

Electronic Supporting Information

Synthesis of Furostanol Glycosides: Discovery of a Potent α -Glucosidase Inhibitor

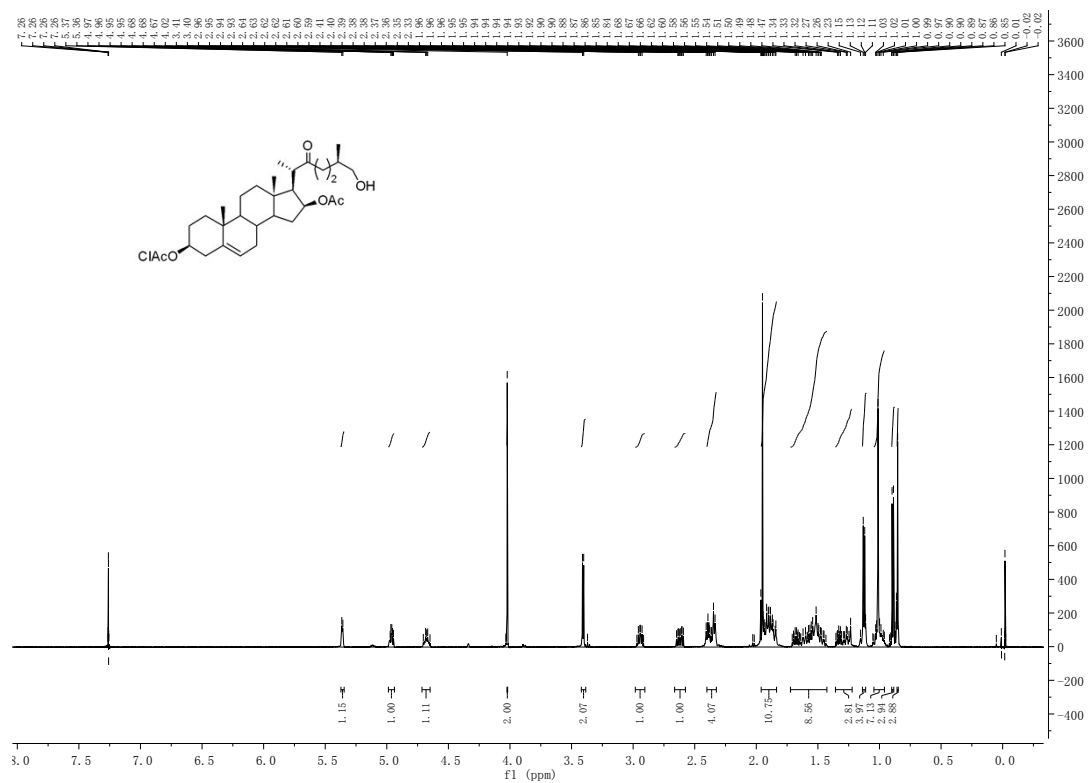
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Key Laboratory of Marine Medicine, Chinese Ministry of Education, School of Medicine and Pharmacy, Ocean University of China, 5 Yushan Road, Qingdao, Shandong 266003, China.

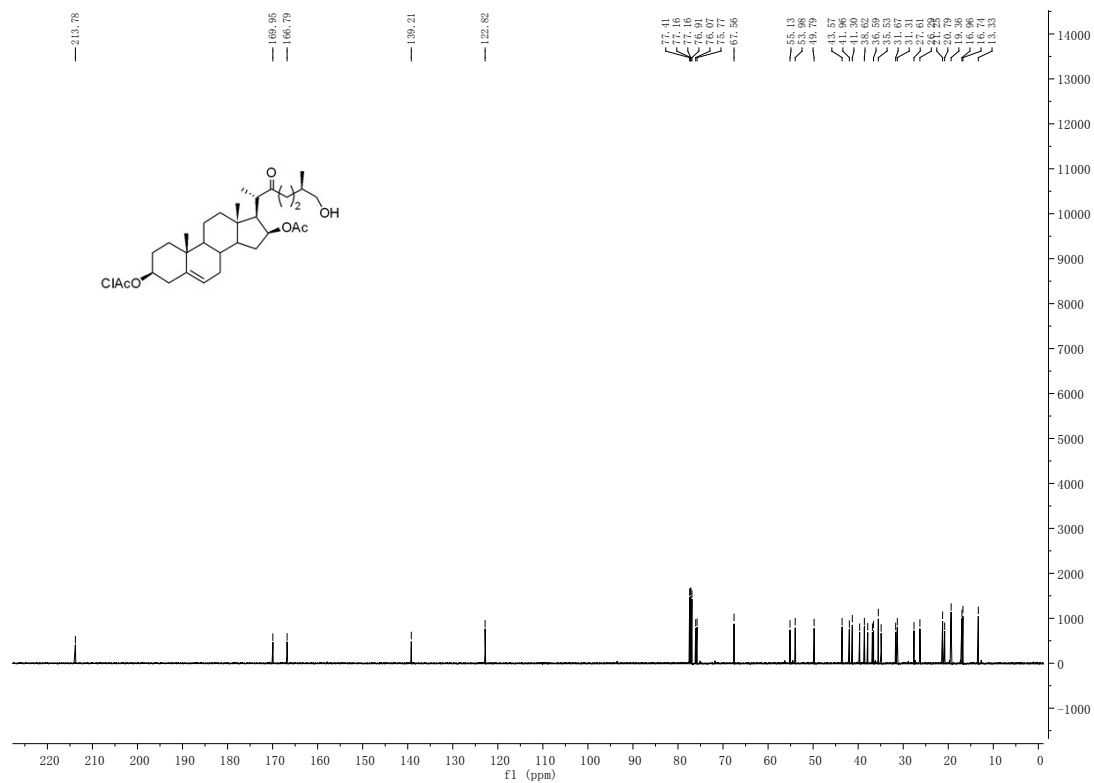
E-mail: lmsnouc@ouc.edu.cn

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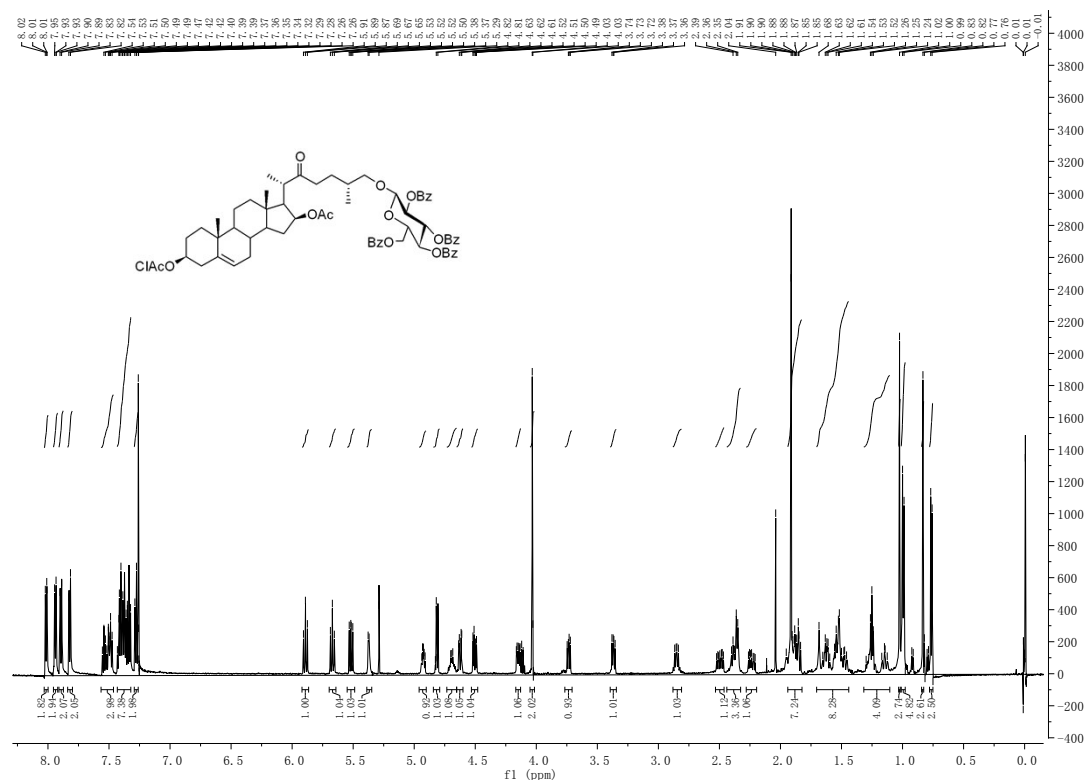
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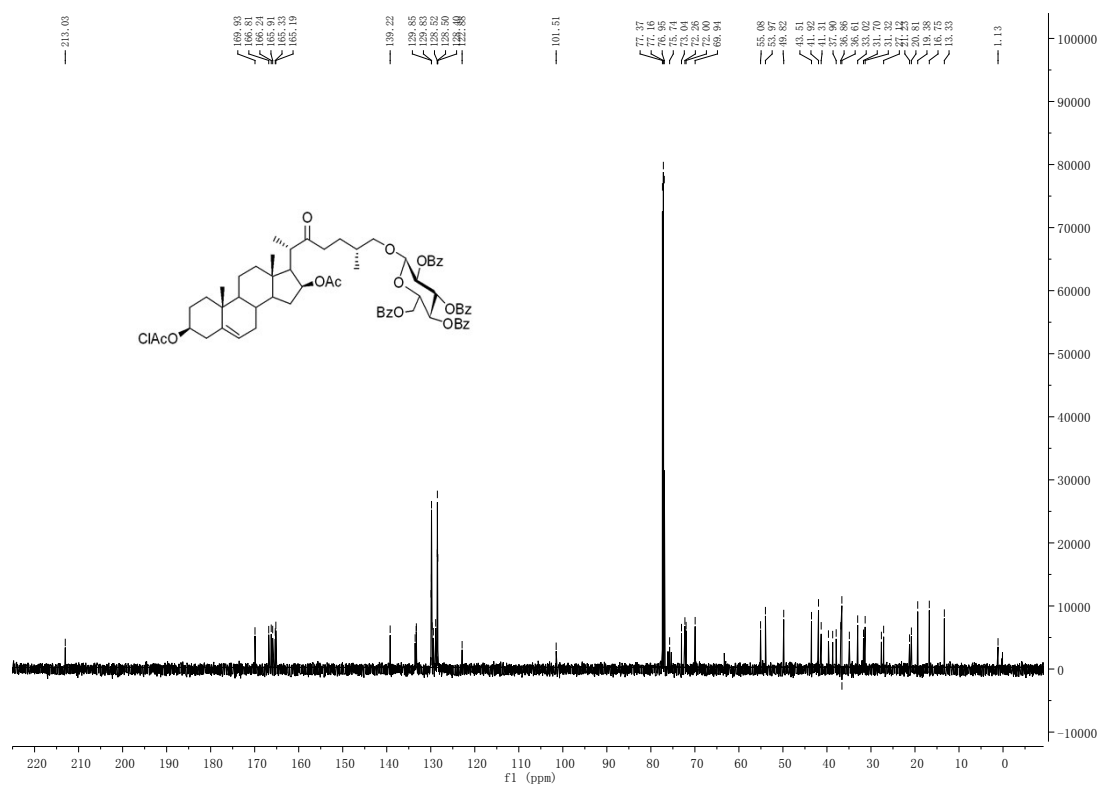
The ¹H NMR spectrum of 11 (CDCl₃, 600 MHz)



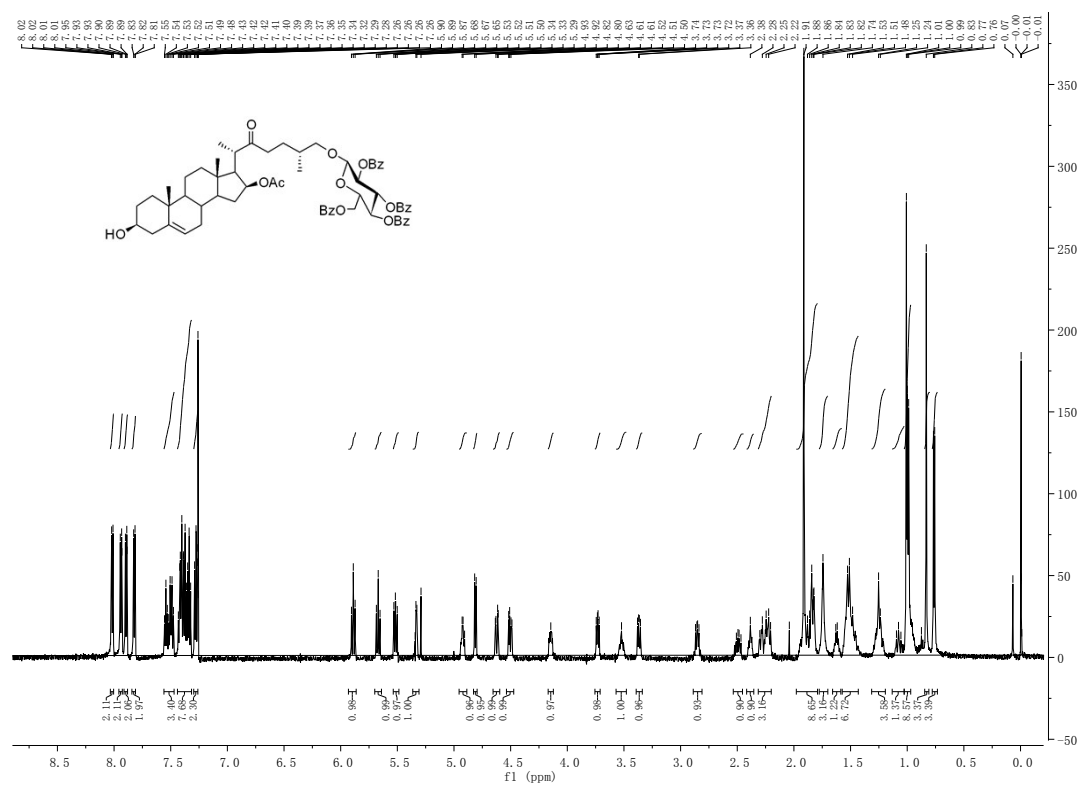
The ¹³C NMR spectrum of 11 (CDCl₃, 150 MHz)



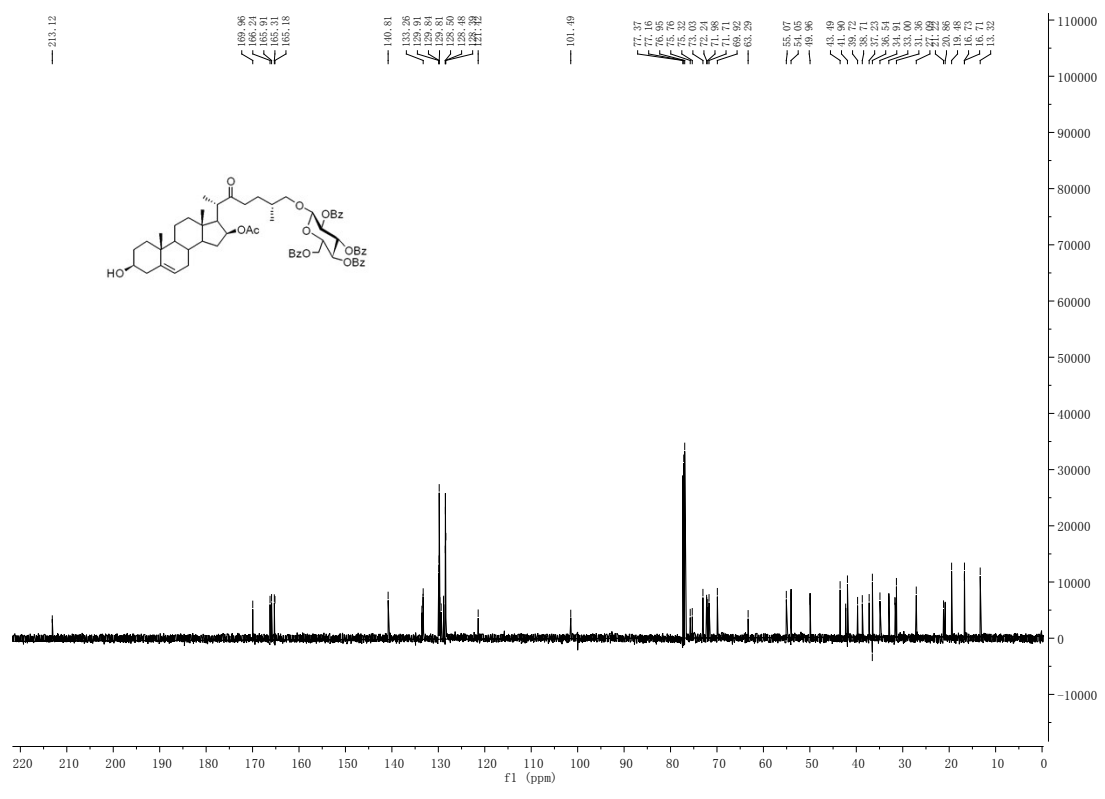
The ^1H NMR spectrum of **10** (CDCl_3 , 600 MHz)



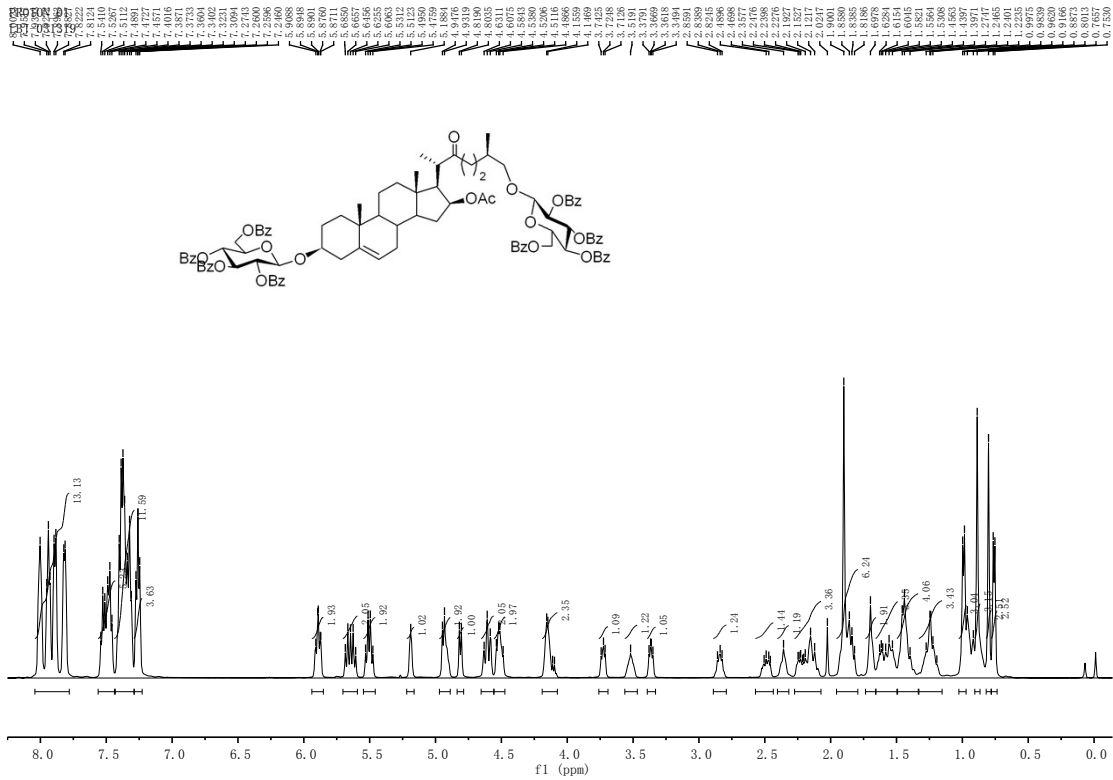
The ^{13}C NMR spectrum of **10** (CDCl_3 , 150 MHz)



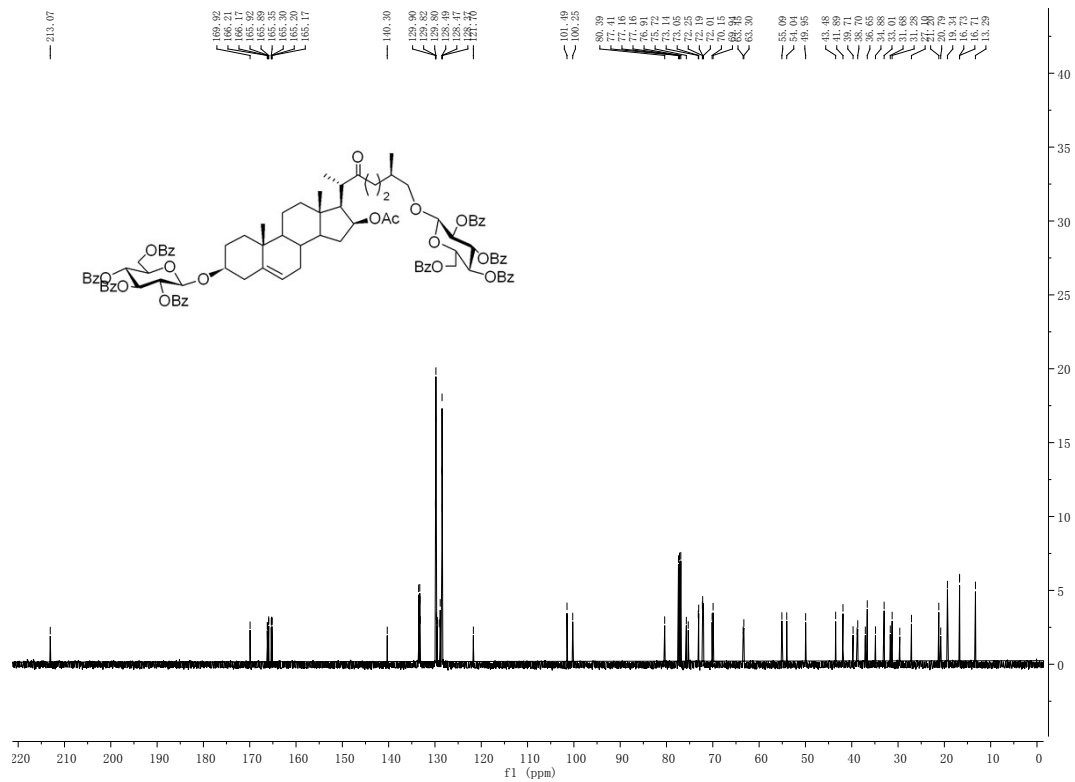
The ¹H NMR spectrum of **19** (CDCl₃, 600 MHz)



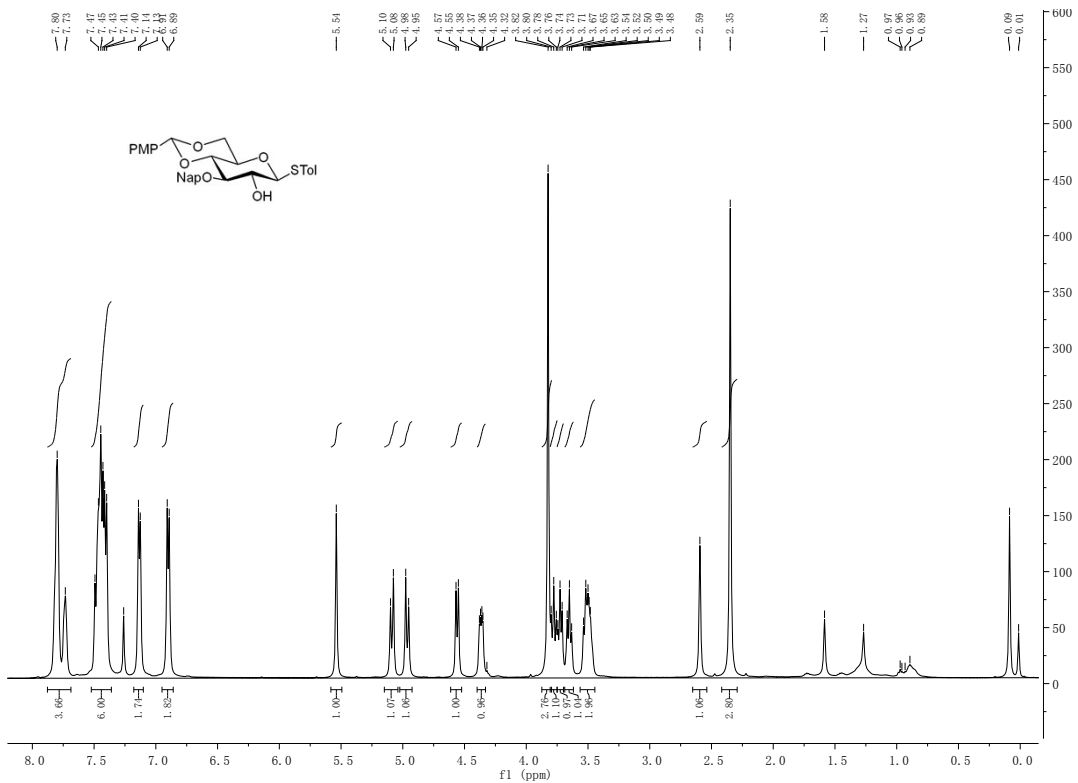
The ¹³C NMR spectrum of **19** (CDCl₃, 150 MHz)



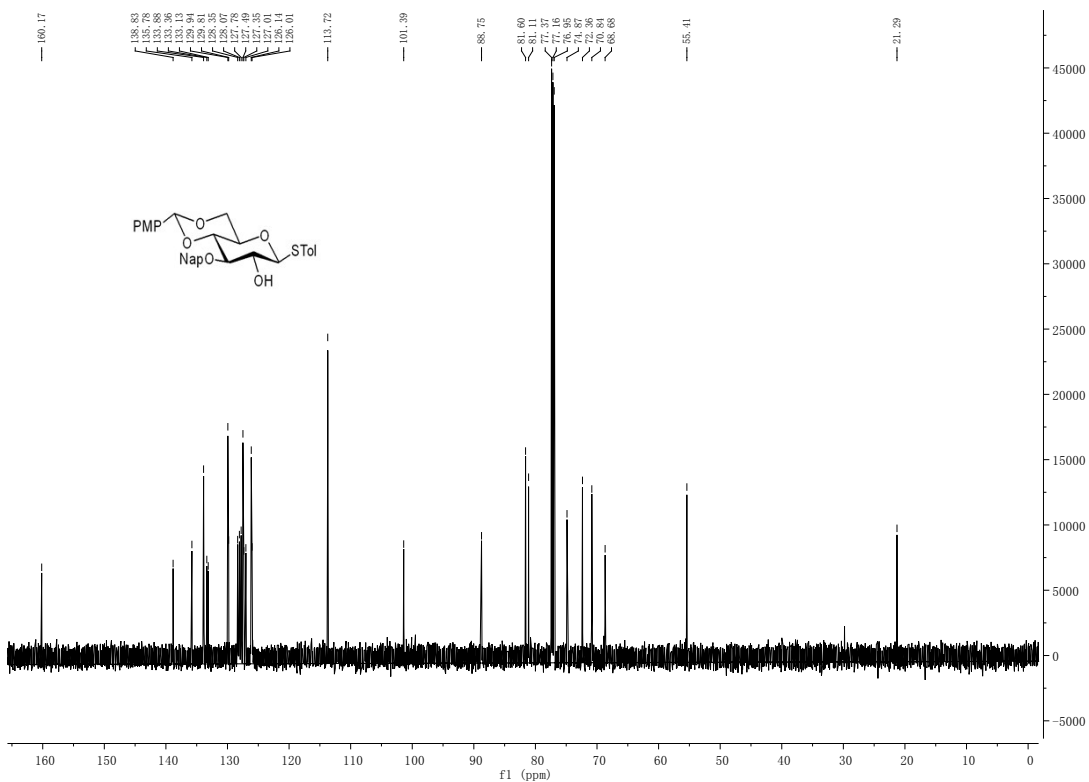
The ^1H NMR spectrum of **20** (CDCl_3 , 600 MHz)



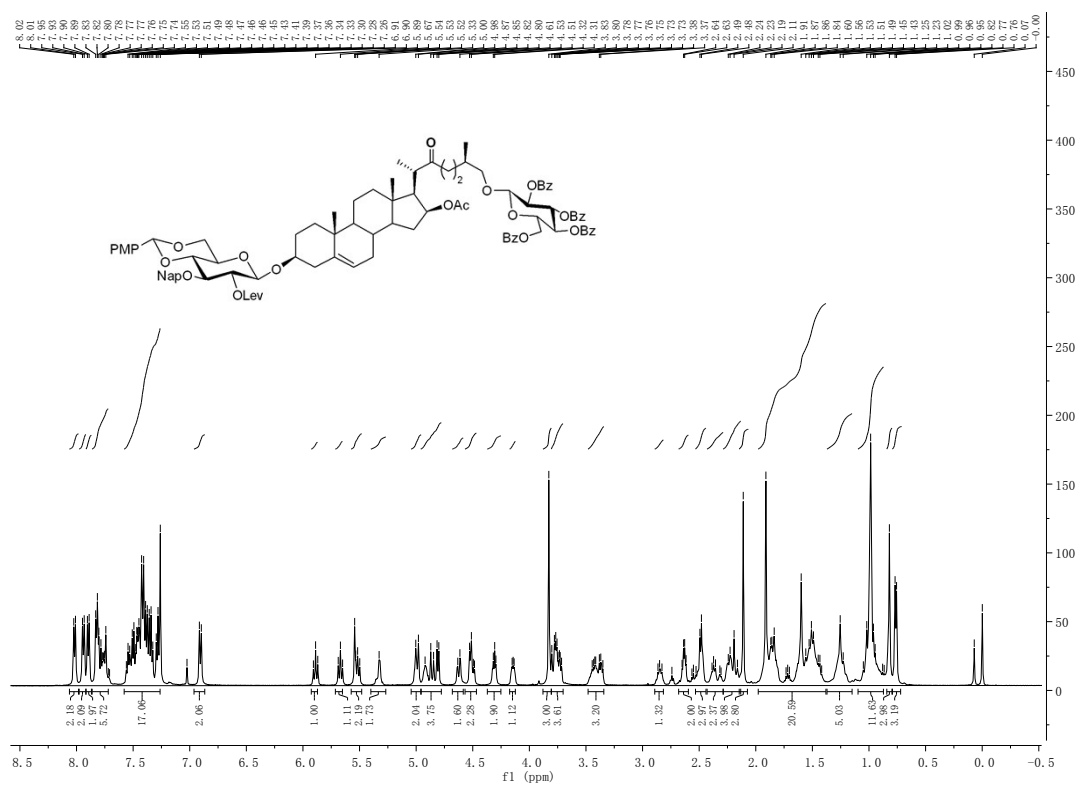
The ^{13}C NMR spectrum of **20** (CDCl_3 , 150 MHz)



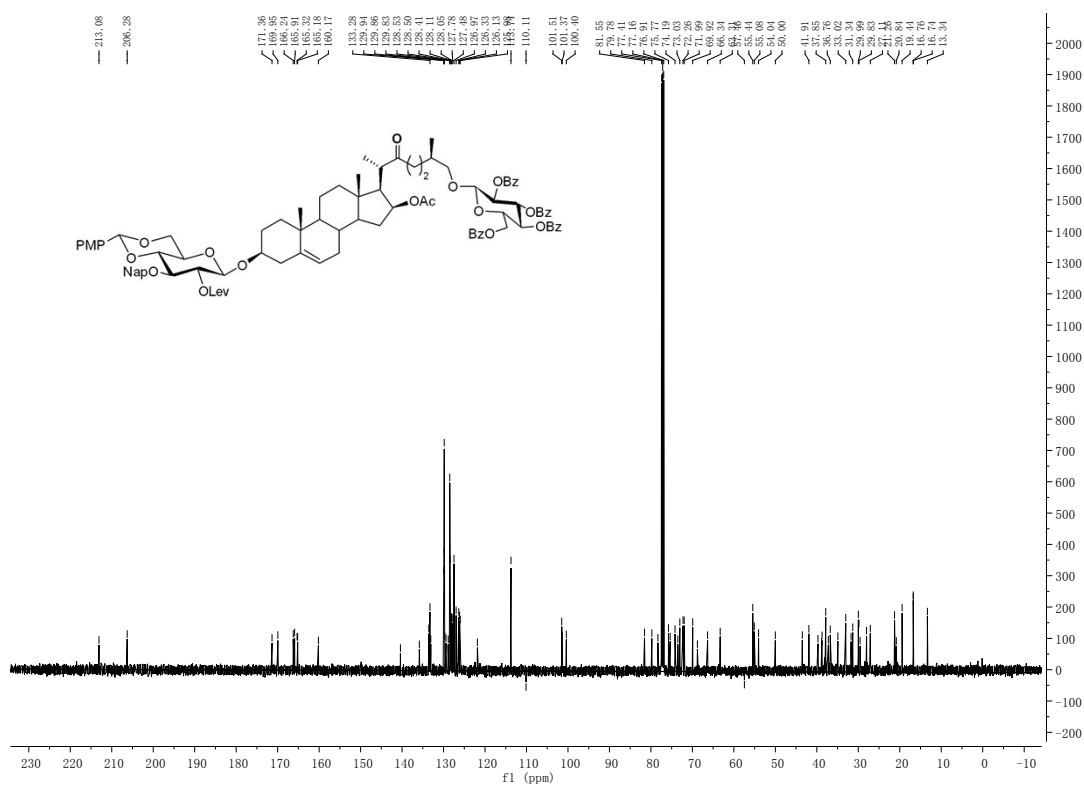
The ¹H NMR spectrum of **22** (CDCl₃, 600 MHz)



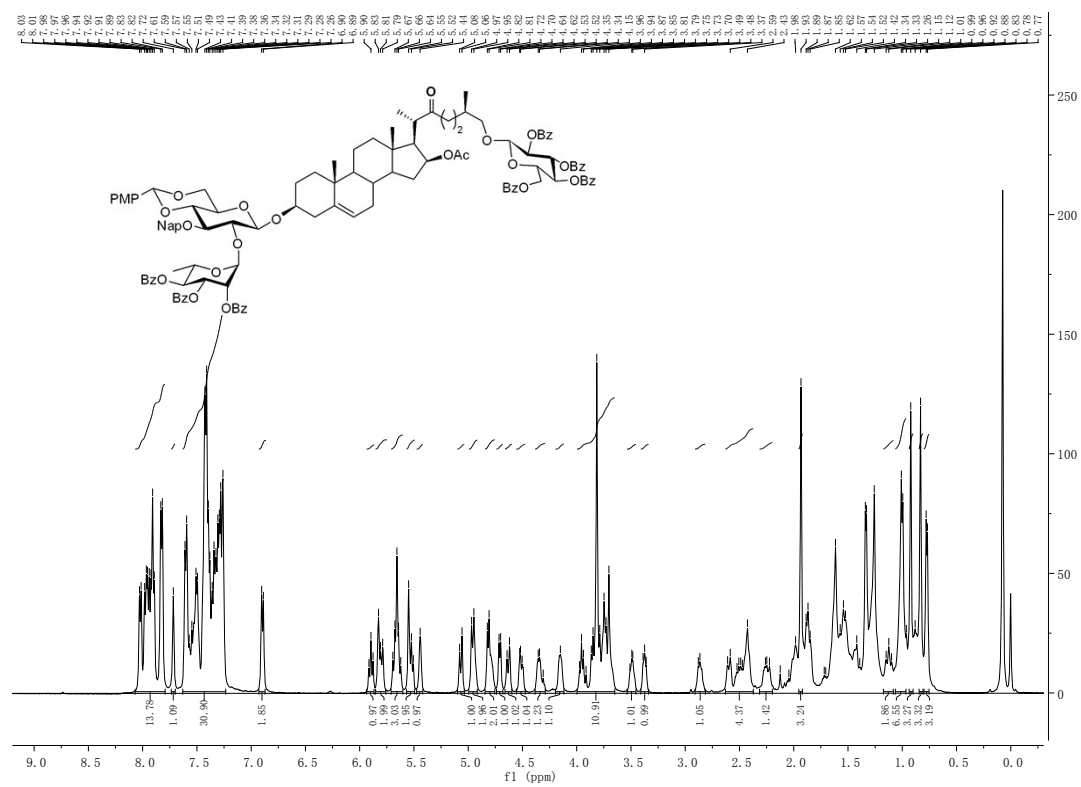
The ¹³C NMR spectrum of **22** (CDCl₃, 150 MHz)



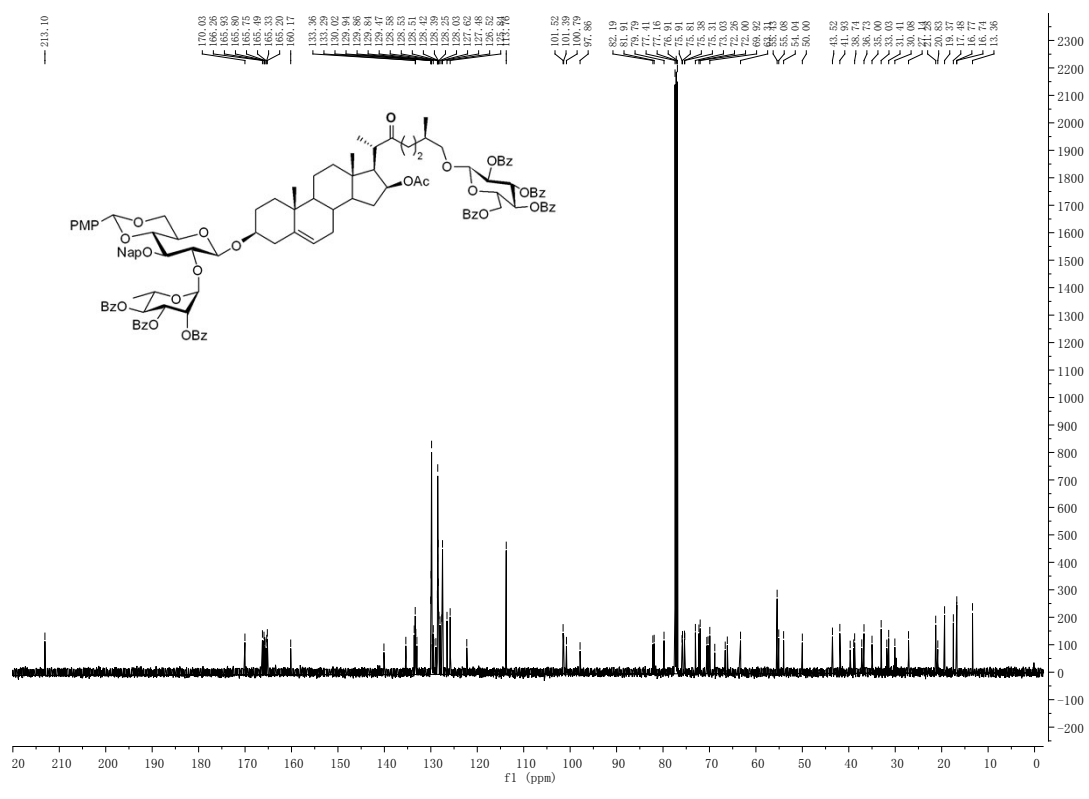
The ¹H NMR spectrum of **9** (CDCl₃, 600 MHz)



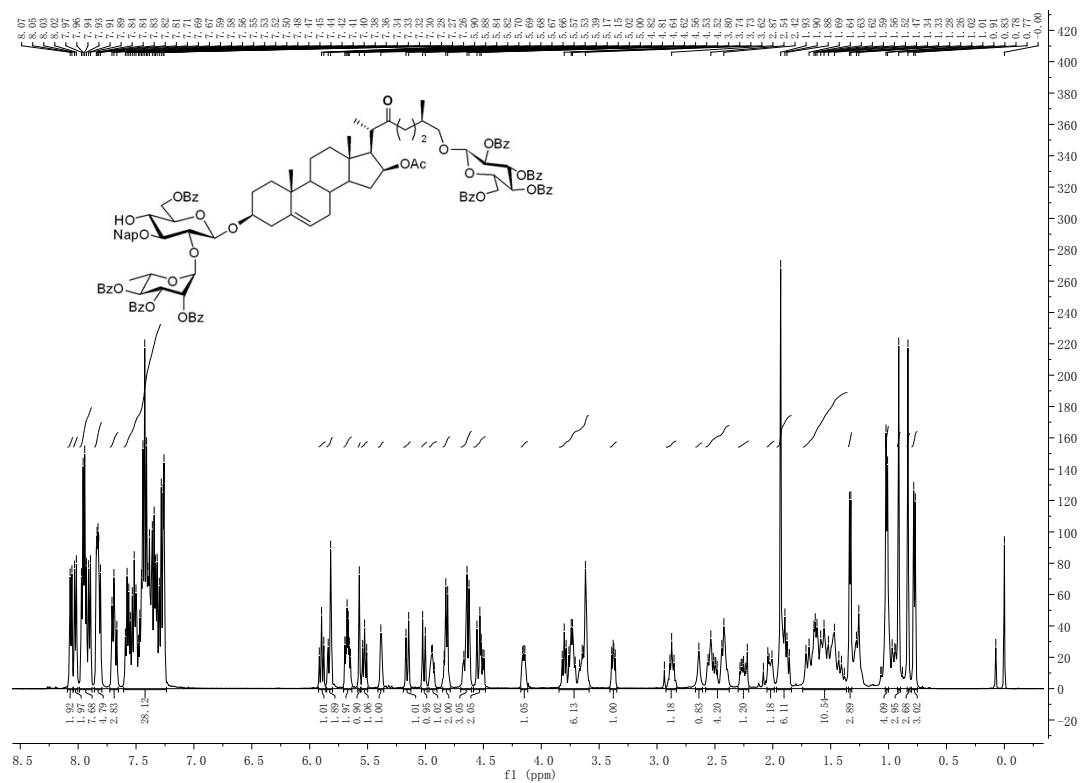
The ¹³C NMR spectrum of **9** (CDCl₃, 150 MHz)



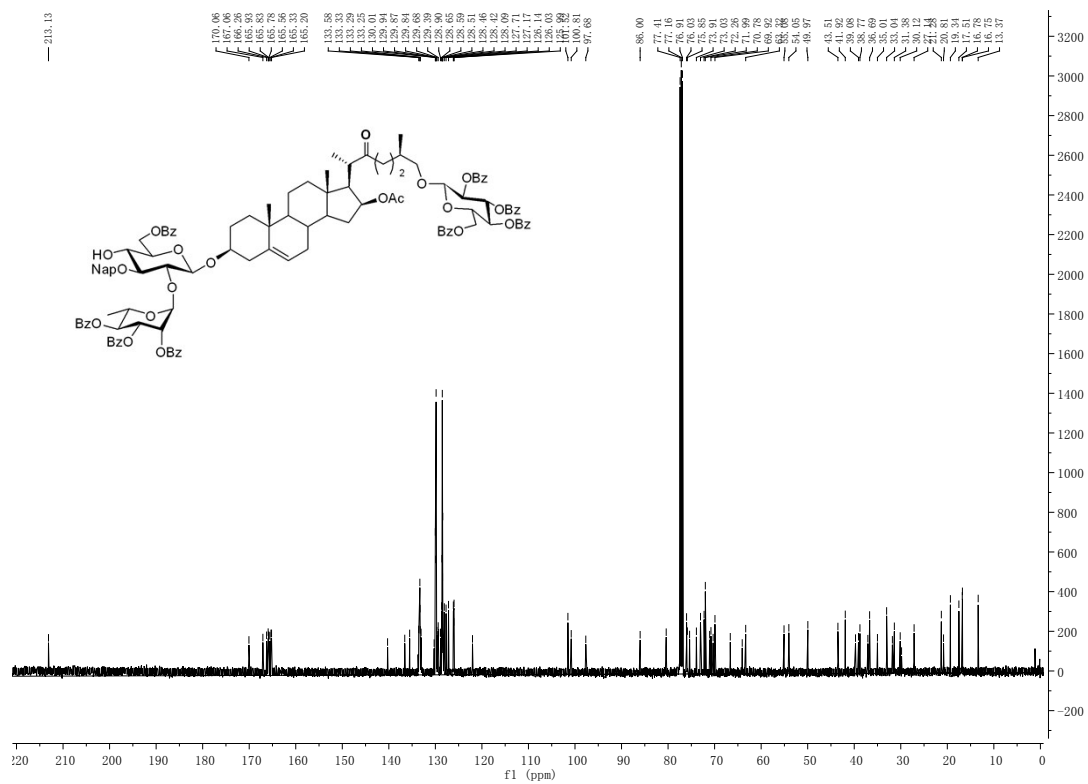
The ¹H NMR spectrum of **24** (CDCl₃, 600 MHz)



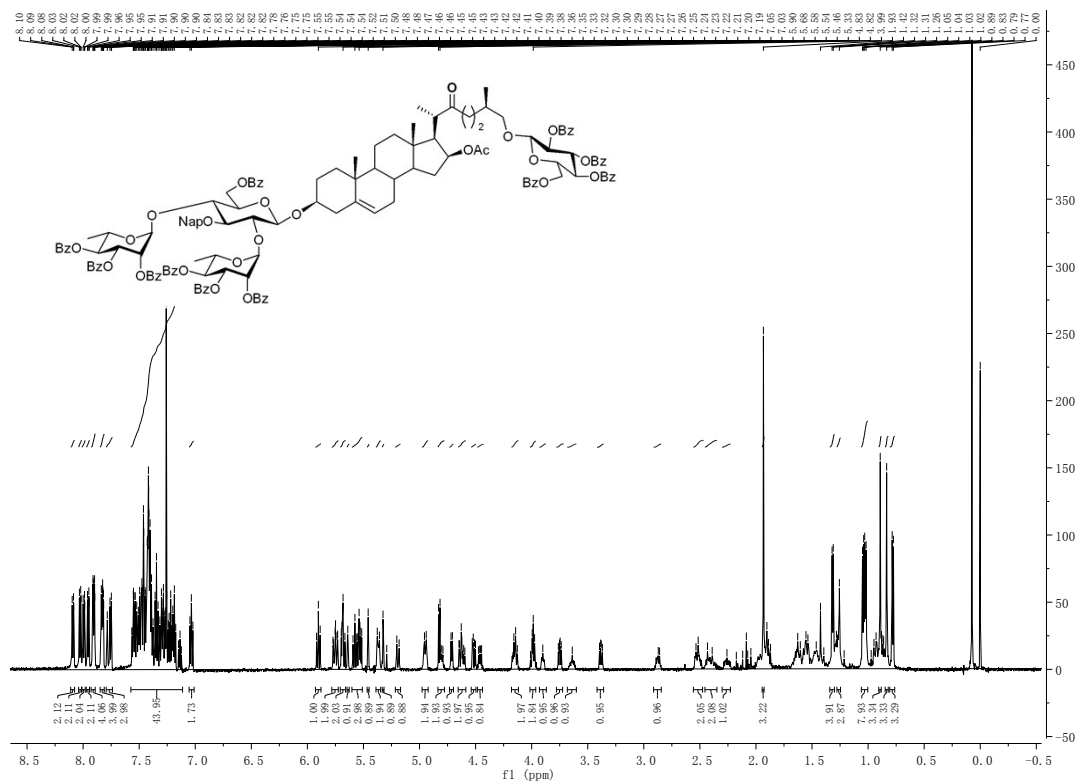
The ¹³C NMR spectrum of **24** (CDCl₃, 150 MHz)



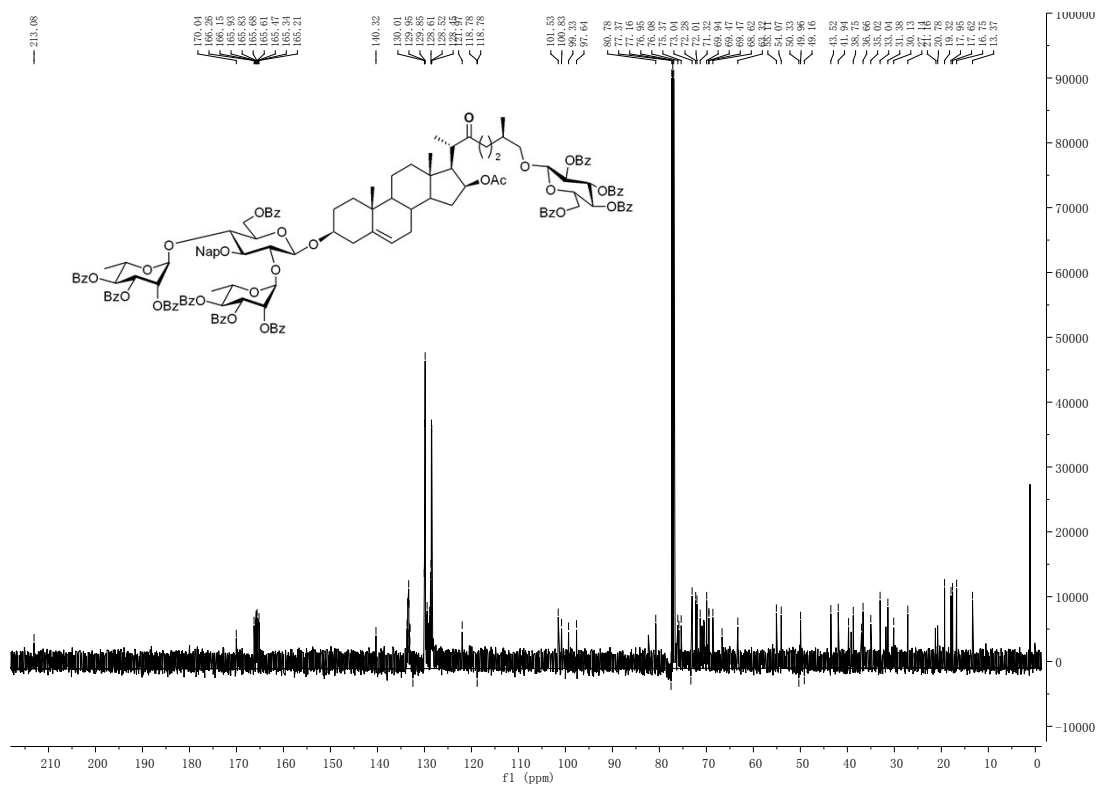
The ^1H NMR spectrum of **8** (CDCl_3 , 600 MHz)



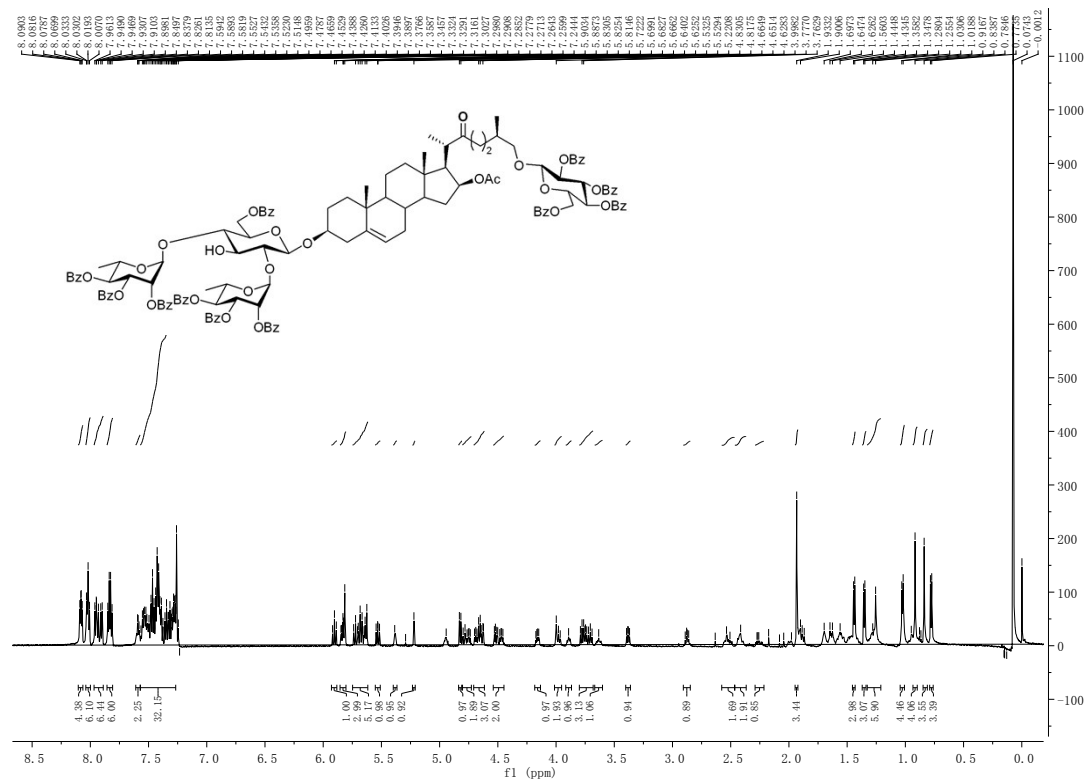
The ^{13}C NMR spectrum of **8** (CDCl_3 , 150 MHz)



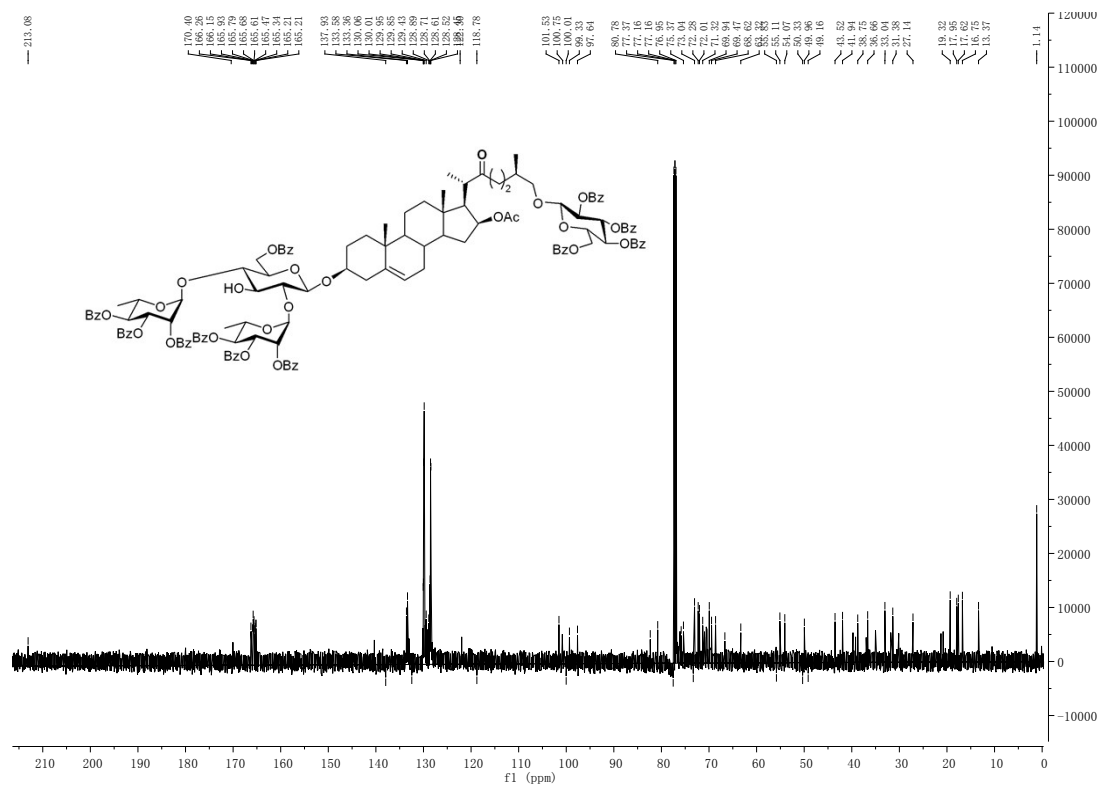
The ^1H NMR spectrum of **26** (CDCl_3 , 600 MHz)



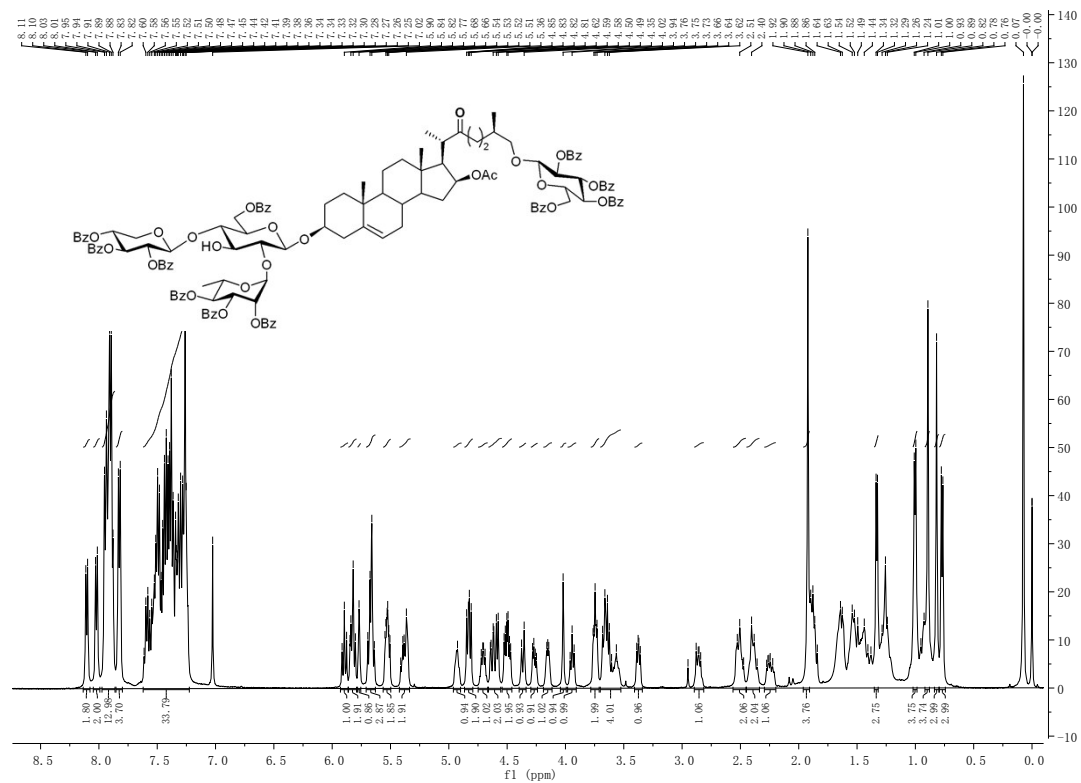
The ^{13}C NMR spectrum of **26** (CDCl_3 , 150 MHz)



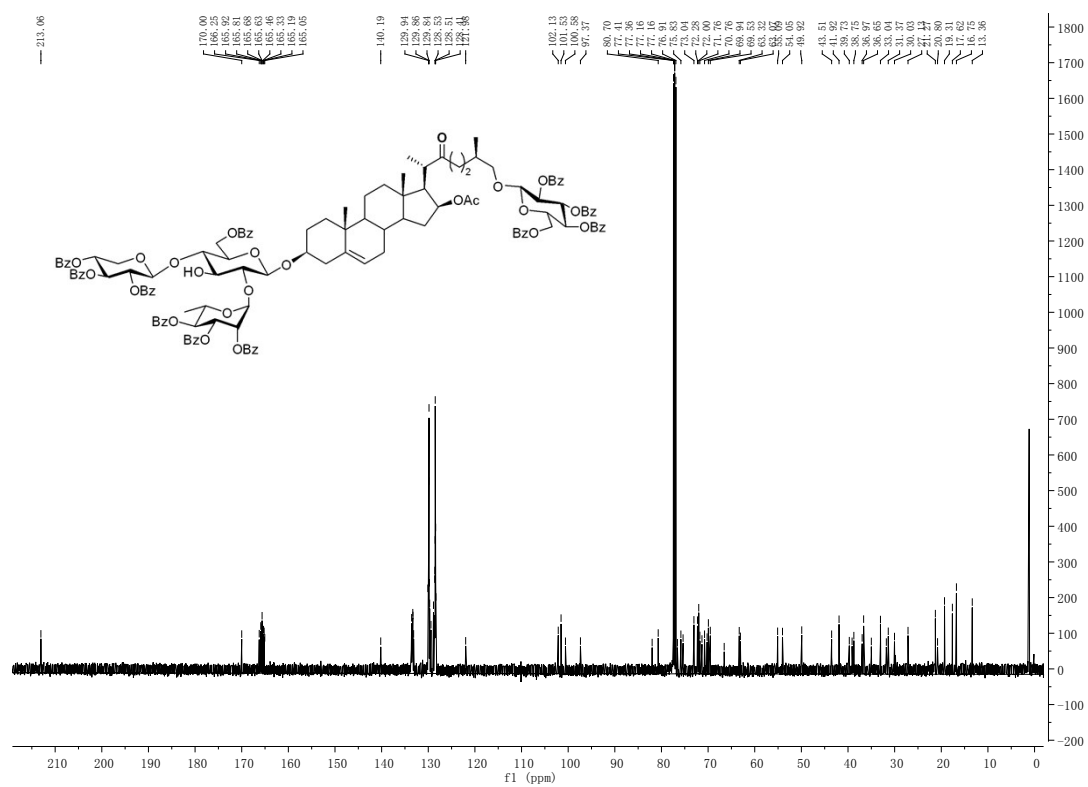
The ^1H NMR spectrum of **30** (CDCl_3 , 600 MHz)



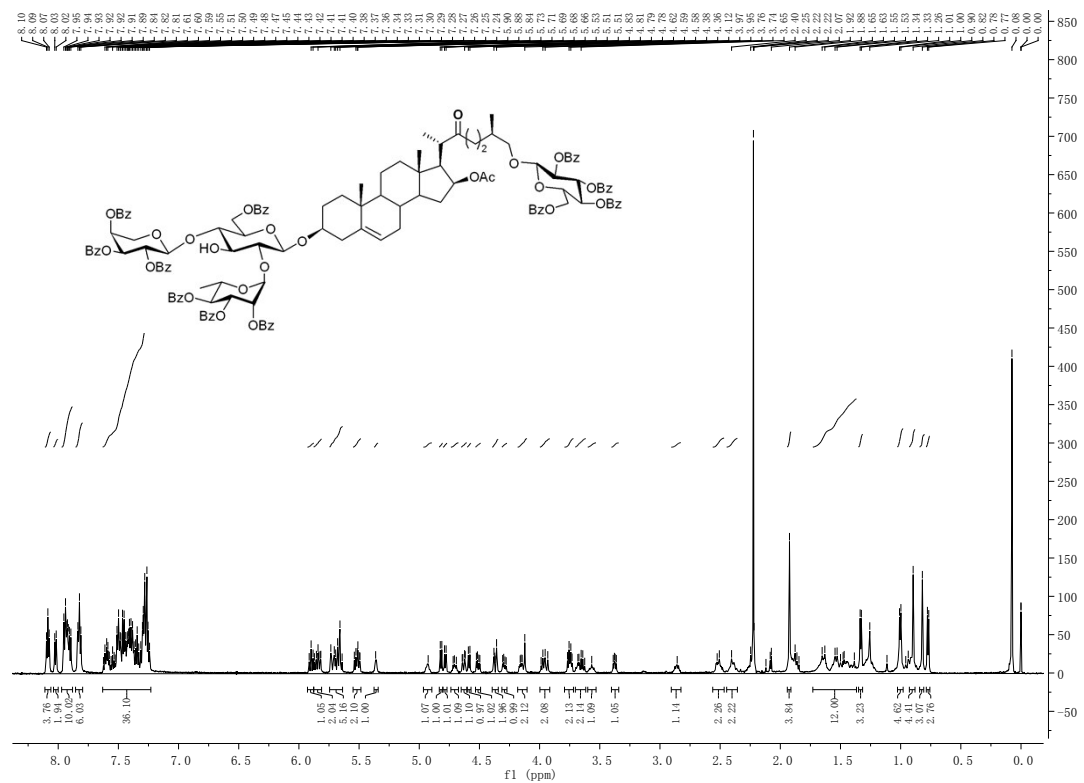
The ^{13}C NMR spectrum of **30** (CDCl_3 , 150 MHz)



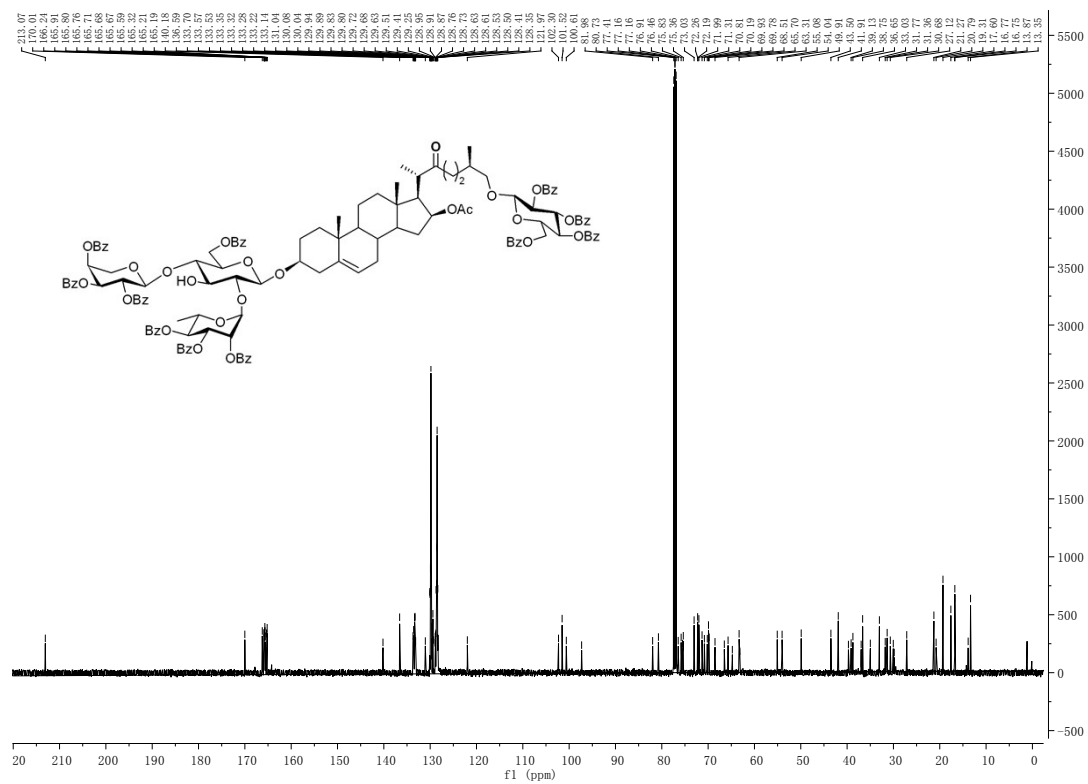
The ¹H NMR spectrum of **31** (CDCl₃, 600 MHz)



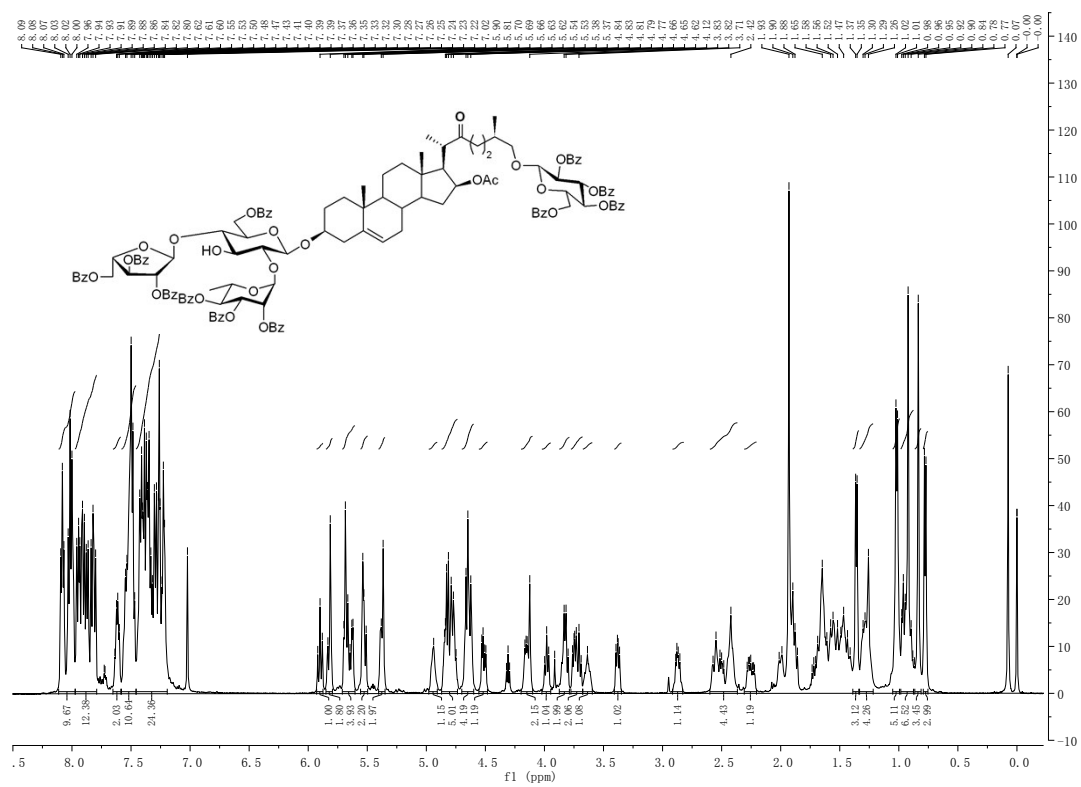
The ¹³C NMR spectrum of **31** (CDCl₃, 150 MHz)



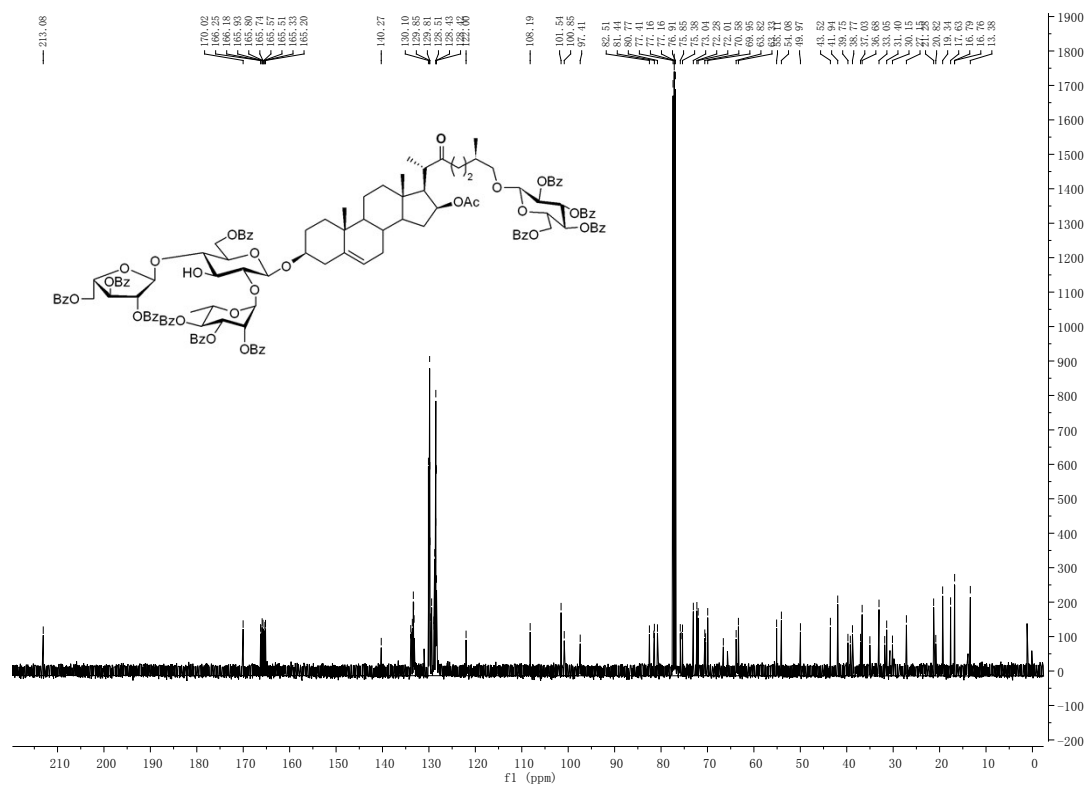
The ^1H NMR spectrum of **32** (CDCl_3 , 600 MHz)



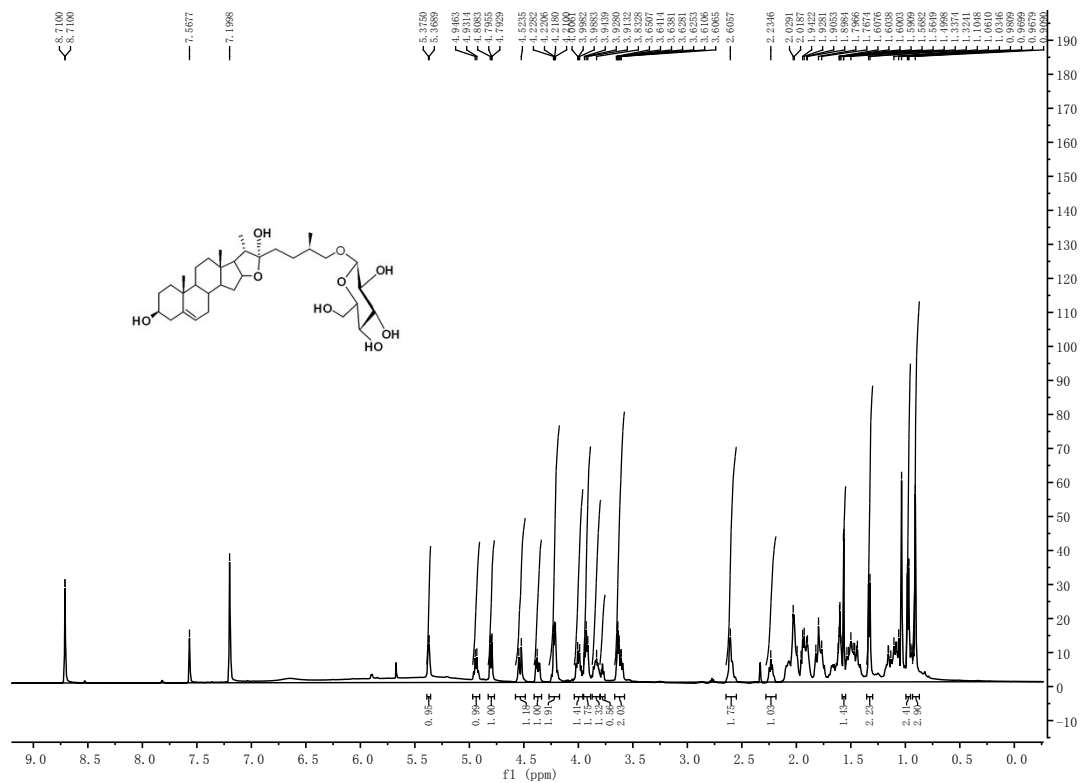
The ^{13}C NMR spectrum of **32** (CDCl_3 , 150 MHz)



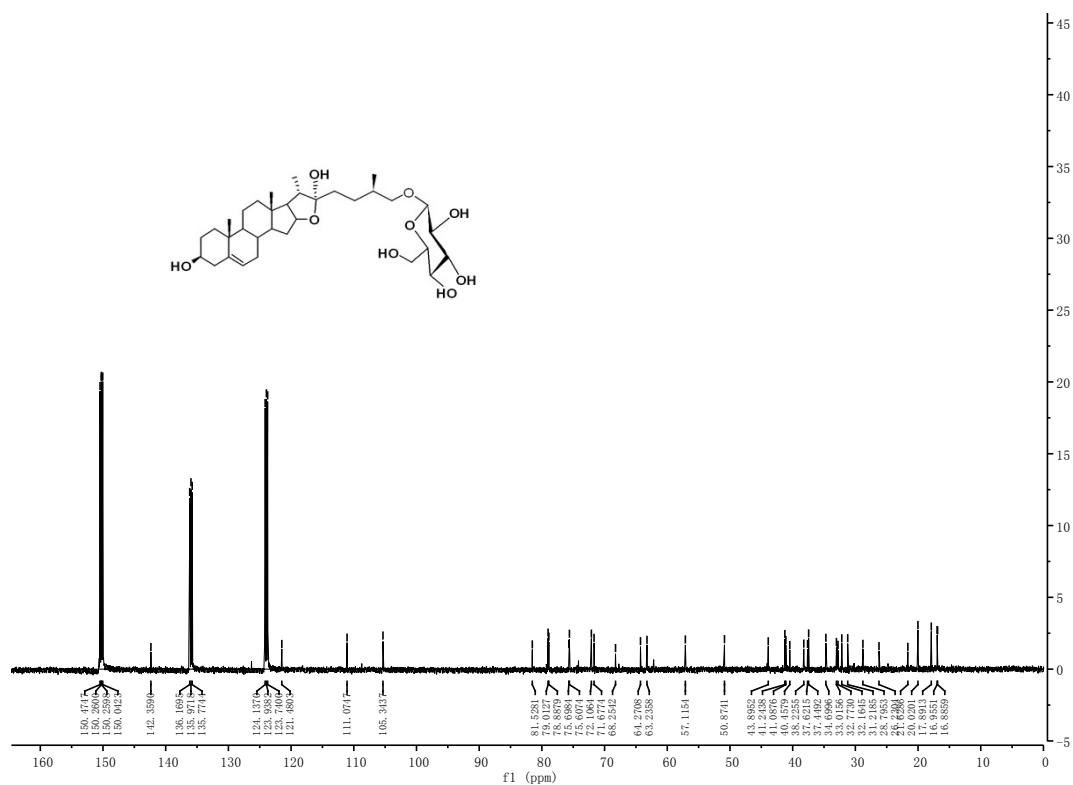
The ¹H NMR spectrum of **33** (CDCl₃, 600 MHz)



The ¹³C NMR spectrum of **33** (CDCl₃, 150 MHz)



The ^1H NMR spectrum of **1** (pyridine- d_5 , 500 MHz)



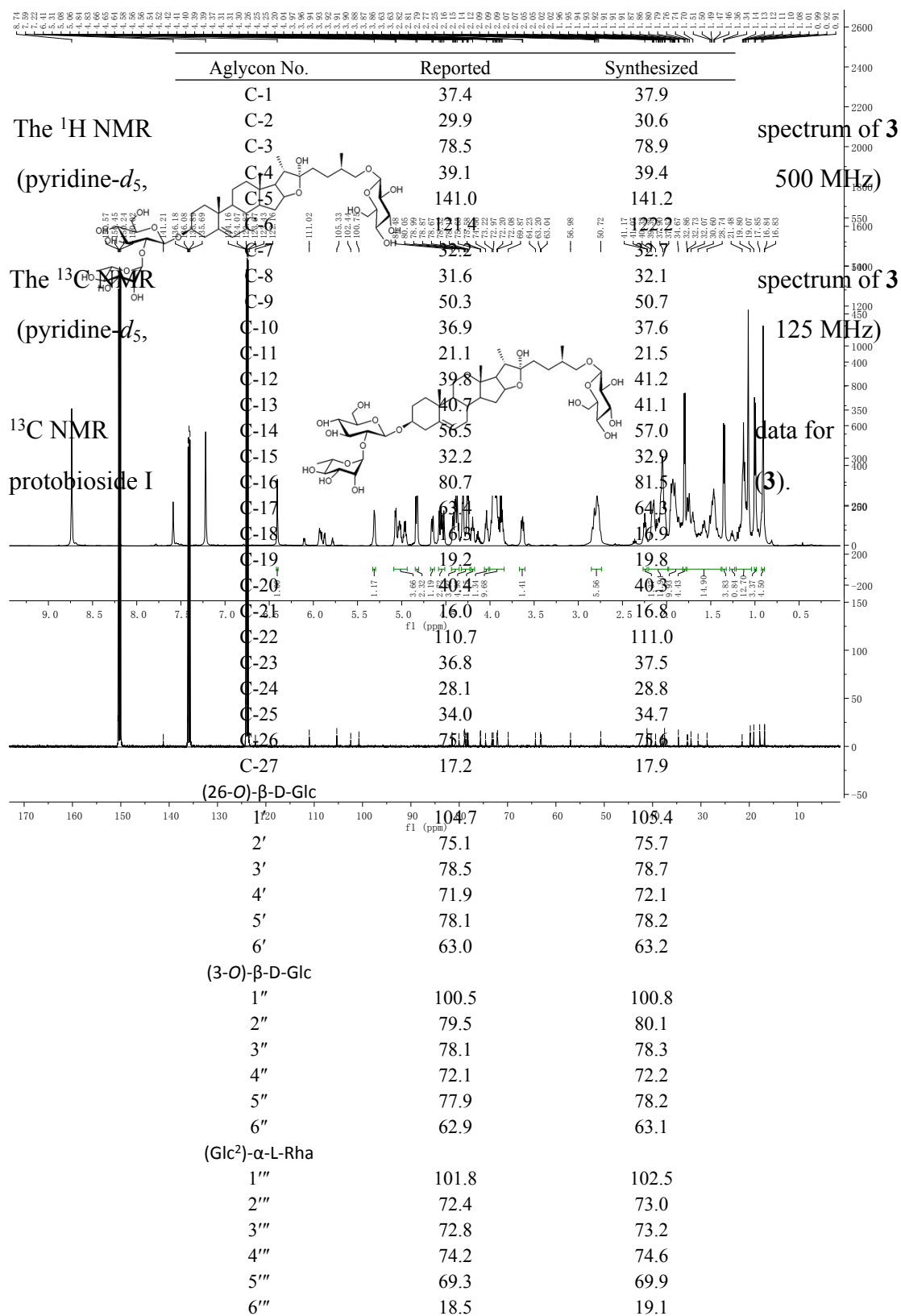
The ^{13}C NMR spectrum of **1** (pyridine- d_5 , 125 MHz)

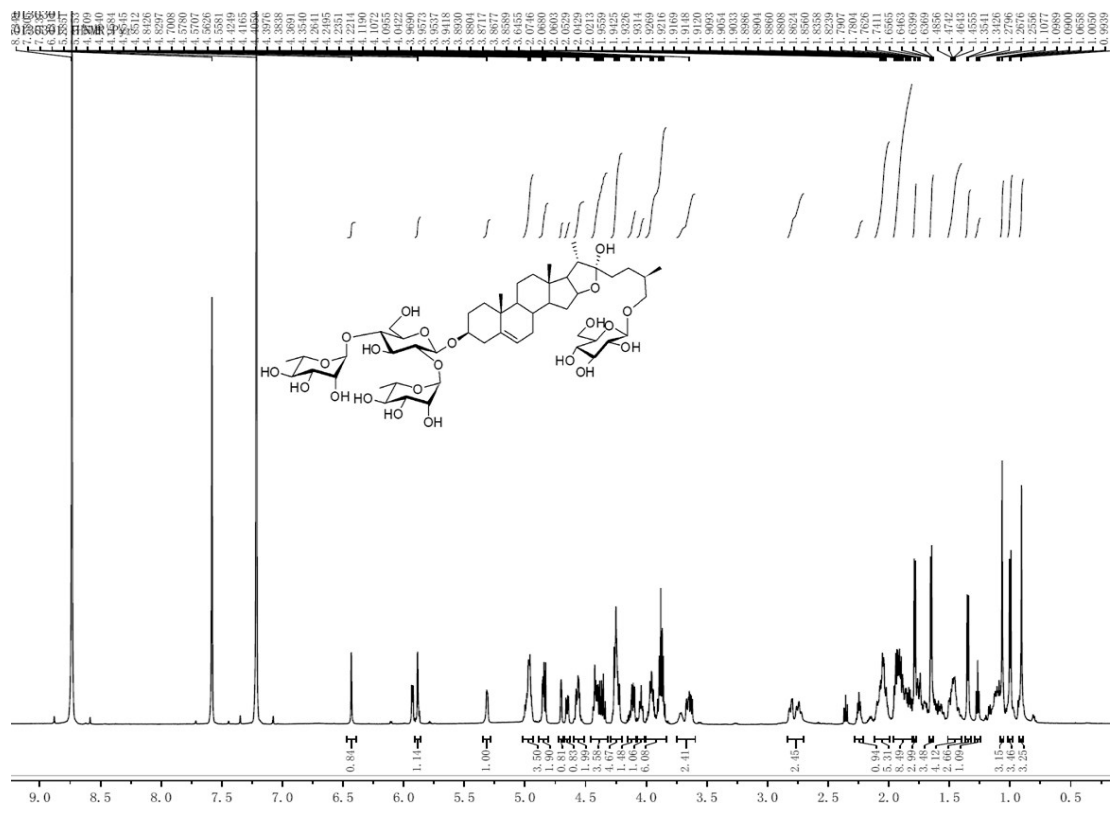
¹³C NMR data for funloside B (1).

Aglycon No.	Reported	Synthesized
C-1	37.8	38.2
C-2	32.6	33.0
C-3	71.3	71.7
C-4	43.5	43.9
C-5	142.0	142.4
C-6	121.1	121.5
C-7	32.4	32.8
C-8	31.8	32.2
C-9	50.5	50.9
C-10	37.1	37.4
C-11	21.2	21.6
C-12	40.1	40.4
C-13	40.8	41.1
C-14	56.7	57.1
C-15	32.5	32.8
C-16	81.1	81.5
C-17	63.9	64.3
C-18	16.5	16.9
C-19	19.6	20.0
C-20	40.7	41.1
C-21	16.5	16.9
C-22	110.7	111.1
C-23	37.2	37.6
C-24	28.4	28.8
C-25	34.3	34.7
C-26	75.2	75.6
C-27	17.5	17.9
(26-O)-β-D-Glc		
1'	105.0	105.3
2'	75.3	75.7
3'	78.6	78.9
4'	71.7	72.1
5'	78.5	78.9
6'	62.9	63.2

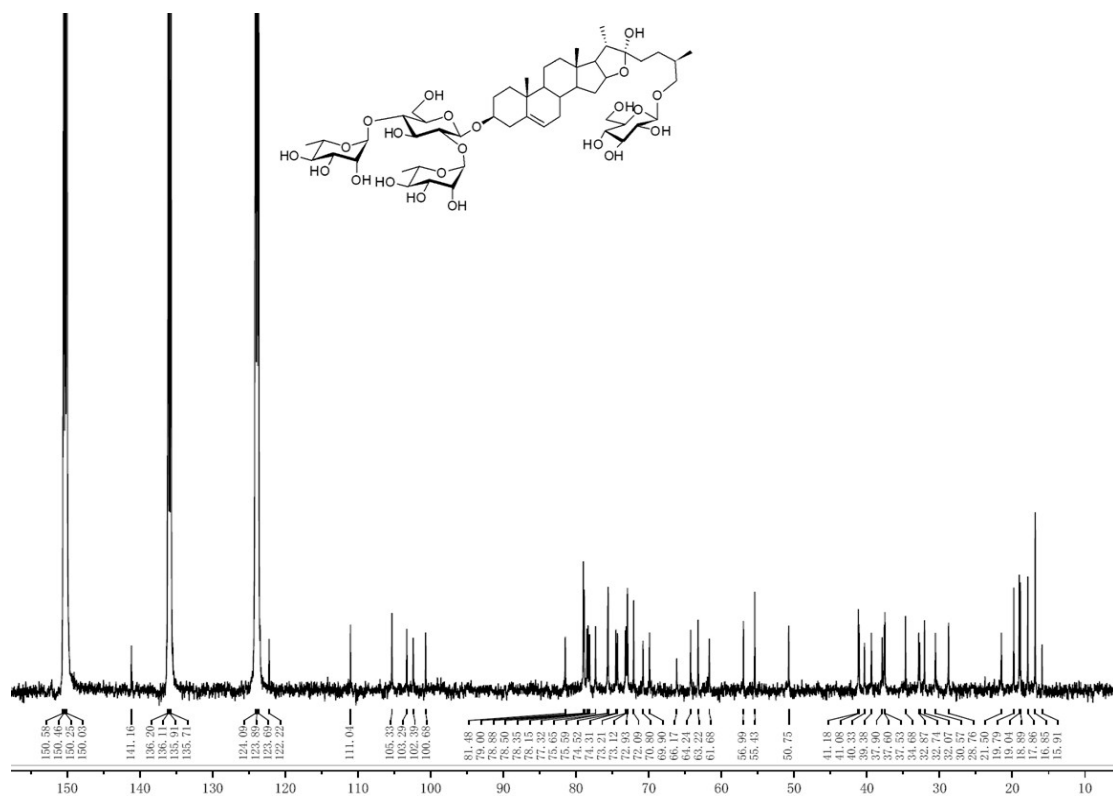
¹³C NMR data for lilioglycoside (2).

Aglycon No.	Reported	Synthesized
C-1	37.5	38.0
C-2	30.1	30.8
C-3	78.2	78.7
C-4	39.4	39.9
C-5	141.0	141.4
C-6	121.8	122.3
C-7	32.4	32.8
C-8	31.7	32.2
C-9	50.4	50.8
C-10	37.3	37.7
C-11	21.2	21.7
C-12	40.0	40.5
C-13	40.9	41.3
C-14	56.7	57.1
C-15	32.5	32.8
C-16	81.2	81.6
C-17	63.9	64.3
C-18	16.6	17.0
C-19	19.5	19.9
C-20	40.8	41.2
C-21	16.6	16.9
C-22	110.8	111.2
C-23	37.1	37.6
C-24	28.4	28.9
C-25	34.4	34.8
C-26	75.3	75.7
C-27	17.5	18.0
(26-O)-β-D-Glc		
1'	105.0	105.4
2'	75.4	75.9
3'	78.7	79.1
4'	71.8	72.2
5'	78.6	79.0
6'	62.9	63.3
(3-O)-β-D-Glc		
1''	102.7	103.1
2''	75.4	75.9
3''	78.7	79.1
4''	71.8	72.2
5''	78.6	79.0
6''	62.9	63.3





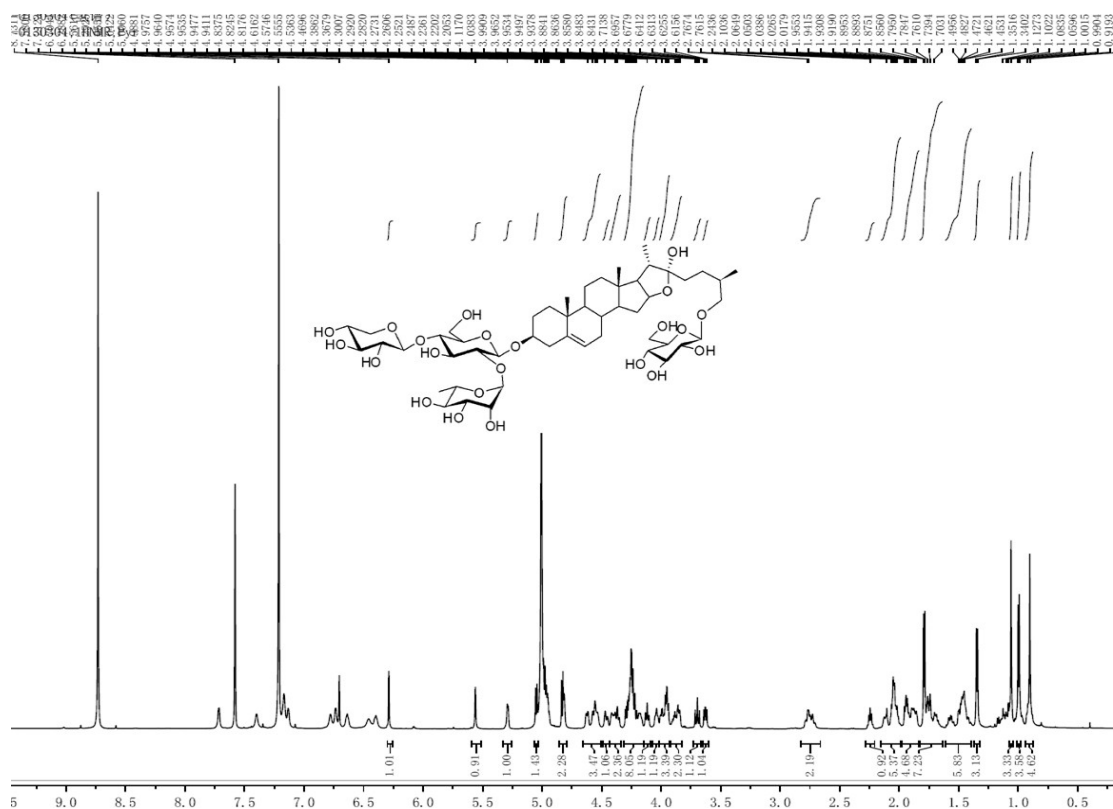
The ^1H NMR spectrum of 4 (pyridine- d_5 , 500 MHz)



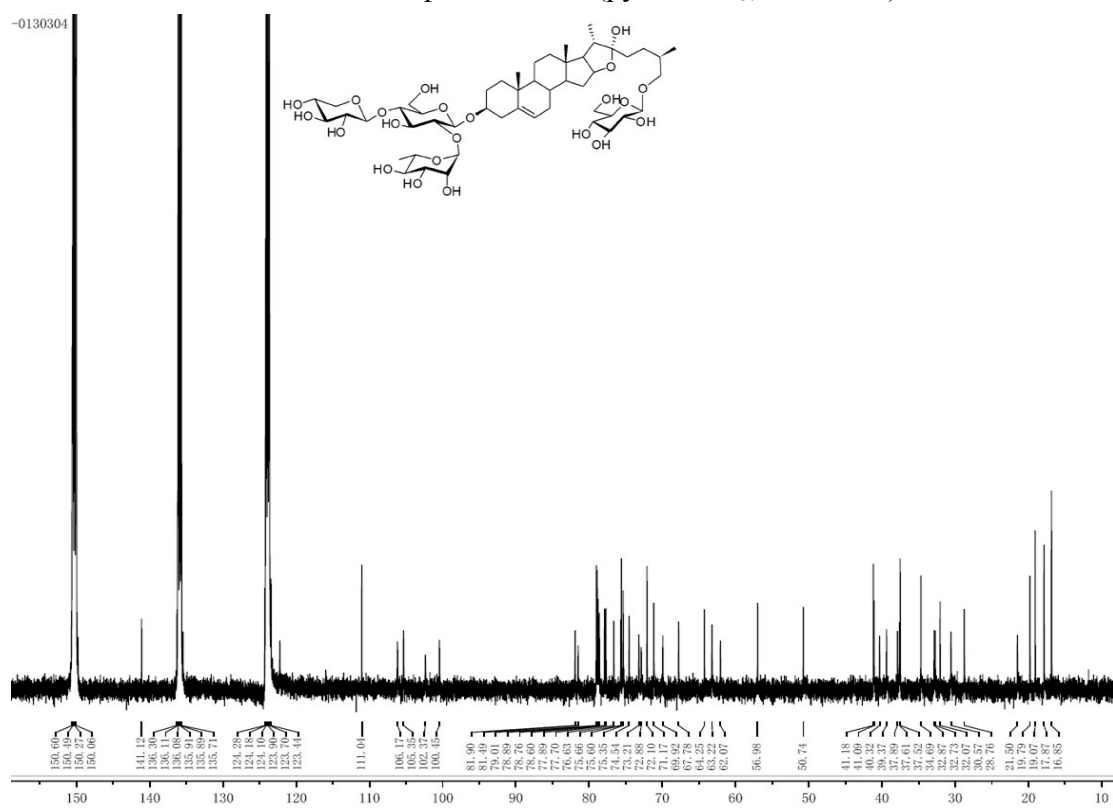
The ^{13}C NMR spectrum of 4 (pyridine- d_5 , 125 MHz)

¹³C NMR data for protodioscin (4).

Aglycon No.	Reported	Synthesized
C-1	37.5	37.9
C-2	30.2	30.6
C-3	78.5	78.9
C-4	39.0	39.4
C-5	140.8	141.2
C-6	121.8	122.2
C-7	32.2	32.7
C-8	31.7	32.1
C-9	50.4	50.7
C-10	37.1	37.6
C-11	21.0	21.5
C-12	39.9	41.2
C-13	40.8	41.1
C-14	56.6	57.0
C-15	32.3	32.9
C-16	81.1	81.5
C-17	63.8	64.2
C-18	16.3	16.9
C-19	19.4	19.8
C-20	40.7	40.3
C-21	16.4	16.9
C-22	110.7	111.0
C-23	30.0	30.6
C-24	28.3	28.8
C-25	34.4	34.7
C-26	75.0	75.6
C-27	17.5	17.9
(26-O)-β-D-Glc		
1'	105.1	105.3
2'	75.2	75.7
3'	78.4	78.9
4'	71.7	72.1
5'	78.3	78.4
6'	62.9	63.2
(3-O)-β-D-Glc		
1''	100.3	100.7
2''	78.1	78.2
3''	76.9	77.3
4''	77.9	78.2
5''	77.8	78.2
6''	61.3	61.7
(Glc ²)-α-L-Rha		
1'''	102.0	102.4
2'''	72.5	72.9
3'''	72.7	73.1
4'''	74.1	74.5
5'''	69.5	69.9
6'''	18.6	19.0
(Glc ⁴)-α-L-Rha		
1''''	102.9	103.3
2''''	72.5	72.9
3''''	72.8	73.1
4''''	73.9	74.3
5''''	70.4	70.8
6''''	18.5	18.9



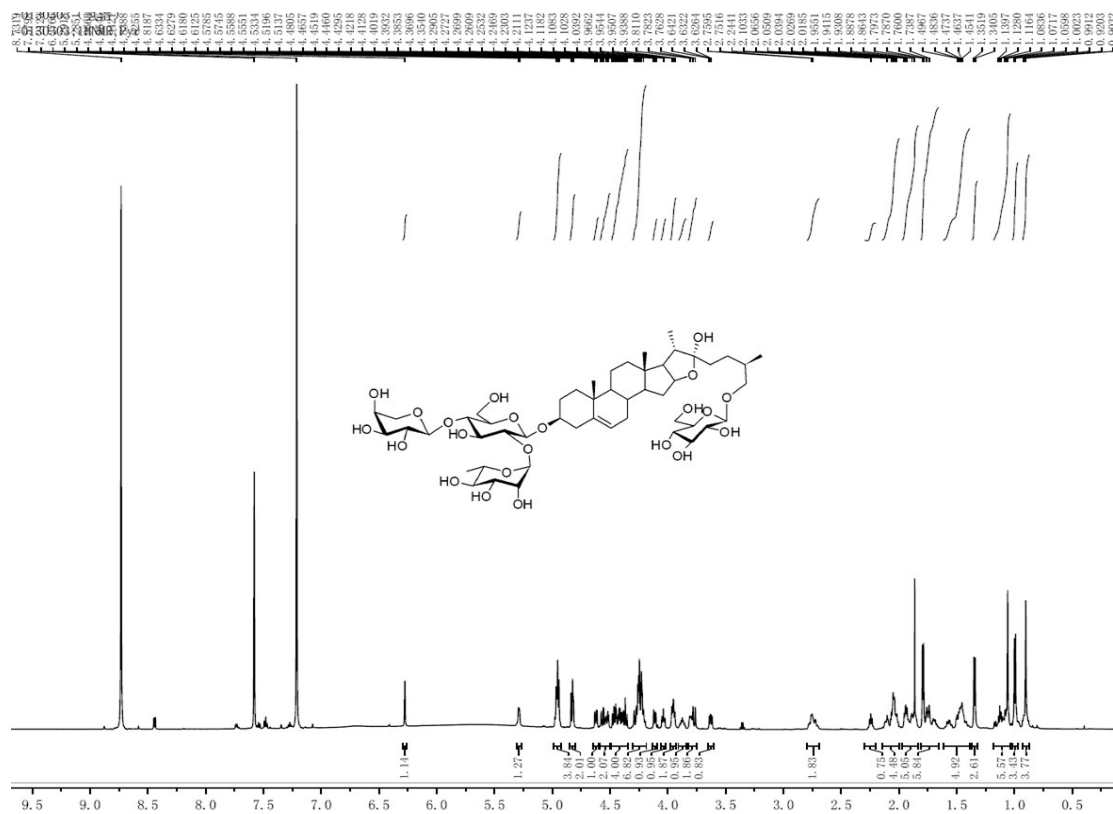
The ^1H NMR spectrum of **5** (pyridine- d_5 , 500 MHz)



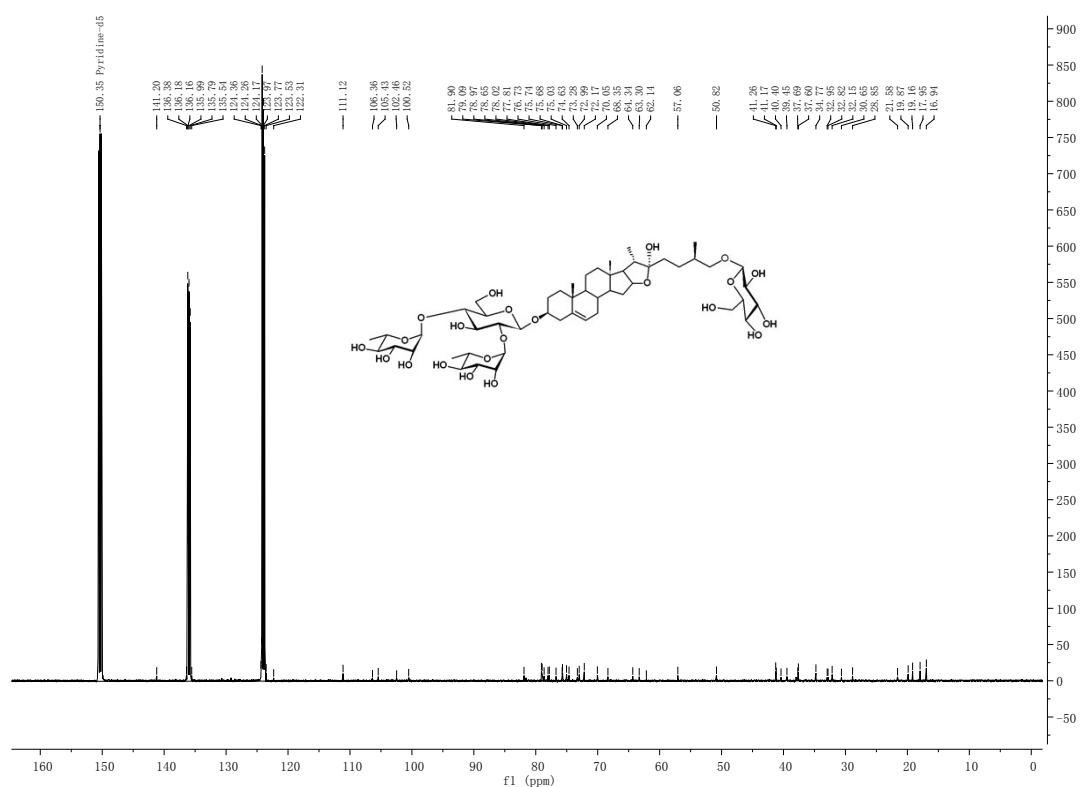
The ^{13}C NMR spectrum of **5** (pyridine- d_5 , 125 MHz)

¹³C NMR data for pallidifloside I (5).

Aglycon No.	Reported	Synthesized
C-1	37.2	37.9
C-2	29.9	30.6
C-3	77.8	78.6
C-4	38.7	39.4
C-5	140.4	141.2
C-6	121.6	122.2
C-7	32.1	32.9
C-8	31.4	32.1
C-9	50.0	50.7
C-10	36.9	37.6
C-11	20.8	21.5
C-12	39.7	40.3
C-13	40.4	41.1
C-14	56.3	50.7
C-15	32.2	32.9
C-16	81.1	81.9
C-17	63.6	64.3
C-18	16.2	16.9
C-19	19.1	21.5
C-20	40.5	41.2
C-21	16.2	16.9
C-22	110.4	111.0
C-23	37.0	37.6
C-24	28.1	28.8
C-25	34.0	34.7
C-26	75.0	75.7
C-27	17.2	17.9
(26-O)-β-D-Glc		
1'	104.7	105.4
2'	74.9	75.6
3'	78.3	78.9
4'	71.4	72.1
5'	78.3	78.9
6'	62.5	63.2
(3-O)-β-D-Glc		
1''	99.7	100.5
2''	77.2	77.9
3''	77.0	77.7
4''	80.8	81.5
5''	76.0	76.6
6''	61.3	62.1
(Glc ²)-α-L-Rha		
1'''	101.7	102.4
2'''	72.2	72.9
3'''	72.5	73.2
4'''	73.9	74.5
5'''	69.3	69.9
6'''	18.5	19.1
(Glc ⁴)-β-D-Xyl-		
1''''	105.5	106.2
2''''	74.7	75.4
3''''	78.1	78.8
4''''	70.5	71.2
5''''	67.1	67.8



The ¹H NMR spectrum of 6 (pyridine-*d*₅, 500 MHz)



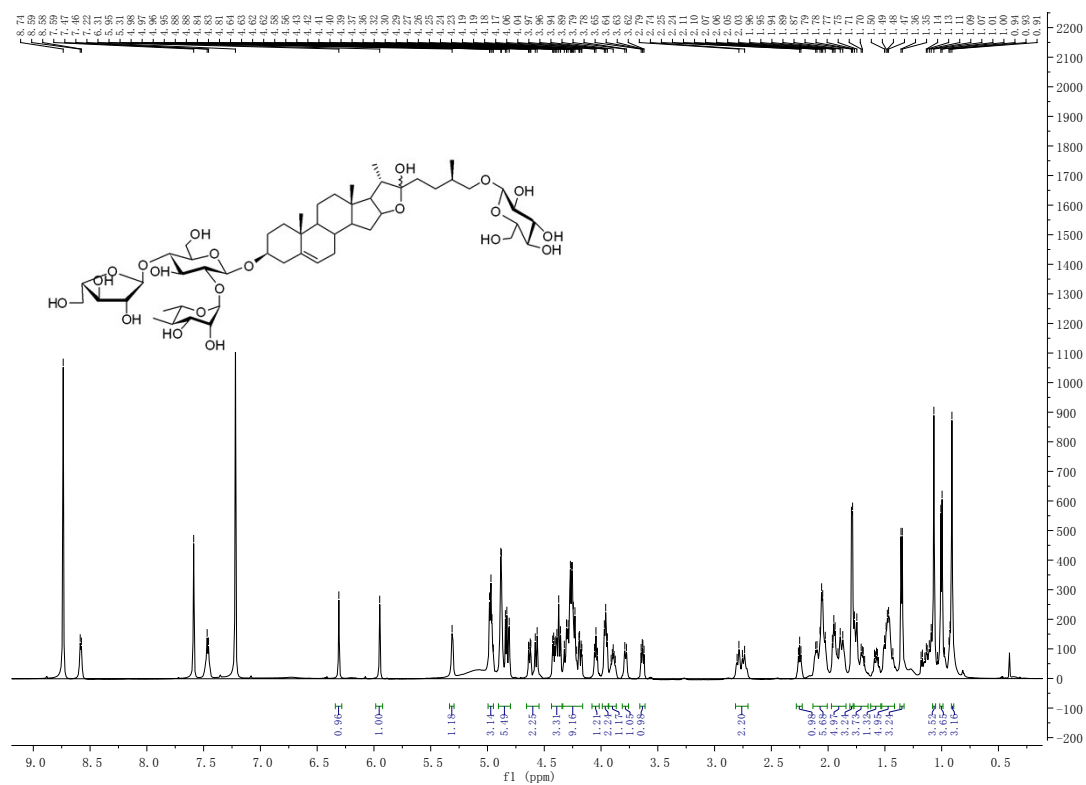
The ¹³C NMR spectrum of 6 (pyridine-*d*₅, 125 MHz)

¹³C NMR data for Coreajaponins A (**6**).

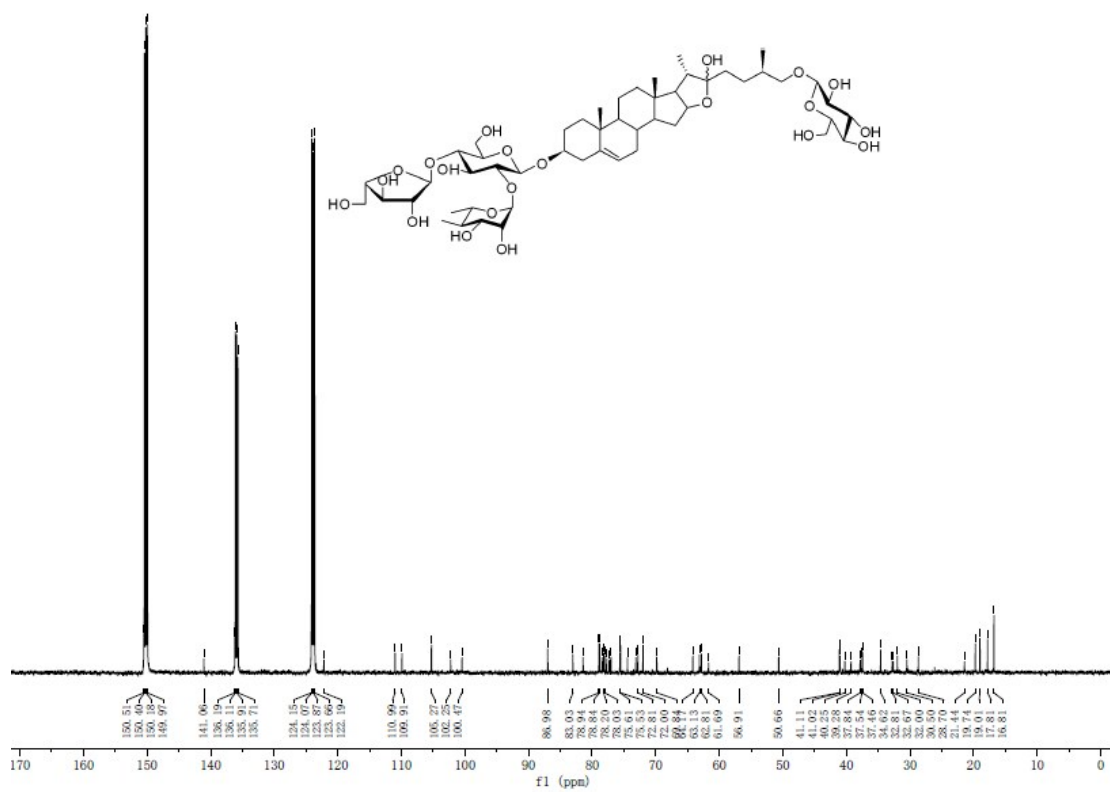
Aglycon No.	Reported (in CD ₃ OD)	Synthesized (in C ₅ D ₅ N)*	Methyl coreajaponins A (in C ₅ D ₅ N)**
C-1	37.1	37.7	37.4
C-2	29.3	30.6	30.1
C-3	77.9	79.0	78.5
C-4	39.4	39.5	39.2
C-5	140.4	141.2	140.8
C-6	121.2	122.3	121.5
C-7	31.7	32.8	32.2
C-8	31.3	32.1	31.6
C-9	50.2	50.8	50.3
C-10	36.6	37.6	37.1
C-11	20.5	21.6	21.1
C-12	39.4	40.4	39.7
C-13	40.4	41.2	40.7
C-14	56.3	57.1	56.5
C-15	31.3	32.2	32.0
C-16	81.0	81.9	81.3
C-17	63.6	64.3	64.1
C-18	15.3	18.0	17.1
C-19	18.4	19.9	19.3
C-20	39.7	41.3	41.2
C-21	14.6	16.9	16.2
C-22	112.5	111.1	112.6
C-23	29.9	30.7	30.6
C-24	27.5	28.9	28.1
C-25	33.5	34.8	34.2
C-26	74.5	75.7	75.1
C-27	15.8	19.2	18.6
(26-O)-β-D-Glc			
1'	103.1	105.4	104.9
2'	74.7	75.7	75.1
3'	76.7	78.7	78.3
4'	70.3	72.2	71.7
5'	76.4	79.0	78.6
6'	61.4	63.3	62.5
(3-O)-β-D-Glc			
1''	98.9	100.5	100.1
2''	77.0	78.0	77.8
3''	77.1	77.8	77.3
4''	79.5	81.9	81.4
5''	76.1	76.7	76.3
6''	60.4	62.1	61.6
(Glc ²)-α-L-Rha			
1'''	100.5	102.5	102.5
2'''	70.7	73.0	72.5
3'''	71.1	73.3	72.8
4'''	72.9	74.6	74.2
5'''	68.5	70.0	69.4
6'''	16.5	19.2	18.9
(Glc ⁴)-β-L-Arap			
1''''	104.0	106.4	105.9
2''''	70.9	73.0	72.6
3''''	73.7	75.0	74.6
4''''	68.3	70.0	69.6
5''''	66.3	68.3	67.8

* ¹³C NMR data for synthesized **6** (in C₅D₅N) are different from the reported coreajaponins A (in CD₃OD), which are ascribed to solvent effect. However, the acquired ¹³C NMR data are in agreement with those for Coreajaponins B (Methyl coreajaponins A) except that for C-22.

** ¹³C NMR data for Coreajaponins B.



The ^1H NMR spectrum of **7** (pyridine-d_5 , 500 MHz)



The ^{13}C NMR spectrum of **7** (pyridine-d_5 , 125 MHz)

¹³C NMR data for Parisaponin I (7).

Aglycon No.	Reported	Synthesized
C-1	37.5	37.9
C-2	30.2	30.6
C-3	78.2	78.5
C-4	39.0	39.4
C-5	140.8	141.1
C-6	121.9	122.2
C-7	32.4	32.7
C-8	31.7	32.1
C-9	50.4	50.7
C-10	37.2	37.5
C-11	21.2	21.5
C-12	40.0	40.3
C-13	40.7	41.1
C-14	56.6	56.9
C-15	32.5	32.9
C-16	81.1	81.5
C-17	63.9	64.2
C-18	16.5	16.8
C-19	19.4	19.8
C-20	40.8	41.1
C-21	16.5	16.8
C-22	110.7	111.0
C-23	37.2	37.5
C-24	28.4	28.8
C-25	34.3	34.7
C-26	75.3	75.7
C-27	17.5	17.9
(26-O)-β-D-Glc		
1'	105.0	105.3
2'	75.2	75.6
3'	78.6	79.0
4'	71.7	72.1
5'	78.5	78.9
6'	62.9	63.2
(3-O)-β-D-Glc		
1''	100.2	100.6
2''	77.4	77.8
3''	77.7	78.1
4''	77.1	77.4
5''	76.7	77.1
6''	61.4	61.7
(Glc ²)-α-L-Rha		
1'''	101.9	102.3
2'''	72.5	72.8
3'''	72.8	73.2
4'''	74.2	74.5
5'''	69.5	69.9
6'''	18.7	19.1
(Glc ⁴)-α-L-Araf		
1''''	109.7	110.0
2''''	82.7	83.1
3''''	78.0	78.3
4''''	86.7	87.1
5''''	62.5	62.9