	38.8	38.4	38.2	39.5	39.2	38.8	38.3	39.4	39.3	39.1	38.4	37.9	39.2	39.1	38.9	38.5
C11	199.1	198.0	200.0	197.8	191.8	198.1	199.8	200.1	197.6	199.3	194.1	193.9	199.3	199.5	201.6	201.2	198.0	197.8
C12	50.5	49.1	50.8	48.9	78.5	47.8	50.5	51.0	50.2	48.9	79.0	79.1	77.9	78.1	77.5	52.1	51.1	50.9
C13	48.1	46.3	49.3	46.0	50.3	44.8	48.6	49.2	45.0	47.0	47.7	47.9	51.9	51.7	49.8	47.8	46.0	45.7
C14	53.4	58.7	53.5	58.7	59.9	56.8	52.4	52.5	59.4	57.2	58.6	58.4	60.3	60.4	57.9	52.8	59.8	59.8
C15	72.7	216.4	72.5	216.4	215.1	204.9	72.9	72.9	216.4	206.8	205.4	205.5	216.8	215.5	206.0	71.8	217.9	218.0
C16	31.8	37.7	31.6	37.9	38.4	37.1	32.3	32.5	41.0	39.8	37.8	37.8	38.4	38.5	37.9	30.2	36.2	36.4
C17	52.2	49.7	52.4	49.7	50.1	50.8	52.0	52.1	45.8	44.5	44.5	44.7	45.8	45.8	45.3	50.9	50.2	50.4
C18	19.0	18.8	18.8	19.0	14.4	17.5	16.7	15.5	17.7	16.1	12.1	12.1	12.0	12.1	10.9	18.9	19.1	19.4
C19	19.9	18.4	19.7	18.1	18.1	18.4	17.4	17.3	18.2	18.6	18.7	17.9	18.8	18.3	18.1	17.5	18.6	18.4
C20	157.0	153.8	157.3	153.6	154.1	153.6	155.6	155.7	32.0	32.0	29.4	29.3	28.7	28.7	29.5	73.3	73.4	73.3
C21	21.3	21.0	21.3	20.9	20.3	21.5	21.1	21.1	19.7	19.8	21.6	21.6	21.4	21.4	21.3	26.6	26.4	26.3
C22	124.3	124.7	124.5	124.7	126.1	124.6	124.5	124.6	49.1	49.1	48.5	48.4	48.4	48.5	48.9	52.5	48.5	48.5
C23	198.6	197.2	199.6	196.9	197.8	197.2	197.4	197.3	207.6	207.6	207.4	207.4	208.1	208.1	208.1	211.2	74.8	74.8
C24	47.5	47.6	48.1	47.5	47.5	47.6	47.6	47.9	46.8	46.7	46.7	46.6	46.4	46.4	46.6	47.7	36.8	36.8
C25	35.1	34.8	34.8	34.8	34.4	35.1	35.2	35.2	34.7	34.6	34.7	34.6	34.6	34.7	34.7	34.5	33.8	33.7
C26	180.2	180.0	179.0	180.6	180.0	181.2	181.2	175.9	176.1	176.1	176.0	176.0	176.1	176.1	176.1	177.8	178.8	178.8
C27	17.1	17.1	17.3	17.0	17.0	17.0	17.0	17.3	17.1	17.1	17.1	17.0	17.1	17.1	17.1	17.0	16.1	16.1
C28	--	--	--	--	26.6	27.2	27.0	27.7	--	--	--	--	--	--	--	27.2	28.4	27.2
C29	--	--	--	--	21.0	20.3	20.3	18.7	--	--	--	--	--	--	--	20.2	15.7	21.0
C30	27.5	28.2	28.2	27.0	24.0	20.9	20.7	20.7	27.0	27.6	27.6	27.9	28.1	26.3	28.0	20.6	25.1	25.3
	C31	C31	C31	C31	CH_3CO			CO-	C31	C31	C31	C31	C31	C31	C31			
	20.7	15.5	15.8	20.8	170.6			OCH_3	20.8	20.9	20.8	15.5	15.4	21.3	15.6			
	C32	C32	C32	C32	CH_3CO			51.4	C32	C32	C32	C32	C32	C32	C32			
	19.4	24.4	19.5	24.7	20.6				24.7	20.3	20.4	21.2	23.1	23.3	20.3			

Table 12. *Cont.*

NO.	109[f)]	111[b)]	113[b)]	115[a)]	116[b)]	117[a)]	118[b)]	119[b)]	120[b)]	124[b)]	125[b)]	126[b)]	127[b)]	128[h)]	129[b)]	133[a)]	134[b)]	135[b)]
C1	35.9	35.3	35.4	35.2	34.9	35.9	30.2	30.4	36.1	34.6	34.6	34.2	34.9	34.5	35.7	35.2	35.5	35.4
C2	28.4	34.4	34.4	28.9	27.5	28.5	23.3	23.4	34.7	27.5	27.7	27.3	27.8	33.9	34.3	34.3	34.4	34.3
C3	79.2	214.8	214.6	77.1	78.0	77.8	78.1	78.0	216.3	78.2	78.2	78.2	78.4	208.9	217.8	214.9	217.3	214.6
C4	39.9	47.2	47.3	40.1	38.8	39.3	36.7	36.8	47.3	38.6	38.7	38.5	38.9	46.2	45.3	47.1	46.7	47.2
C5	50.5	50.3	49.1	49.6	49.9	50.7	45.3	45.3	51.3	49.3	49.3	49.2	49.2	49.1	49.4	50.2	50.7	50.4
C6	28.4	37.1	37.2	37.2	36.5	18.5	18.0	18.0	19.6	26.0	26.1	26.0	26.7	36.8	27.7	37.0	28.2	37.1
C7	67.7	198.2	198.1	198.7	198.8	26.6	26.0	26.0	26.5	67.1	67.1	66.6	66.9	203.5	66.3	198.2	66.8	198.0
C8	157.3	139.5	139.6	138.9	138.8	134.1	134.0	133.8	135.0	158.0	158.1	158.3	156.6	151.1	157.6	139.4	136.7	139.5
C9	144.2	162.8	162.8	164.9	164.6	134.1	134.6	134.6	133.9	142.2	142.1	142.6	142.3	152.6	141.0	163.0	139.6	162.6
C10	39.8	39.4	39.5	39.5	39.7	37.2	36.9	36.9	37.1	39.1	39.2	38.7	38.7	38.9	38.3	39.3	38.0	39.4
C11	199.4	23.8	23.9	23.8	23.7	21.0	21.0	20.8	21.4	197.4	197.3	192.2	197.8	200.9	197.6	23.8	21.1	23.8
C12	78.7	30.1	30.2	30.5	30.2	30.6	30.8	30.8	29.0	44.3	44.4	75.8	50.7	78.5	50.5	30.0	31.0	30.1
C13	53.3	44.9	45.0	45.2	45.0	44.7	44.3	44.3	45.0	51.4	51.4	54.0	45.7	54.4	46.8	44.8	45.1	44.9
C14	62.7	47.4	47.8	48.2	47.8	49.6	49.9	49.6	49.9	58.3	58.3	59.4	59.7	55.0	59.7	47.7	49.7	47.8
C15	217.4	28.6	28.7	28.3	32.0	27.3	27.5	27.0	31.0	210.9	210.8	209.9	217.7	72.1	216.8	31.8	30.0	31.9
C16	38.6	31.8	31.9	32.7	28.7	29.2	29.7	29.0	27.3	122.4	122.3	122.5	36.1	33.3	36.3	28.6	29.9	28.7
C17	53.9	49.0	50.5	50.6	49.0	47.5	40.6	47.2	47.6	187.6	187.6	187.1	49.3	55.3	49.0	48.8	45.1	49.0
C18	13.8	15.9	16.0	16.1	15.9	16.1	16.1	16.0	16.5	30.9	30.9	26.3	19.0	13.1	19.3	15.8	16.2	15.9
C19	19.5	24.9	17.9	18.3	18.4	19.2	19.0	18.9	18.6	18.5	18.5	18.4	18.4	17.3	18.1	17.8	17.2	17.9
C20	73.8	36.6	36.6	37.3	36.7	48.9	44.9	47.5	48.5	28.6	28.6	29.1	73.0	72.9	72.9	36.0	36.4	36.2
C21	28.3	18.9	18.9	19.3	19.0	178.4	70.2	182.0	175.8	19.4	19.4	18.5	26.7	26.4	26.7	18.5	18.5	18.7
C22	52.3	33.4	33.6	34.5	33.5	33.0	30.7	32.5	33.4	47.6	47.6	47.4	52.7	51.2	52.7	36.0	32.8	32.6
C23	211.5	28.6	28.8	29.1	28.6	26.1	24.7	25.9	26.4	205.8	205.9	206.1	210.4	208.9	210.4	24.2	25.3	25.0
C24	49.4	79.5	79.1	77.1	79.6	124.0	124.8	123.6	124.7	46.1	46.3	46.0	47.7	48.3	47.7	131.4	60.6	60.3
C25	36.2	73.2	73.9	74.8	73.2	136.7	131.4	132.2	131.9	34.4	34.6	34.2	34.5	35.0	34.5	136.7	60.7	60.7
C26	180.2	23.2	67.7	69.3	23.3	67.8	17.7	17.6	25.8	179.9	176.0	180.3	175.9	176.3	175.9	67.4	65.4	65.5
C27	17.8	26.5	20.9	20.1	26.6	13.7	25.7	25.7	17.8	16.9	17.1	16.7	17.0	17.2	17.0	59.8	14.2	14.2
C28	28.9	25.3	25.4	27.9	25.0	--	27.6	27.6	26.4	28.2	28.2	28.0	--	27.9	27.0	25.2	26.5	25.4
C29	16.4	21.4	21.4	16.0	27.5	--	21.8	21.8	21.3	15.5	15.5	15.3	--	19.6	20.8	21.3	21.3	21.4
C30	23.3	17.9	25.0	25.2	15.3	28.4	24.4	24.3	24.4	33.2	33.2	33.0	28.2	20.7	25.1	24.8	26.1	24.9
						C31	C1'		Glc		C31	C31	C31	CO-	CO-			
						16.2	102.7		C1'		51.9	170.7	15.5	OCH_3	OCH_3			
						C32	C2'		95.8			C32	C32	51.4	52.0			
						24.3	71.9					20.7	24.8					

Table 12. *Cont.*

NO.	**136**[b)]	**137**[b)]	**138**[b)]	**139**[b)]	**140**	**141**	**142**[c)]	**143**[b)]	**144**[b)]	**145**[b)]	**148**[a)]	**149**[e)]	**150**[b)]	**151**[g)]	**152**[b)]	**153**[c)]	**155**[b)]
C1	34.7	34.8	34.7	34.7	35.9	35.6	37.2	36.3	37.2	39.2	34.1	31.1	35.2	30.5	33.7	30.5	35.9
C2	24.2	24.1	24.2	24.2	33.6	27.6	35.2	34.0	34.5	18.2	28.5	23.6	24.1	24.6	27.4	23.0	33.8
C3	80.2	79.3	80.2	80.2	216.4	78.2	217.5	214.2	214.5	41.3	78.3	77.8	80.8	78.8	77.6	78.2	215.3
C4	37.8	37.9	37.7	37.8	46.0	41.6	49.0	47.8	47.4	38.3	39.4	37.0	37.8	38.1	40.5	36.5	47.7
C5	49.2	49.9	49.5	49.2	40.5	39.1	53.6	52.8	50.9	59.5	52.4	45.8	50.3	46.9	50.8	45.1	54.4
C6	26.7	37.0	26.7	26.7	23.1	22.2	40.9	40.0	33.4	22.3	19.1	18.3	26.3	19.4	36.2	17.7	40.3
C7	66.9	202.8	66.9	66.9	62.4	62.6	215.6	212.8	198.2	32.4	22.5	26.4	18.0	27.3	199.3	25.8	204.8
C8	157.0	154.7	157.0	157.0	63.6	62.8	55.0	54.0	150.0	42.8	51.2	134.7	132.9	135.6	146.8	133.9	46.2
C9	142.8	149.9	142.8	142.8	167.7	158.2	60.4	59.5	149.5	53.1	44.9	134.9	135.4	136.3	151.4	134.3	59.1
C10	38.9	40.1	38.9	38.9	40.5	37.9	38.0	36.5	39.2	37.5	35.7	37.2	37.0	38.4	39.1	36.6	37.5
C11	197.9	199.5	197.9	197.5	130.0	128.7	210.1	207.6	197.0	22.3	27.1	21.0	20.8	22.2	199.8	21.0	207.7
C12	50.4	52.3	50.4	50.4	203.6	78.1	53.7	52.6	192.6	41.5	49.0	29.6	31.1	30.8	49.9	28.6	50.6
C13	45.6	48.1	45.6	45.6	50.2	50.2	51.0	50.0	59.0	42.1	145.2	46.2	44.7	45.8	44.9	45.6	46.2
C14	59.6	53.0	59.6	59.6	64.8	64.4	51.3	49.7	61.0	59.5	47.9	48.8	51.0	51.0	57.2	49.3	54.7
C15	217.6	72.3	217.6	217.6	78.4	204.0	75.5	74.1	203.8	35.6	33.8	43.6	76.0	28.3	207.7	42.1	210.4
C16	41.1	36.5	41.1	41.1	127.2	127.2	39.0	38.4	38.9	30.5	31.3	76.6	36.5	28.7	35.0	76.6	40.2
C17	45.7	48.3	45.8	45.7	167.7	168.9	49.0	47.7	38.3	53.1	137.3	57.3	49.0	48.6	47.8	56.1	44.5
C18	17.6	17.5	17.6	17.6	30.9	31.0	17.1	16.6	12.4	14.6	179.2	17.8	16.1	17.0	17.8	17.0	15.8
C19	18.7	18.0	18.7	18.7	24.7	25.7	13.7	13.1	18.5	18.6	19.7	19.0	19.1	20.0	17.8	21.4	13.0
C20	32.2	32.6	32.2	32.2	72.2	72.2	33.5	32.0	32.2	36.0	35.4	48.7	36.2	49.0	73.9	47.9	32.1
C21	19.9	19.6	19.9	19.9	28.6	28.7	20.0	19.4	23.3	17.9	18.6	178.8	18.2	178.1	26.5	179.7	19.4
C22	49.5	49.5	49.5	49.5	53.9	53.9	50.5	49.6	48.6	35.3	35.1	31.6	34.6	34.3	42.1	32.0	49.1
C23	207.8	208.5	207.8	207.8	208.0	208.7	211.2	208.3	207.3	22.3	23.2	33.2	25.9	32.2(24R)	23.4	24.9	207.7
C24	46.8	46.8	46.9	46.8	48.0	48.2	47.8	46.8	46.5	58.2	125.6	156.1	145.2	76.5(24R)	143.6	33.6	47.1
C25	34.6	34.8	35.0	34.6	34.1	34.5	36.1	34.6	33.6	213.2	131.5	34.1	126.7	150.0(24R)	127.6	155.1	34.5
C26	179.9	179.3	175.8	179.9	180.1	179.6	179.6	176.2	180.3	32.1	25.8	21.9	172.6	110.8(24R)	173.0	106.4	176.2
C27	17.1	17.1	17.4	17.1	16.8	16.9	17.8	17.1	16.8	31.8	17.7	21.9	12.0	18.7(24R)	12.1	18.6	16.7
C28	28.3	17.3	28.3	28.3	24.0	24.6	25.9	25.2	--	20.3	26.7	27.8	18.2	28.7	27.9	27.3	25.4
C29	16.7	20.3	16.7	16.7	21.7	22.2	21.9	21.2	--	35.0	16.4	22.0	27.9	22.9	15.5	21.5	20.7
C30	24.5	28.3	24.6	24.5	26.9	27.0	12.8	12.5	27.4		28.7	25.7	16.5	25.3	22.4	24.8	12.7
	CO	CO						OCH_3	C31			C31	CH_3CO	$COCH_3$			
	171.1	170.9						51.9	20.3			107.0	171.1	171.3			
	CH_3	CH_3							C32			CH_3CO	CH_3CO	$COCH_3$			
	21.5	21.4							19.3			21.1	171.1	21.8			

Table 12. *Cont.*

NO.	156[b)]	157[d)]	158[d)]	160[b)]	161[d)]	162[b)]	163[b)]	164	165	166	167	168[b)]	170[b)]	171	172[b)]	173[b)]	174[b)]	175[b)]
C1	36.6	29.8	29.7	36.6	35.8	30.9	30.7	36.6	35.8	35.4	35.3	36.4	30.6	36.9	30.8	29.8	30.5	36.6
C2	34.8	25.7	25.6	34.9	34.8	23.2	23.2	34.8	28.2	28.1	24.1	34.7	23.1	35.0	23.3	25.5	23.0	34.8
C3	216.6	73.8	73.8	216.9	216.6	78.1	78.1	217.0	79.0	80.8	80.6	216.4	78.1	215.2	78.2	76.0	78.0	216.9
C4	47.4	37.2	37.0	47.5	47.3	36.6	36.6	47.4	38.7	38.0	37.4	47.4	36.5	47.5	36.8	37.1	36.4	47.5
C5	50.5	42.8	42.8	50.7	50.4	44.0	44.1	50.7	50.4	50.3	48.8	50.6	44.0	51.0	44.1	43.1	44.0	50.7
C6	23.6	22.6	22.6	23.7	23.6	22.9	22.8	23.6	23.1	24.3	22.7	23.6	22.8	23.9	22.7	27.5	27.5	23.7
C7	121.2	120.6	120.6	119.9	121.0	121.2	121.3	119.8	120.3	120.0	120.9	121.7	121.6	121.6	121.6	120.3	120.2	120.3
C8	141.0	142.0	141.9	142.9	141.0	140.3	140.8	142.8	142.7	142.6	140.0	139.9	140.5	142.1	140.2	142.2	142.2	142.5
C9	144.8	146.0	145.9	144.5	144.7	145.9	146.2	144.5	145.9	145.6	145.5	145.0	146.2	145.4	146.2	145.9	145.8	144.6
C10	37.3	37.1	37.1	37.2	37.2	37.4	37.4	37.2	37.4	37.2	37.2	37.4	37.3	37.6	37.5	37.3	37.1	37.2
C11	116.9	115.1	115.1	117.3	117.0	115.7	115.7	117.2	116.3	116.5	116.0	116.8	115.3	117.3	115.5	115.5	115.5	116.9
C12	38.5	35.3	35.3	37.8	38.5	38.0	38.5	37.8	37.9	37.8	37.9	36.6	38.4	38.9	38.1	37.6	37.6	37.8
C13	44.4	43.9	43.9	43.8	44.3	44.2	44.5	43.7	43.8	43.8	43.9	44.3	44.3	44.6	44.1	43.6	43.6	43.7
C14	52.0	48.5	48.4	50.3	51.9	51.5	52.1	50.3	49.2	49.3	51.2	42.9	52.1	52.6	51.6	50.3	50.3	50.3
C15	74.6	43.4	43.3	31.5	74.6	77.5	74.7	27.9	28.0	27.9	77.2	47.0	74.5	73.7	77.4	31.2	31.3	31.4
C16	40.0	75.1	75.0	27.9	40.1	37.0	40.1	31.4	31.5	31.5	36.8	219.2	39.6	40.5	36.7	22.9	22.8	27.6
C17	48.9	56.2	56.2	50.8	48.8	48.9	48.9	50.9	50.9	50.8	48.7	60.5	45.5	49.4	45.6	47.3	47.3	47.4
C18	16.0	16.9	16.9	15.7	15.9	16.0	16.0	15.7	15.7	15.7	15.8	16.8	15.8	16.5	15.9	15.4	15.4	15.5
C19	22.2	22.7	22.7	22.1	22.1	22.7	22.5	22.4	22.8	22.9	22.7	22.1	22.7	22.2	23.0	22.7	22.4	21.1
C20	35.9	46.9	46.9	36.2	35.8	36.0	36.0	36.0	36.1	36.1	35.8	31.5	39.3	36.3	39.8	39.3	39.3	39.4
C21	18.3	177.2	177.2	18.3	18.3	18.5	18.3	18.4	18.4	18.4	18.0	18.6	12.8	18.7	12.8	12.6	12.6	12.7
C22	34.7	31.9	31.7	35.8	36.6	34.7	34.8	35.9	36.0	35.8	34.5	35.7	74.7	30.0	74.6	74.6	74.6	74.7
C23	25.8	26.0	25.4	26.9	25.4	26.0	25.9	24.5	24.6	24.8	25.8	24.8	31.7	24.7	32.1	31.7	31.8	31.9
C24	145.1	124.3	123.1	147.1	126.6	144.9	145.2	126.9	127.0	128.6	144.9	131.2	139.1	127.6	139.2	139.5	139.6	139.5
C25	126.8	131.2	135.7	125.7	134.6	126.8	126.8	134.3	134.3	137.4	126.7	137.3	129.4	140.8	129.4	129.0	129.0	129.1
C26	172.2	25.7	66.5	172.1	69.0	172.0	172.1	69.0	69.1	66.8	173.0	67.7	172.2	65.5	172.0	172.2	172.3	171.9
C27	12.0	17.7	13.6	20.6	13.5	12.1	12.1	13.6	13.7	59.8	11.8	60.5	12.3	58.6	12.4	12.2	12.2	12.3
C28	17.0	28.7	28.7	25.4	16.9	27.8	27.8	25.3	25.6	25.6	18.2	22.4	27.8	25.7	--	--	--	25.3
C29	25.4	22.8	22.8	25.3	25.4	22.5	22.7	25.4	27.8	28.2	28.0	25.3	22.5	22.4	--	--	--	22.5
C30	22.5	26.2	26.1	22.5	22.1	18.2	17.2	22.0	15.8	17.0	16.8	25.7	17.3	18.0	27.9	28.1	27.7	25.5
						$COCH_3$	$COCH_3$				$AcCH_3$		$COCH_3$		C31	C31	C31	22-O-$COCH_3$
						171.2	170.8				21.1		170.8		22.6	22.5	22.5	170.7
						$COCH_3$	$COCH_3$				$AcCH_3$		$COCH_3$		C32	C32	C32	22-O-$COCH_3$
						21.4	21.3				21.2		21.3		18.6	25.7	25.6	21.1

Table 12. *Cont.*

NO.	176[b)]	177[b)]	178[b)]	179[b)]	180[b)]	181[b)]	182[b)]	183[b)]	184[b)]	185[b)]	186[b)]	187[a)]	188[a)]	189[b)]	190[b)]	191[b)]	192[b)]	193[b)]
C1	35.4	29.9	30.5	30.6	30.5	35.6	35.3	36.6	36.6	29.9	30.6	36.8	36.8	35.6	36.1	35.8	35.4	30.5
C2	24.2	25.5	23.0	23.1	23.1	27.6	24.1	37.5	34.8	25.5	23.1	35.0	29.2	27.8	34.9	36.5	36.5	23.1
C3	80.7	76.7	78.0	78.1	78.0	78.8	80.7	216.6	216.4	76.1	78.1	215.3	78.4	78.8	216.8	216.5	216.5	78.0
C4	37.6	37.3	36.4	36.5	36.4	38.5	37.4	47.4	47.4	37.0	36.5	47.5	39.8	38.6	47.5	47.6	47.6	36.4
C5	48.9	42.9	43.8	44.0	43.9	48.7	48.9	50.4	50.4	42.9	45.0	50.9	50.1	49.0	50.8	60.7	60.8	44.2
C6	22.8	23.0	22.7	22.8	22.7	22.9	22.6	23.6	23.7	23.0	22.8	23.8	23.9	22.9	23.7	23.8	23.8	22.7
C7	121.3	121.5	121.3	121.4	121.2	121.3	121.0	121.0	121.3	121.5	121.6	121.6	122.5	120.3	120.0	121.8	121.8	121.5
C8	140.0	140.0	140.0	140.6	140.6	140.0	140.6	140.4	140.2	140.0	140.5	142.0	142.4	142.4	142.9	140.1	140.2	140.4
C9	145.8	146.0	145.8	146.1	146.1	145.8	145.7	145.0	144.7	146.0	146.2	145.3	147.4	145.9	144.6	145.1	145.1	146.1
C10	37.3	37.3	37.3	37.3	37.2	37.3	37.2	37.3	37.3	37.3	37.3	37.5	38.3	37.3	37.3	37.6	37.6	37.2
C11	115.9	115.5	115.4	115.5	115.4	115.8	116.0	116.9	116.7	115.3	115.3	117.2	116.6	116.0	117.3	117.0	117.0	115.2
C12	38.0	37.9	37.8	38.3	38.3	37.9	38.3	38.0	38.0	37.9	38.4	38.8	39.2	37.7	37.9	36.8	36.8	38.4
C13	43.9	44.1	44.1	44.5	44.3	44.0	44.2	44.1	43.9	43.9	44.2	44.5	45.0	43.7	43.8	44.5	44.5	43.9
C14	51.3	51.7	51.4	52.2	52.0	51.2	51.8	51.3	51.4	51.4	52.0	52.6	53.0	50.2	50.4	43.1	43.1	52.0
C15	77.0	77.0	77.2	74.6	74.5	77.3	74.5	77.2	76.7	76.9	74.5	73.6	74.2	31.4	27.9	34.9	34.9	74.4
C16	36.6	37.2	37.1	40.1	40.2	36.9	39.8	37.0	36.6	36.7	39.8	40.9	41.0	27.7	31.5	25.0	25.3	39.6
C17	45.4	48.7	48.6	48.8	49.2	48.7	48.7	48.9	45.5	45.4	45.0	50.1	49.8	50.7	50.9	31.6	31.7	45.4
C18	15.7	16.0	15.9	16.0	15.7	15.9	15.8	16.0	15.8	15.8	15.8	16.3	16.8	15.7	15.8	17.0	17.1	15.7
C19	22.8	22.6	22.5	22.7	22.5	22.7	22.7	22.4	22.1	22.7	22.6	22.1	23.6	22.6	22.5	22.3	22.3	22.6
C20	39.6	32.8	32.8	33.0	33.4	35.8	35.8	35.9	39.6	39.6	39.3	34.4	36.8	36.0	36.1	50.8	50.8	39.2
C21	12.6	19.4	19.3	19.6	19.4	18.1	18.1	18.2	12.7	12.7	12.8	20.3	19.0	18.2	18.4	18.7	18.8	12.7
C22	74.4	51.5	51.5	51.9	67.0	34.5	34.7	34.6	74.4	74.4	74.6	44.7	37.3	34.6	36.7	219.3	219.0	74.5
C23	31.9	201.6	201.4	201.8	43.6	25.8	25.7	25.9	31.9	31.9	31.7	67.1	25.1	25.9	24.4	47.1	47.1	31.7
C24	139.0	133.8	133.9	134.1	144.8	144.9	145.0	144.5	139.0	139.1	139.2	145.5	127.9	155.4	131.7	131.4	126.8	139.2
C25	129.2	139.5	139.4	139.3	128.3	126.7	126.8	126.8	129.2	129.2	129.4	128.7	141.3	139.1	136.8	137.4	134.8	129.2
C26	171.3	171.2	171.8	171.0	172.0	172.9	172.9	172.1	171.3	171.6	172.0	170.3	65.8	195.3	67.7	60.2	69.3	172.1
C27	12.3	14.1	13.9	14.1	12.6	11.9	11.9	12.0	12.3	12.3	12.3	13.5	58.8	9.0	60.2	67.9	13.8	12.2
C28	18.4	18.5	18.3	17.2	17.1	18.3	17.0	18.2	25.4	--	--	25.6	29.3	25.4	25.5	25.5	25.5	17.2
C29	28.1	28.2	27.7	27.8	27.7	28.1	28.0	25.4	22.4	--	--	22.3	17.1	28.0	22.1	22.6	22.6	27.6
C30	16.9	22.6	22.3	22.5	22.3	15.7	16.8	22.1	18.3	28.2	27.7	18.0	18.6	15.5	25.4	25.8	25.8	22.4
	AcCO	AcCO	AcCO	AcCO	AcCO	AcCO	AcCO	AcCO	15-O-	C31	C31							C1'
	171.1	171.0	171.1	170.9	170.7	171.1	170.9	171.2	$COCH_3$	22.8	22.5							170.8
	AcCO	$AcCH_3$	AcCO	$AcCH_3$	$AcCH_3$	AcCO	AcCO	AcCO	171.1	C32	C32							C2'
	170.6	21.4	170.7	21.3	21.2	21.3	21.2	21.4		18.5	17.3							170.5
										$AcCH_3$	$AcCH_3$							C3'
										21.0	21.6							21.2

Table 12. *Cont.*

NO.	194[b)]	196[d)]	197[b)]	198[b)]	201[b)]	202[b)]	203	204[b)]	205[b)]	207[b)]	208[b)]	209	210[b)]	214[b)]	215[b)]	216[b)]	217[b)]	218[b)]
C1	35.6	36.1	35.7	35.4	35.7	36.6	36.6	36.5	29.9	30.0	35.5	30.5	36.7	29.8	35.6	30.6	35.4	29.9
C2	27.7	34.4	28.0	22.8	27.9	34.8	28.7	34.9	25.6	25.6	27.0	23.0	34.8	25.4	27.4	23.1	24.2	25.6
C3	78.8	215.3	78.9	80.8	78.9	216.7	78.1	216.9	76.1	76.3	78.3	78.0	217.0	75.8	78.6	78.0	80.7	76.1
C4	38.6	46.9	38.7	37.6	38.7	47.4	39.4	47.5	37.3	37.3	38.3	36.4	47.5	37.2	38.5	36.5	37.6	37.4
C5	48.7	50.5	49.1	49.3	49.1	50.7	49.8	50.3	42.9	43.1	48.5	43.8	50.3	42.9	49.0	43.9	49.0	43.0
C6	22.9	23.2	23.0	24.3	23.0	23.6	23.5	23.7	23.0	23.0	22.6	22.7	23.6	22.8	22.8	22.8	22.9	22.9
C7	121.6	120.1	120.4	120.0	120.2	119.9	121.0	119.9	121.3	121.4	121.0	121.0	119.9	121.2	121.2	121.2	121.2	121.7
C8	139.9	142.1	142.5	142.7	142.6	142.8	143.0	142.8	140.2	140.9	140.5	140.1	142.8	140.6	140.7	140.1	140.2	140.5
C9	146.0	144.2	146.0	146.7	145.9	144.5	146.6	144.5	146.0	146.3	145.9	145.4	144.4	146.1	146.0	145.9	145.7	146.3
C10	37.4	37.0	37.4	37.8	37.3	37.2	37.8	37.8	37.3	37.3	37.1	37.2	37.8	37.2	37.3	37.3	37.3	37.4
C11	115.5	116.7	116.1	116.5	116.2	117.2	116.6	117.2	115.6	115.7	115.5	115.5	117.2	115.4	115.8	115.5	116.1	115.3
C12	37.9	35.3	37.8	37.2	37.8	37.8	38.1	37.2	38.0	38.5	38.2	37.9	37.2	38.3	38.4	37.9	38.0	38.5
C13	43.9	43.8	43.8	43.7	43.7	43.7	44.1	43.8	44.1	44.4	44.0	44.0	43.7	44.2	44.1	44.1	44.1	44.2
C14	51.3	48.3	50.3	50.3	50.3	50.3	50.7	50.7	51.4	52.2	51.6	51.3	50.7	51.9	51.9	51.4	51.4	52.1
C15	76.9	43.3	31.5	26.0	31.5	27.6	28.1	27.9	77.4	74.8	73.9	77.3	27.9	74.2	74.3	77.3	77.1	74.6
C16	36.6	75.0	27.8	31.5	27.8	28.8	31.9	28.7	37.0	40.0	39.2	36.9	28.8	39.8	38.7	37.2	37.2	39.8
C17	45.4	56.2	50.9	50.8	50.9	51.0	51.5	50.9	48.9	48.8	48.7	48.8	51.0	49.2	45.0	49.4	49.4	45.4
C18	15.7	16.9	15.7	16.9	15.7	15.7	16.6	15.7	16.0	15.9	15.5	15.9	15.3	15.7	15.7	15.9	15.9	15.8
C19	22.7	21.8	22.7	22.8	22.7	22.4	23.1	22.5	22.7	22.7	22.4	22.5	22.4	22.6	22.7	22.6	22.9	22.7
C20	39.5	46.9	36.2	36.5	36.5	36.5	37.1	36.6	36.0	35.9	35.6	35.9	36.6	33.3	40.7	33.6	33.6	39.3
C21	12.6	177.2	18.3	18.6	18.6	18.6	19.0	18.6	18.2	18.3	17.9	18.1	18.6	19.3	12.4	19.3	19.3	12.8
C22	74.4	31.8	34.7	32.6	33.5	31.4	34.4	31.5	34.7	34.8	34.5	34.5	31.5	66.5	72.1	67.2	67.2	74.6
C23	31.8	26.0	26.1	27.8	28.7	33.5	28.9	33.5	25.9	25.7	25.4	25.8	33.5	43.4	34.8	43.3	43.4	31.7
C24	138.9	124.2	155.4	76.6	79.6	79.2	77.2	79.6	145.1	145.2	143.3	145.0	79.1	143.6	139.9	144.7	144.7	139.2
C25	129.2	131.1	139.1	73.3	73.2	73.9	74.8	73.3	126.6	127.0	127.0	126.7	74.1	128.6	129.0	128.1	128.1	129.1
C26	171.5	25.6	195.4	68.5	23.6	67.6	69.3	25.5	171.9	172.8	170.5	172.9	67.6	170.3	170.4	171.2	171.2	171.0
C27	12.2	17.6	9.2	20.2	26.5	22.0	20.1	25.3	12.0	12.0	11.7	11.8	22.0	12.7	11.4	12.8	12.8	12.3
C28	18.3	25.4	28.1	28.1	28.1	--	28.8	23.2	18.5	17.4	16.8	18.3	25.4	17.0	17.1	18.4	18.4	17.3
C29	28.1	22.1	15.8	15.7	15.8	--	16.0	26.6	28.2	28.2	27.7	27.7	25.4	28.0	28.0	27.8	28.1	28.1
C30	15.7	25.8	25.6	25.5	25.6	25.3	25.9	22.1	22.8	22.8	15.4	22.3	20.9	22.7	15.7	22.4	16.9	22.8
	C1'			$OCOCH_3$		C31			C31			$AcCH_3$				CH_3CO	CH_3CO	CH_3CO
	171.0			170.64		20.9			171.2			21.2				170.8	170.5	170.6
	C2'			170.93		C32			C32			$AcCH_3$				CH_3CO	CH_3CO	CH_3CO
	170.5			171.11		25.4			21.4			21.3				170.6	171.0	21.03
	C3'			$OCOCH_3$								AcCO				CH_3CO	CH_3CO	
	21.3			20.83								170.7				21.4	21.3	
	C4'			20.99								AcCO				CH_3CO	CH_3CO	
	20.9			21.29								171.0				21.3	21.4	

Table 12. *Cont.*

NO.	219[b)]	220[b)]	221[b)]	222[b)]	223[b)]	224[b)]	225[b)]	226[b)]	227[b)]	228[b)]	229[b)]	230[b)]	231[b)]	232[b)]	233[b)]	234[b)]	238[b)]	239[b)]
C1	35.6	36.6	35.7	35.0	35.8	34.7	35.8	37.4	35.7	36.0	34.8	37.4	36.7	37.3	35.6	34.2	35.3	34.4
C2	27.3	34.8	27.8	27.9	34.5	27.5	34.1	34.0	34.3	34.5	27.6	34.0	27.4	34.6	34.2	23.9	34.3	27.2
C3	78.6	216.8	78.9	78.5	216.8	78.3	216.6	214.8	216.5	215.9	78.3	215.2	77.5	215.3	218.1	79.9	214.7	78.0
C4	38.5	47.5	38.7	38.8	47.0	38.6	46.7	46.9	46.8	46.8	38.6	46.9	40.5	43.9	46.7	37.5	47.2	38.5
C5	48.9	50.7	49.1	49.3	49.1	49.1	48.8	51.0	49.0	48.9	49.1	50.9	51.4	51.0	48.7	49.2	50.4	49.1
C6	22.8	23.7	23.0	26.8	27.8	26.5	27.6	33.8	27.7	29.1	26.6	33.7	33.3	33.9	27.6	26.6	37.1	26.6
C7	121.6	120.0	120.3	67.0	66.5	66.9	66.2	198.5	66.3	65.7	66.9	198.7	198.8	199.5	66.2	66.1	198.1	66.1
C8	140.4	142.8	142.6	157.2	158.1	156.8	157.4	149.7	157.8	159.8	156.8	149.8	151.6	149.7	157.9	157.4	139.5	155.9
C9	146.2	144.5	146.0	142.9	141.4	142.6	141.1	146.2	141.3	140.9	142.7	146.2	146.0	146.9	141.1	141.6	162.7	142.9
C10	37.3	37.2	37.4	38.8	38.4	38.8	38.2	39.3	38.3	38.5	38.8	39.3	39.2	39.4	38.2	37.5	39.4	38.5
C11	115.4	117.2	116.2	198.2	197.9	197.8	196.9	194.1	197.5	198.0	198.0	194.1	194.1	199.4	197.8	199.5	23.8	192.3
C12	38.3	37.8	37.8	50.6	50.4	49.1	49.9	79.1	49.1	49.8	50.3	79.1	79.4	49.0	50.2	78.2	30.1	79.8
C13	44.0	43.8	43.8	45.5	45.1	46.0	45.0	47.6	45.3	45.5	45.3	47.6	48.0	47.0	44.9	51.9	44.9	50.4
C14	51.8	50.3	50.3	59.6	59.5	58.8	59.2	58.6	58.8	58.3	59.4	58.6	58.5	57.2	59.3	60.2	47.8	60.6
C15	74.0	31.5	31.5	218.1	218.2	217.7	215.8	205.8	217.7	215.5	217.5	205.9	206.0	207.3	216.8	217.1	28.5	216.7
C16	39.1	27.9	27.9	41.2	41.3	38.4	35.6	37.4	38.7	39.5	41.0	37.6	37.6	39.9	41.1	38.0	31.8	37.4
C17	45.3	50.9	50.9	46.4	46.5	46.1	49.5	45.2	46.3	46.7	46.1	45.2	45.5	45.2	46.2	46.5	48.9	46.0
C18	15.6	15.7	15.7	17.6	17.9	18.4	19.0	12.0	18.8	19.3	17.4	12.0	12.1	16.1	17.6	12.0	15.9	13.1
C19	22.7	22.5	22.7	18.6	18.3	18.5	18.1	18.6	18.2	18.6	18.4	18.7	18.0	18.6	18.2	18.8	17.9	18.6
C20	39.1	36.1	36.0	35.4	35.4	143.9	85.9	33.0	143.9	145.8	35.1	33.1	33.0	35.4	35.2	31.7	35.9	31.8
C21	12.5	18.4	18.4	18.3	18.2	112.2	25.9	20.1	112.3	111.6	18.0	20.0	20.2	18.3	18.0	20.5	18.3	20.4
C22	74.9	32.7	32.7	30.8	30.9	31.3	34.2	30.1	31.3	31.8	30.4	29.9	30.2	30.8	30.6	29.4	30.8	29.5
C23	31.5	25.3	25.3	31.3	31.3	32.3	27.4	31.6	31.9	32.6	30.7	31.6	31.8	31.0	31.1	31.5	30.9	30.0
C24	137.2	60.6	60.6	173.8	173.8	177.3	175	173.6	175.1	173.2	178.2	178.7	173.7	173.8	173.5	177.8	178.1	178.2
C25	129.9	60.7	60.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C26	169.9	65.4	65.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C27	12.3	14.2	14.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C28	17.1	25.4	28.1	28.4	27.2	24.2	25.0	--	27.0	27.0	24.4	--	--	--	--	27.9	25.3	28.0
C29	27.9	22.1	15.8	15.6	20.9	28.1	26.9	--	20.8	20.9	28.1	--	--	--	--	16.4	21.4	15.3
C30	15.6	25.4	25.6	24.6	24.9	15.4	20.7	27.6	24.6	25.2	15.4	27.6	27.9	27.7	27.0	23.1	24.9	24.0
	CH_3CO			Bu1'	Bu1'			C31		$COOCH_3$		C31	C31	C31	C31	C31		$COCH_3$
	171.1			64.6	64.6			20.8		51.5		20.4	15.6	20.9	20.7	161.0		170.5
	CH_3CO			Bu2'	Bu2'			C32				C32	C32	C32	C32			$COCH_3$
	20.87			30.9	30.9			20.4				20.8	21.4	20.3	24.6			20.7

Table 12. *Cont.*

NO.	241[b)]	242[b)]	243[b)]	244[b)]	248[b)]	249[b)]	252[b)]	253[b)]	254[b)]	255[b)]	256[b)]	261[b)]	262[a)]	263[a)]	264[a)]	266[a)]	267[b)]	268[a)]
C1	35.6	33.6	34.0	33.3	35.0	35.4	34.0	34.6	33.2	34.8	34.4	36.6	36.8	35.4	36.7	35.3	35.4	73.8
C2	34.3	27.4	33.8	27.4	27.9	34.5	33.6	33.8	27.3	27.6	27.4	34.8	35.0	28.3	27.9	28.9	27.7	39.8
C3	216.9	77.6	214.8	77.5	78.5	215.9	214.9	215.1	77.4	78.2	78.1	216.5	215.3	72.0	70.7	79.3	78.8	75.5
C4	46.8	39.1	46.9	40.5	38.8	47.2	46.9	47.0	40.5	38.6	38.6	47.4	47.4	43.0	43.6	43.1	38.8	40.2
C5	48.8	50.8	51.0	51.4	49.3	49.6	50.9	50.9	51.4	49.1	49.1	50.7	50.9	42.5	44.5	50.2	50.2	49.1
C6	29.0	36.3	37.4	36.7	26.9	28.0	37.4	37.2	36.6	26.6	26.7	23.7	23.8	27.8	34.1	28.5	18.2	17.6
C7	68.8	199.4	198.5	198.8	67.0	66.0	198.4	199.1	198.0	66.0	66.1	119.9	121.6	66.7	200.4	67.0	26.4	26.0
C8	159.2	151.6	149.7	151.6	157.2	158.6	145.6	146.2	151.4	156.5	155.9	142.6	142.0	158.8	152.2	158.0	134.1	134.1
C9	140.3	147.0	146.2	156.0	142.9	140.6	149.6	149.6	145.4	142.6	142.9	144.4	145.3	142.9	147.4	142.6	134.4	137.0
C10	38.0	40.4	39.3	39.2	38.9	38.1	39.3	34.6	39.1	38.9	38.6	37.2	37.5	39.2	40.8	39.1	36.9	44.1
C11	199.6	199.9	194.1	194.1	198.1	199.9	193.3	198.0	193.0	197.0	191.0	117.0	117.2	198.3	199.8	198.4	20.9	25.1
C12	51.8	49.6	79.1	79.4	50.6	78.5	78.6	48.8	78.9	50.2	79.1	37.8	38.7	51.1	49.9	51.1	30.7	32.0
C13	46.6	44.3	47.6	48.0	45.5	51.9	47.9	44.3	48.2	45.4	49.8	43.7	44.5	45.6	44.5	45.6	44.4	44.3
C14	53.9	57.0	58.6	58.5	59.6	60.5	58.9	57.1	58.9	59.3	61.0	50.2	52.6	59.2	57.6	59.0	49.8	50.4
C15	72.6	208.1	205.8	206.0	218.1	217.5	203.8	204.9	203.9	215.7	214.5	27.9	73.6	216.8	208.0	216.7	30.7	31.6
C16	36.6	40.2	37.4	37.6	41.2	37.9	35.4	34.3	35.7	35.7	37.1	31.5	40.4	41.4	40.5	41.5	27.7	28.7
C17	48.5	45.6	45.2	45.5	46.4	46.8	48.8	48.1	49.2	49.5	50.2	50.8	49.3	46.2	45.5	46.3	45.7	46.6
C18	17.3	16.2	12.0	12.1	17.6	12.3	13.0	17.4	13.2	18.8	14.2	15.7	16.4	17.8	16.4	17.9	15.5	16.2
C19	19.4	17.8	18.6	18.0	18.6	18.5	18.7	18.6	17.9	18.3	18.5	22.0	22.1	19.2	18.6	19.2	19.1	15.5
C20	35.7	35.3	33.0	33.0	35.4	31.8	86.4	86.0	86.6	85.9	86.7	36.2	36.1	35.4	35.5	35.3	40.4	40.7
C21	18.1	18.2	20.1	20.2	18.2	20.7	26.1	26.3	26.1	25.9	25.2	18.3	18.4	18.1	18.2	18.0	13.3	13.8
C22	30.0	30.5	30.1	30.2	30.9	30.0	34.5	34.2	34.5	34.2	34.6	29.7	32.0	31.0	31.0	31.0	80.2	80.5
C23	31.0	30.8	31.6	31.8	31.1	32.4	28.0	27.3	28.1	27.5	28.3	30.1	31.9	31.0	31.1	30.9	27.7	28.7
C24	174.3	178.0	173.6	173.7	174.1	173.9	175.6	175.8	175.6	175.9	175.5	178.2	176.4	174.0	174.0	174.1	139.7	140.5
C25	--	27.8	--	--	--	--	--	--	--	--	--	--	--	66.6	65.1	--	128.1	127.8
C26	--	15.5	--	--	--	--	--	--	--	--	--	--	--	13.2	13.1	--	166.6	166.2
C27	--	21.8	--	--	--	--	--	--	--	--	--	--	--	24.8	21.6	--	17.1	18.7
C28	27.4	--	--	--	28.4	26.5	27.6	27.6	27.9	28.1	28.1	25.4	25.6	--	--	23.7	27.9	28.2
C29	20.7	--	--	--	15.6	21.4	20.4	20.3	15.5	15.4	15.4	22.4	22.3	--	--	64.2	15.4	15.4
C30	19.4	--	27.6	27.9	24.6	23.5	21.1	21.3	21.6	24.7	24.5	25.3	17.9	--	--	24.9	24.3	24.9
	CO-		C31	C31	C1'	C1'	$COCH_3$		$COCH_3$		$COCH_3$			CO-	CO-	CO-		
	OCH_3		20.4	15.6	51.9	64.6	170.1		170.1		170.3			OCH_3	OCH_3	OCH_3		
	51.6		C32	C32		C2'	$COCH_3$		$COCH_3$		$COCH_3$			51.4	51.4	51.4		
			20.8	21.4		30.9	21.0		21.0		21.2							

Table 12. *Cont.*

NO.	**269**[b)]	**270**[b)]	**271**[b)]	**272**[b)]	**273**[b)]	**274**[b)]	**275**[b)]	**276**[b)]	**277**[a)]	**278**[b)]	**279**[b)]	**280**[b)]	**281**[b)]	**282**[b)]	**286**	**287**	**288**[b)]	**289**[b)]
C1	143.7	143.6	144.2	147.9	35.2	35.0	36.6	36.6	35.5	35.2	36.0	35.7	35.7	35.4	36.2	36.1	36.7	29.7
C2	118.0	118.1	118.5	116.7	34.3	28.3	34.8	34.8	29.3	34.3	33.6	27.7	35.4	27.5	33.7	33.6	34.9	22.8
C3	167.1	167.0	166.8	163.9	213.2	77.0	217.0	217.0	78.1	217.2	216.2	78.0	215.7	77.9	216.5	216.0	216.9	77.5
C4	80.5	80.5	80.6	77.5	47.0	38.6	47.5	47.5	40.1	44.8	45.9	41.5	46.0	41.8	46.0	45.9	47.5	36.4
C5	49.0	49.0	49.2	92.6	49.8	49.6	50.8	50.8	50.5	49.4	40.8	39.3	40.7	39.4	39.4	40.7	50.7	47.7
C6	38.7	38.4	37.3	44.1	27.9	27.9	23.6	23.6	27.2	27.2	23.2	21.8	22.9	21.8	23.2	22.7	23.7	20.4
C7	27.6	27.2	27.2	26.8	65.8	66.6	119.4	119.4	71.7	70.1	60.5	58.7	59.1	59.0	62.9	62.6	119.4	25.7
C8	147.6	147.0	149.3	149.5	157.8	156.8	142.8	142.7	158.3	158.3	66.0	71.4	62.1	62.9	64.3	57.6	142.7	137.6
C9	130.5	129.9	131.8	127.6	140.9	143.0	144.4	144.4	140.7	138.7	163.4	165.6	167.6	168.9	164.8	164.8	144.3	128.3
C10	139.1	139.3	140.1	132.9	37.8	39.2	37.2	37.1	39.3	37.5	40.2	37.9	40.8	38.0	40.3	40.7	37.2	39.4
C11	26.9	26.8	67.7	28.0	199.4	200.5	117.3	117.2	200.0	199.7	130.8	128.7	129.8	128.5	130.1	129.7	117.2	22.5
C12	31.4	31.1	42.5	31.1	78.1	79.0	37.7	37.7	53.3	52.1	201.2	200.9	199.8	200.2	202.8	200.5	37.7	31.0
C13	43.7	44.3	43.2	44.3	49.9	50.5	43.7	43.7	40.1	46.9	50.3	54.9	54.5	54.3	53.3	55.0	43.8	44.3
C14	56.4	54.9	55.6	55.1	63.3	63.0	50.3	50.2	53.7	52.9	59.3	62.0	62.8	61.5	60.2	58.8	50.3	50.4
C15	76.2	78.0	77.6	78.4	215.5	215.0	27.8	27.8	71.9	70.8	71.7	209.6	202.8	203.1	76.6	209.5	27.8	31.1
C16	40.6	38.6	38.5	38.4	60.4	60.6	31.5	31.4	33.3	32.5	33.6	38.5	125.2	125.2	39.5	38.3	31.5	27.6
C17	45.6	45.3	45.1	45.7	54.2	54.0	50.8	50.7	49.6	48.9	45.8	43.0	181.6	181.9	48.7	42.9	50.9	45.7
C18	17.3	16.7	18.9	16.8	12.8	13.3	15.7	15.7	18.1	17.6	18.1	18.1	30.3	29.8	19.6	18.1	15.8	15.7
C19	143.0	142.8	141.0	139.4	18.3	19.2	22.0	22.0	20.7	19.6	21.6	18.3	24.9	25.9	21.3	21.6	22.1	104.0
C20	40.0	39.9	39.9	39.8	33.0	33.3	36.4	36.5	33.6	32.7	157.3	154.9	73.0	72.9	158.6	158.6	36.5	40.4
C21	13.4	13.3	13.2	13.3	19.2	19.6	18.5	18.5	20.3	19.8	20.6	20.4	29.5	29.4	20.9	20.4	18.7	13.3
C22	80.0	79.8	79.6	79.7	52.5	52.3	33.1	33.1	50.6	49.9	126.0	126.7	52.9	52.9	126.3	126.8	33.5	80.1
C23	27.8	27.8	27.7	27.7	87.0	87.5	25.8	25.7	209.3	208.5	198.8	198.7	206.2	206.3	199.2	198.5	29.8	27.9
C24	139.6	139.4	139.4	139.3	40.6	40.4	78.8	76.8	47.8	46.9	47.6	47.7	47.8	47.8	47.6	47.6	77.2	139.0
C25	128.3	128.4	128.4	128.4	34.3	34.8	73.6	73.5	36.3	34.8	34.8	34.9	34.5	33.1	33.7	34.9	73.9	128.0
C26	166.4	166.3	166.2	166.2	178.6	179.0	66.5	68.7	178.6	176.4	179.6	179.7	179.9	179.9	180.1	180.2	69.6	166.5
C27	17.1	17.1	17.1	17.1	15.6	15.6	18.1	18.3	18.3	17.3	17.0	17.0	16.9	16.9	17.0	17.0	20.3	17.2
C28	29.0	28.8	28.1	24.9	--	--	25.3	25.3	29.3	27.8	14.6	17.1	24.8	17.1	21.7	24.8	25.4	23.8
C29	26.3	26.4	26.7	24.8	--	--	22.5	22.4	17.4	20.8	24.6	25.8	21.6	25.7	24.8	21.7	22.5	25.7
C30	26.6	26.4	25.4	24.4	25.8	28.5	25.4	25.4	20.2	19.8	28.7	28.7	28.7	28.7	28.6	28.6	25.5	23.2
		C1'	C1'	C1'	C31	C31	C1'	C1'	C1'	$COCH_3$							C1'	OCH_3
		170.4	170.3	170.1	21.3	16.0	195.5	31.8	102.7	52.1							195.3	55.2
		C2'	C2'	C2'	C32	C32	C2'	C2'	C2'	$C(CH_3)_2$							C2'	
		21.4	21.4	21.3	25.2	24.6	127.8	140.6	24.1	102.3							126.6	

Table 12. *Cont.*

NO.	**290**[b)]	**291**[b)]	**292**[b)]	**293**[a)]	**294**[b)]	**295**[b)]	**296**[b)]	**297**[e)]	**298**[b)]	**299**[a)]	**300**[a)]	**301**[a)]	**302**[b)]	**303**[b)]	**304**[b)]	**305**[b)]	**306**[b)]	**307**[b)]
C1	27.5	143.8	34.1	35.5	35.7	31.2	28.7	31.3	32.6	57.0	57.0	57.0	30.4	31.0	28.8	28.8	29.7	35.2
C2	27.1	118.0	27.4	28.6	34.2	27.7	28.4	23.6	28.0	36.5	36.5	36.5	23.3	34.6	27.7	25.5	28.3	34.0
C3	177.3	167.0	76.5	77.6	216.4	78.7	179.0	78.3	78.9	216.5	216.5	216.4	78.1	216.6	175.6	174.5	175.5	214.9
C4	74.5	77.8	39.2	49.7	46.8	38.9	75.3	37.0	39.0	47.0	47.0	47.1	36.7	47.1	75.2	75.0	74.8	46.6
C5	55.1	48.9	50.3	49.7	48.9	50.2	47.9	46.0	50.1	55.4	55.4	55.5	45.3	39.7	47.9	48.0	47.8	49.3
C6	33.8	35.8	36.9	28.1	27.6	17.6	23.9	18.4	17.8	29.4	29.4	29.4	18.0	28.8	24.3	21.5	24.8	36.9
C7	27.1	27.1	203.8	66.7	66.2	25.7	26.7	26.3	26.2	68.3	68.4	68.3	25.9	66.2	24.3	117.9	26.0	204.5
C8	139.2	146.0	146.2	158.7	157.5	137.1	143.3	134.4	137.9	136.4	136.3	136.3	133.7	132.9	143.1	134.1	139.6	150.9
C9	121.7	147.0	155.9	142.7	141.2	131.7	126.1	135.1	130.4	154.7	154.7	154.8	134.7	76.3	126.1	141.1	126.1	153.2
C10	91.5	142.8	40.4	39.3	38.3	39.6	45.4	37.3	42.2	48.6	48.6	48.6	36.9	41.4	45.4	42.2	45.7	39.4
C11	33.0	26.3	198.5	198.0	196.8	23.0	20.8	21.2	22.0	83.5	83.6	83.5	20.8	26.2	22.6	120.4	22.5	200.9
C12	30.7	31.1	79.3	50.9	50.1	31.0	31.0	30.8	31.0	37.4	37.4	37.4	30.8	34.2	31.2	39.4	31.2	49.6
C13	44.5	44.3	54.1	45.8	45.1	44.4	44.3	45.0	44.4	45.6	45.6	45.7	44.3	45.2	51.4	43.7	44.1	48.2
C14	50.5	54.9	50.6	59.0	59.3	50.2	51.5	49.9	50.4	62.3	62.4	62.4	49.5	155.0	51.8	49.9	51.4	51.8
C15	30.1	77.8	80.1	215.0	215.8	30.7	31.3	27.5	30.7	215.0	215.3	214.8	27.0	77.5	30.5	31.5	30.8	72.9
C16	27.1	38.5	128.1	36.5	35.8	27.6	27.4	29.4	27.5	41.0	41.1	41.0	28.9	47.9	28.5	26.0	26.6	31.7
C17	45.5	44.8	157.7	49.7	49.0	45.8	45.9	47.7	47.1	46.8	46.9	46.6	47.0	49.7	46.9	47.5	47.8	39.2
C18	15.5	16.7	26.0	18.6	18.1	15.6	15.9	16.4	16.6	17.7	17.7	17.7	16.3	17.2	15.7	16.0	15.8	16.6
C19	41.5	142.8	20.8	19.4	19.1	67.8	67.3	19.1	65.8	18.8	18.8	18.8	19.0	17.0	67.2	61.6	67.2	17.6
C20	40.3	35.8	71.2	86.5	85.5	40.4	40.3	49.1	41.6	35.7	35.9	32.6	47.8	37.8	40.1	40.0	40.2	124.4
C21	13.3	12.8	32.8	25.8	26.0	13.3	13.4	178.5	12.0	18.6	18.7	20.3	175.2	13.3	12.9	12.6	13.3	138.4
C22	80.1	84.0	48.6	27.8	27.5	80.2	80.3	31.9	72.7	31.4	31.9	49.8	32.9	74.6	75.6	75.5	80.1	107.7
C23	27.9	63.6	106.8	34.2	34.2	27.9	27.8	32.8	34.0	31.1	31.8	208.9	123.5	31.6	33.1	33.1	27.3	153.6
C24	139.7	143.8	44.6	176.7	175.9	139.6	139.7	156.0	125.4	174.1	176.1	46.9	132.3	138.5	141.0	140.9	142.9	34.3
C25	128.0	127.7	34.1	--	--	128.2	128.2	34.3	137.9	--	--	35.7	155.4	129.8	128.2	128.1	128.0	38.5
C26	166.5	164.0	178.7	--	--	166.6	166.7	22.0	61.4	--	--	178.4	106.7	172.0	172.4	171.7	166.3	180.0
C27	17.1	16.8	14.5	--	--	17.1	17.1	21.9	22.4	--	--	17.7	17.7	12.5	20.6	20.5	17.0	18.9
C28	32.0	28.5	29.6	25.4	25.0	28.1	33.7	28.0	28.4	27.1	27.1	27.1	27.6	25.8	33.7	33.5	28.7	27.3
C29	25.2	26.6	15.1	16.5	27.0	15.5	26.1	21.9	15.5	18.9	18.9	18.9	21.8	22.0	26.1	25.8	23.8	20.4
C30	24.5	26.6	29.7	28.8	20.7	24.2	24.9	24.5	24.7	20.6	20.7	20.6	24.4	31.4	24.3	24.3	22.5	20.5
		CO				C1'	C1'	C1'	C1'	OCH_3			C1'		C1'	C1'	C1'	
		170.4				171.1	170.7	171.2	170.5	51.4			94.5		170.6	170.5	170.4	

Table 12. *Cont.*

NO.	**308**[a)]	**309**[b)]	**310**[a)]	**311**[b)]	**312**[a)]	**315**[a)]	**316**[b)]	NO.	**308**[a)]	**309**[b)]	**310**[a)]	**311**[b)]	**312**[a)]	**315**[a)]	**316**[b)]
C1	32.7	31.8	38.0	36.6	37.1	35.5	32.4	C18	17.7	17.7	18.0	17.8	17.7	17.7	19.6
C2	30.8	30.4	29.6	29.9	30.1	28.8	32.2	C19	22.4	22.4	25.5	24.9	23.0	20.0	16.3
C3	176.5	173.9	176.4	174.7	175.6	77.6	214.1	C20	36.2	36.2	36.2	36.0	139.9	40.1	205.2
C4	146.5	146.4	87.3	86.1	145.0	39.4	47.0	C21	18.5	18.5	18.1	18.1	19.0	17.5	31.2
C5	45.0	45.0	48.0	48.4	44.8	49.9	43.5	C22	31.9	27.7	31.9	31.3	126.3	66.9	26.9
C6	35.5	35.4	32.1	32.5	27.0	29.0	36.7	C23	31.9	32.4	31.6	31.0	75.2	--	20.3
C7	67.9	67.8	72.9	73.1	61.3	69.5	198.3	C24	176.5	176.5	176.4	174.5	36.8	--	17.5
C8	165.3	165.7	161.4	161.2	66.5	160.5	66.8	C25	--	--	--	--	34.3	--	--
C9	137.4	137.1	135.4	135.1	163.0	141.9	68.1	C26	--	--	--	--	179.0	--	--
C10	41.3	41.2	41.6	41.1	43.8	39.1	37.4	C27	--	--	--	--	15.5	--	--
C11	200.4	200.4	199.8	200.2	130.0	200.3	200.6	C28	115.6	115.7	71.3	71.3	115.2	28.8	--
C12	52.1	52.0	50.9	50.8	201.1	52.8	46.0	C29	23.4	23.2	25.0	25.3	23.0	16.7	
C13	47.3	41.2	45.3	45.2	59.1	47.7	45.5	C30	27.6	27.7	24.5	23.8	15.1	20.2	
C14	53.4	53.3	50.9	50.6	51.8	54.5	54.8			CH_2O		3-OCH_3	OAc		
C15	32.4	31.9	30.1	29.3	71.8	72.6	205.9			60.4		51.9	20.7		
C16	27.8	32.4	27.2	29.5	31.9	36.6	36.4			CH_3CH_2O		24-OCH_3	169.9		
C17	50.1	50.1	50.2	50.0	44.3	45.4	52.4			14.4		51.8			

Notes: NO. **1** N-BU 2' 30.8, N-BU 3' 19.3, N-BU 4' 13.9; NO. **2** Bu 4' 13.9; NO. **3** Bu 4' 13.9; NO. **24** OCH_2CH_3 14.1; NO. **29** $OCOCH_3$ 20.9; NO. **41** 15-$COCH_3$ 21.3; NO.**65** 15-$OCOCH_3$ 21.1; NO. **73** 7-OCH_3 55.6; NO. **74** 7-OCH_3 54.5; NO.**77** $AcCH_3$ 21.4, $AcCH_3$ 21.0; NO. **78** 3-$OCOCH_3$ 21.2, 22-$OCOCH_3$ 170.6, 22-$OCOCH_3$ 21.0; NO. **79** 22-$OCOCH_3$ 21.0; NO. **80** 15-$OCOCH_3$ 21.1, 22-$OCOCH_3$, 170.6, 22-$OCOCH_3$ 21.0; NO. **81** 22-$OCOCH_3$ 21.1; NO. **82** 22-$OCOCH_3$ 170.6, 22-$OCOCH_3$ 21.0; NO. **83** $AcCH_3$ 21.1, $AcCH_3$ 21.3, $AcCH_3$ 21.3, CO 170.3, CO 170.3, CO 170.5; NO. **84** $AcCH_3$ 21.0, $AcCH_3$ 21.6, $AcCH_3$ 21.7, CO 170.6, CO 170.1, CO 170.2, OCH_3 55.2; NO. **99** $COOCH_3$ 51.9; NO. **100** OCH_3 51.9; NO. **101** OCH_3 51.9, $COCH_3$ 20.9, $COCH_3$ 170.2; NO. **102** OCH_3 51.8, $COCH_3$ 20.8, $COCH_3$ 170.1; NO. **103** OCH_3 51.9; NO. **104** OCH_3 51.9; NO. **105** OCH_3 51.9; NO. **118** C3' 73.7, C4' 69.7, C5' 63.7, $COCH_3$ 170.9, $COCH_3$ 21.4; NO. **120** C2' 74.0, C3' 79.2, C4' 71.4, C5' 79.0, C6' 62.5; NO. **127** OCH_3 52.0; NO. **138** COO-CH_2CH_3 60.9, $COOCH_2CH_3$ 14.4, CO of AcO-C(3) 171.1, CH_3 of AcO-C(3) 21.5; NO. **139** $COOCH_2CH_3$ 60.8, $COOCH_2CH_3$ 14.4; NO. **145** C24' 6.8; NO. **149** CH_3CO 170.4; NO. **150** CH_3CO 21.4, CH_3CO 21.3; NO. **151** C23 31.8(24S), C24 75.6(24S), C25 149.8(24S), C26 111.5(24S), C27 18.1(24S); NO. **153** C24' 21.5; NO. **167** AcCO 170.8, AcCO 171.0.; NO. **172** $AcCH_3$ 21.2, $AcCH_3$ 21.4, $AcCH_3$ 21.5, CO 170.7, CO 170.9, CO 170.2; NO. **173** $AcCH_3$ 21.0, CO 170.6; NO. **174** $AcCH_3$ 21.0, $AcCH_3$ 21.3, CO 170.6, CO 170.6; NO. **176** AcCO 170.0, $AcCH_3$ 21.4, $AcCH_3$ 21.3, $AcCH_3$ 21.0; NO. **178** $AcCH_3$ 21.2, $AcCH_3$ 21.2; NO. **184** 15-$OCOCH_3$ 21.4, 22-$OCOCH_3$ 170.6, 22-$OCOCH_3$ 21.0; NO. **185** $AcCH_3$ 21.5, CO 170.6, CO 171.2; NO. **186** $AcCH_3$ 21.7, CO 170.7, CO 170.9; NO. **193** C4' 20.9; NO. **222** Bu3' 19.3, Bu4' 13.9; NO. **223** Bu3' 19.3, Bu4' 13.9; NO. **226** $COOCH_3$ 20.8, OCH_3 51.4, $COCH_3$ 170.0; NO. **230** $COCH_3$ 20.8, $COCH_3$ 170.1; NO. **231** OCH_3 51.6, $COCH_3$ 20.9, $COCH_3$ 170.1; NO. **232** OCH_3 51.7; NO. **233** C33 60.5, C34 14.2; NO. **243** OCH_3 51.6, $COCH_3$ 20.8, $COCH_3$ 170.0; NO. **244** OCH_3 51.6, $COCH_3$ 20.9, $COCH_3$ 170.1; NO. **249** C3' 19.3, C4' 13.9; NO. **275** C3' 145.2, C4' 34.5 C5' 25.6, C6' 122.1, C7' 136.9, C8' 39.0, C9' 25.6, C10' 125.5, C11' 134.5, C12' 38.7, C13' 13.8, C14' 16.2, C15', 169.0, C1" 157.1, C2" 112.7, C3" 117.3, C4" 148.2, C5" 126.0, C6" 119.8; NO. **276** C3' 133.3, C4' 35.9 C5' 28.5, C6' 124.6, C7' 136.7, C8' 38.9, C9' 27.3, C10' 126.8, C11' 135.8, C12' 69.0, C13' 13.7, C14' 16.2, C15' 172.3, C1" 128.0, C2" 149.3, C3" 114.8, C4" 151.2, C5" 116.9, C6" 117.8; NO. **277** C3' 27.0; NO. **278** CH_3 26.4, CH_3 23.5; NO. **288** C3' 146.3, C4' 34.6C5' 25.5, C6' 122.1, C7' 136.6, C8' 39.1, C9' 25.5, C10' 125.3, C11' 134.4, C12' 68.6, C13' 13.9, C14' 16.3, C15' 168.3, C1" 157.0, C2" 114.9, C3" 117.2, C4" 148.1, C5" 126.1, C6" 119.8; NO. **291** CH_3 21.4; NO. **295** C2' 21.1; NO. **296** C2' 21.1; NO. **297** C2' 46.4, C3' 69.9 C4' 46.1, C5' 171. 9,3'-CH_3 28.4, OCH_3 51.2, C31 107.1; NO. **298** C2' 21.1; NO. **302** C2' 72.3, C3' 75.9, C4' 69.5, C5' 65.8, $COCH_3$ 170.9, $COCH_3$ 21.4, C241 25.7; NO. **303** 22-$OCOCH_3$ 171.3, 22-$OCOCH_3$, 21.2; NO. **304** C2' 20.7, C1" 170.9, C2" 21.1, OCH_3 51.8; NO. **305** C2' 21.1, C1" 170.8, C2" 21.2, OCH_3 51.8; NO. **306** C2' 20.7, OCH_3 51.4. (a) Measured in C_5D_5N; (b) Measured in $CDCl_3$; (c) Measured in CD_3OD(50%) and $CDCl_3$(50%); (d) Measured in DMSO-d_6; (e) Measured in pyridine-d_5; (f) Measured in CD_3OD; (g) Measured in $(CD_3)_2CO$; (h) Measured in C_6D_6.

4. The Bioactivities of *Ganoderma* Triterpenes

4.1. Anti-Tumor Activity

Cancer has been acknowledged as a huge threat to human health and most governments are committed to diminish this threat. The urgent task of finding anti-tumor drugs with high efficiency and low toxicity have drawn countless researchers' efforts directed to the discovery of lead compounds or bioactive ingredients from nature resources such as *Ganoderma*. The GTs were extensively evaluated for cytotoxic activities against a series of tumor cell lines. Compounds **45**, **46**, **164** and **204** showed cytotoxic effects against the tested tumor cell lines. Compound **46** exhibited the most potent cytotoxicity against LLC, T-47D, Sarcoma 180 and Meth-A tumor cells [25]. Compounds **62**, **190** and **212** showed strong cytotoxic activities against human Hela cervical cancer cells [26]. According to Cheng's report, the ganoderic alcohols showed stronger activities than ganoderic acids which implies that a hydroxy group substituted at 26 may be a very important structural feature for cytotoxic activity, however, the more hydroxyl groups there are, the lower the inhibitory activity will be [26]. Compounds **42** and **85** showed cytotoxicity against p388, Hela, BEL-7402, and SGC-7901 human cancer cell lines, with IC_{50} values in the 8–25 μM range [32]. Compounds **47**–**52** were studied *in vitro* against Meth-A and LLC tumor cell lines [37]. Compound **187** displayed selective inhibitory activity against HL-60 cells, and compound **131** exhibited selective cytotoxic activity against MCF-7 cells. Compounds **7**, **67** and **188** showed the ability to induce hPXR-mediated CYP3A4 expression [47]. Compounds **9**, **23**, **57** and **68** showed significant cytotoxic activity, with IC_{50} values of 18.7, 21.4, 16.2 and 20.1 μg/mL, respectively [48]. Compounds **77**, **163**, **170** and **173** were tested *in vitro* for their cytotoxic activities against 95D and Hela tumor cell lines with IC_{50} values ranging from 14.7 to 38.5 μM [49]. Compound **121** showed significant activity against T-24 cells, while compounds **119**, **123**, showed significant activity against T-24, HT-3, and CaSKi cells, respectively [60]. Compound **297** showed significant cytotoxic activity with an IC_{50} value of 2.5 μg/mL in the Hep-2 cell line [62]. Treatment of human hepatoma HuH-7 cells with compound **205** caused immediate inhibition of DNA synthesis as well as activation of ERK and JNK mitogen-activated protein kinases, and cell apoptosis. Molecular events of apoptosis including degradation of chromosomal DNA, decrease in the level of Bcl-xL, the disruption of mitochondrial membrane, cytosolic release of cytocherome c and activation of caspase-3 were elucidated. The ability of compound **205** to inhibit topoisomerases and to sensitize cancer cells towards apoptosis meets the criteria of a potential anticancer drug [88]. Compounds **30**, **229** and **235** showed significant cytotoxic activities against Hep G2, Hep G2,2,15, and P-388 cell lines [91]. Compound **233** showed cytotoxicity against HL-60 and CA46 cancer cell lines [93]. Biological activity as an anti-tumor promoter was observed for compounds **279**–**282** [101]. Compound **285** showed moderate cytotoxicity against liver cancer and lung cancer cell lines [27]. Compounds **140**, **279**, **281**, **287**, **292** and **312** inhibited the viability and growth of the HL-60 cell lines [103].

4.2. Anti-HIV and Anti-HIV-1 Protease Activity

It was reported that compounds **270**, **272**, **291** and **304**–**306** were inhibitory against HIV-1 protease, with IC_{50} values for the most potent compounds ranging from 5 $\mu g \cdot mL^{-1}$ to 13 $\mu g \cdot mL^{-1}$ [102]. Moreover, compounds **190** and **210** were found to be active as anti-HIV-1 agents with an inhibitory concentration of 7.8 μg·mL^{-1} for both, and compounds **4**, **11**, **23**, **28**, **171** and **203** were moderately active inhibitors against HIV-1 protease with a 50% inhibitory concentration of 0.17–0.23 mM [18]. While compounds **5**, **53**, **201** and **204** showed significant anti-HIV-1 protease activity with IC_{50} values of 20–90 μM [38]. In addition, compounds **39**, **224** and **255** inhibited human immunodeficiency virus-1 protease with IC_{50} values of 20–24 μM.

4.3. Neurotrophic Activity

A series of reports has shown that *Ganoderma* triterpenes exhibit neurotrophic activity. Bioassay results revealed that compounds **12** and **261** have nerve growth factor-like neuronal survival-promoting effects, whereas the two compounds mentioned above and compounds **10**, **159** and **183** showed brain-derived neurotrophic factor-like neuronal survival-promoting activities [73]. Compounds **1** and **278**, exhibiting specific anti-acetylc-holinesterase activity, are being examined as possible drug candidates for the treatment of Alzheimer's and related neurodegenerative diseases. Compounds **62**, **204**, **210** and some other *Ganoderma* triterpenes exhibited moderate acetylcholinesterase-inhibitory activity, with IC_{50} values ranging from 9.40 to 31.03 μM. These results indicated that these lanostane triterpenes are preferential inhibitors of acetylcholinesterase and may be suitable as drug candidates [16].

4.4. Hepatoprotection

It is also reported that compound **11** showed significant hepatoprotective activity. However, increased doses of compound **11** (up to 10 times) did not further reduce GOT/GPT levels in the serum of the mice [107]. Compound **144** has an activity of lowering the levels GPT in mice with liver injury by CCl_4 and GaNI and exhibits hepatoprotective effects [67].

4.5. Antiobesity Activity

In 2010, the inhibitory effect of triterpenes isolated from *G. lucidum* on adipocyte differentiation in 3T3-L1 cells was reported for the first time [17]. According to a report on the subsequent research, compound **249** reduced the triglyceride accumulation significantly by 72% at 80 μM and it effectively suppressed the glycerol-3-phosphate dehydrogenase activity in the cells. It suppressed the gene expressed of PPARγ, C/EBPα, and SREBP-1c in a dose-dependent manner during differentiation. These findings demonstrate that compound **249** contributes to the inhibitory effect on adipocyte differentiation in 3T3-L1 cells [96].

4.6. Hypoglycemic Activity

The inhibitory effect on aldose reductase was examined for compound **27** and its methyl ester. The results indicated that the IC_{50} of **27** is 22.8 μM, whereas that of its methyl ester is more than 200 μM, which suggested that a carboxyl group of side chain of compound **27** is essential for potent inhibitory activity because of much lower level of inhibitory activity of its methyl ester. However, the exact reason for the difference in inhibition between compound **27** and its methyl ester remains unclear [29]. Compound **169** was also found to have high α-glucosidase inhibition, with IC_{50} of 119.8 μM [108].

4.7. Other Bioactivities

Ganoderma has been investigated for other bioactivities. Compounds **45** and **58** were found to exhibit potent inhibitory activity against herpes simplex virus [42]. Compounds **13** and **15** were shown to inhibit histamine release from rat mast cells [21]. In the study on compounds **3** and **156**, it was found they both exhibited inhibitory activities against the HMG-CoA reductase and acyl CoA acyltransferase [35]. Another study demonstrated that compounds **44** and **49** exhibited potent enhancement of ConA-induced mice splenocytes proliferation *in vitro* [36]. It was found that compounds **161**, **189** and **316** possess the bioactivity to induce apoptosis in human promyelocytic leukemia HL-60 cells [75]. An investigation on the ability of some *Ganoderma* triterpenes to inhibit 5α-reductase in rat liver microsomes revealed that compounds **64**, **161** and **206** showed the inhibitory activity. Further study suggested that a carboxyl group of the 17β-side chain of compound **206** was essential to elicit the inhibitory activity [89]. The *in vitro* tests showed that compounds **308** and **310** exhibited modest inhibitory activity against rabbit platelet aggregation induced by platelet activating factor (PAF), and compound **310** also displayed weak inhibition against platelet aggregation induced by adenosine diphosphate (ADP) [105]. The C-3 epimer of compound **172** also exhibited significant antimycobacterial activity against mycobacterium tuberculosis H37Ra [46].

5. Conclusions

Ganoderma triterpenes (GTs) are a class of compounds with various chemical structures and a diverse range of biological activities. Biomedical analysis has shown that triterpenes possess important pharmacological activities and are thought to be potential candidates for drug discovery, but their low abundance, complex procedures of extraction and purification, the difficult preparation of high purity triterpenoids from *G .lucidum* is currently limited at the laboratory scale. Thus, how to enhance the content of triterpenoids and improve the technology of the extraction and purification of triterpenoids from *Ganoderma lucidum* is a problem that needs to be solved. We can expect to enhance GT production through the regulation of GA biosynthesis, thus promoting the industrial development of *G. lucidum* and provide an important resource for the development and application of new antineoplastic, anti-HIV, and other drugs.

Based on the above analysis of structural complexity and functional group variety, it is especially important to prove the structure-function relationships to make up for the inadequacy of this aspect. Although extensive research has been done on this herb, there is still a lot of scope for further research, especially on the mechanisms of biological activity of GTs with emphasis on agents with anti-tumor, anti-HIV, neurotrophic properties. *G. lucidum* and *G. sinense* that are recorded in the pharmacopoeia of China in 2010 have been widely applied in China [8]. Their long-standing medicinal history indicates their irreplaceable functions. In further study, researchers may need to pay more attention to the two species, and focus on the active substances such as the triterpenes summarized above. To achieve better quality control, the studies on other species are also important, so that the differences between species can be illustrated clearly. Additionally, more important bioactive constituents should be integrated into the quality control system of *Ganoderma*. Further experiments including *in vitro*, *in vivo* and clinical studies should be encouraged to identify any potential side effects.

Acknowledgments

This work was supported by the National Science-technology Support Plan Project (NO. 2012BAI29B00).

Author Contributions

Qing Xia, Huazheng Zhang, Gaimei She, and Lanzhen Zhang have all been involved in drafting this review. Qing Xia and Huazheng Zhang contributed equally to this work. Xuefei Sun, Haijuan Zhao, Lingfang Wu and Xin Mao discussed the results and commented on the manuscript. Dan Zhu, Guanghui Yang, Yanyan Shao and Xiaoxue Zhang corrected the ^{13}C-NMR data. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare that they have no competing interests.

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