Supporting Information

Bioactive Compounds from *Crataegus pinnatifida* Bge. Leaves: Potential Health Benefits.

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[1] These authors contributed equally to this article.

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Supporting Information

List of Contents

Figures

Tables

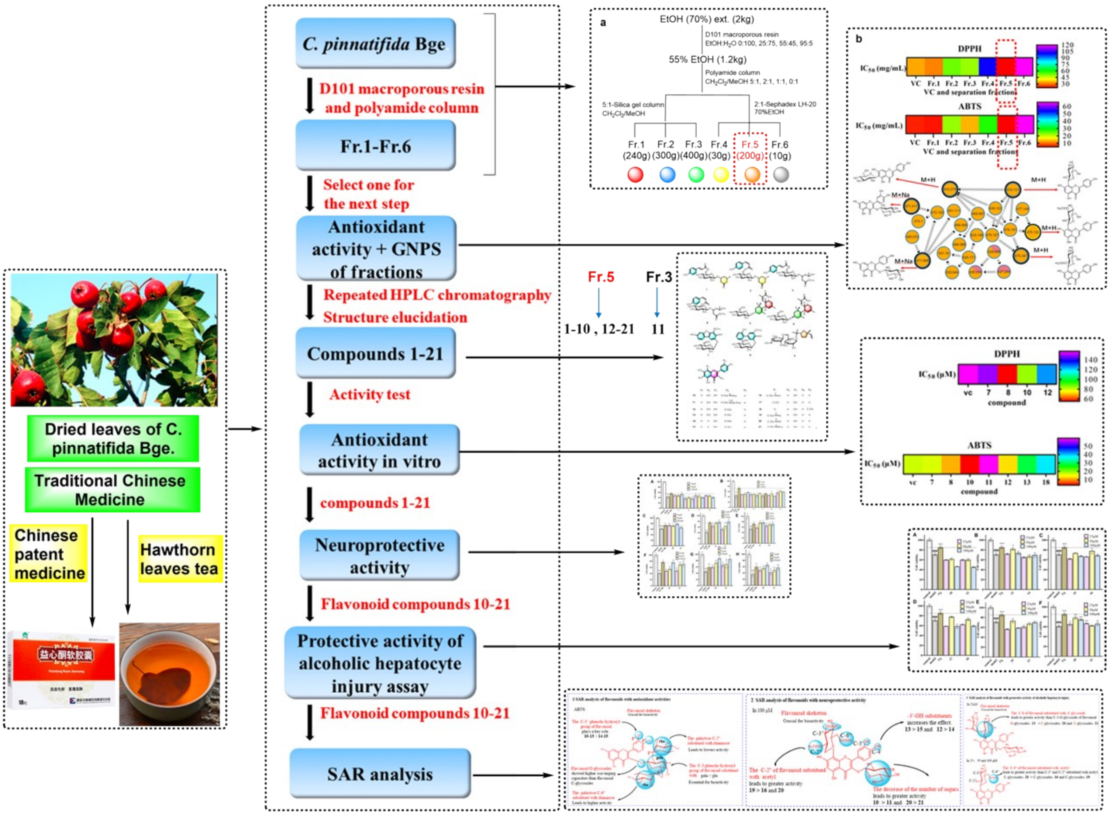

Fig S 1 :The scheme of isolation and activity of compounds from the leaves of *C. pinnatifida* Bge

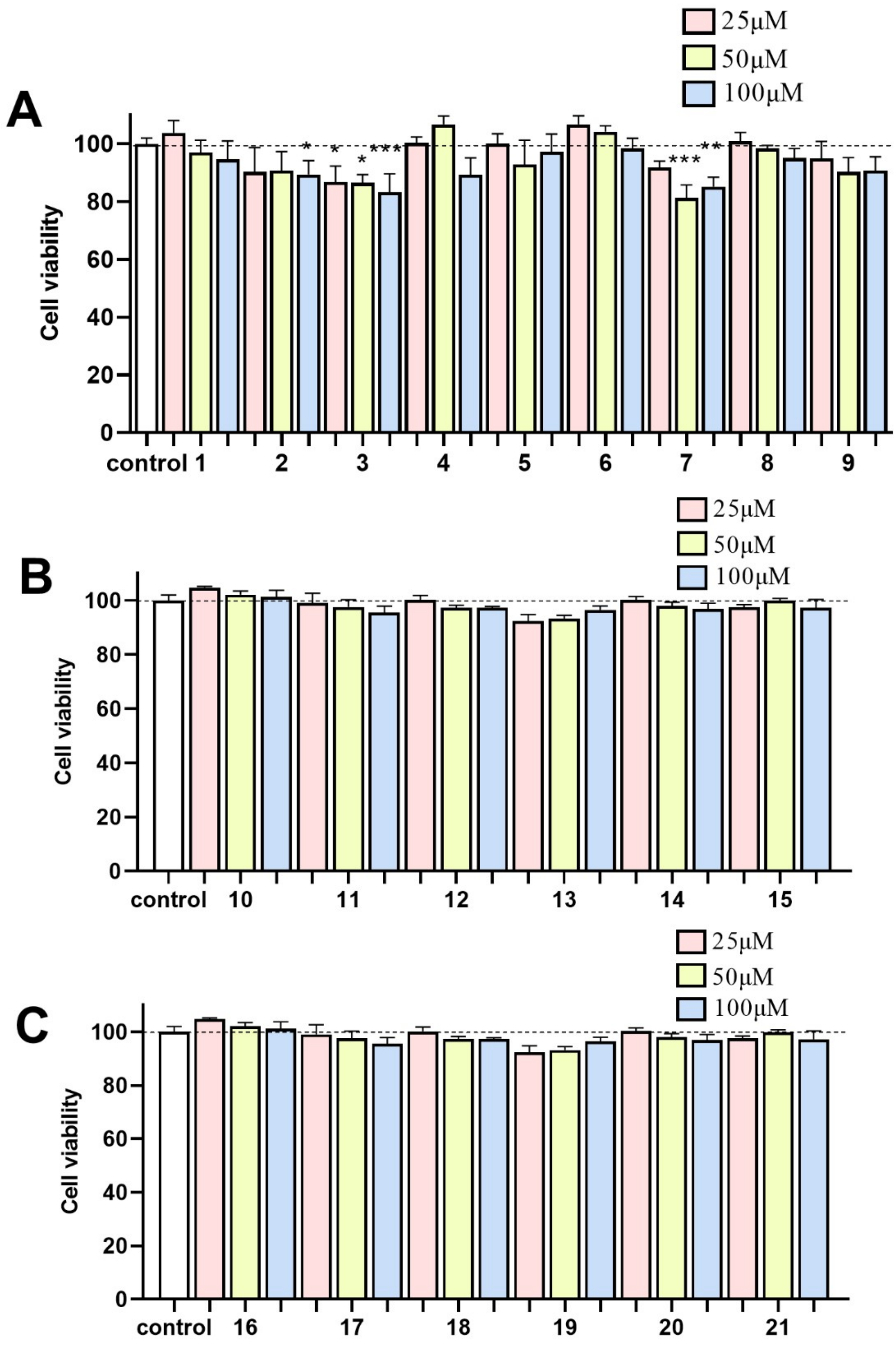

Fig S 2 :Toxicity of compounds **1-21** at 25, 50, 100 μM on the normal SH-SY5Y cells.

(In this figure, "control" is the blank group. Values are presented as percentage differences from control and they are significantly different with *P*>0.05 for Student's t-test: * $P < 0.5$, ** $P < 0.01$, and *** $P < 0.001$. The bars represent mean ± SD (*n*=3).

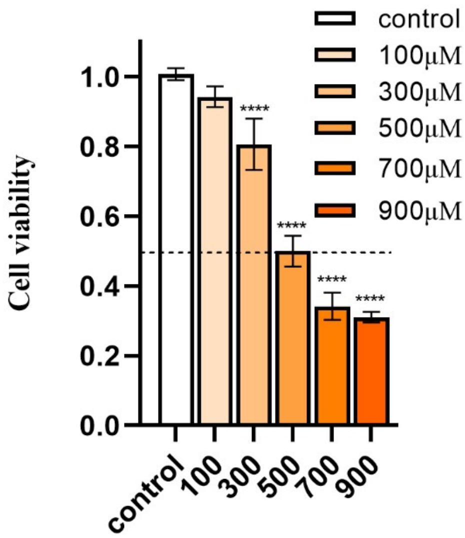

Fig S 3 :Assessment of apoptosis concentration induced by H_2O_2 at different doses (100-900 μM) for 24 h in SH-SY5Y cells.

The value is the mean ± SD of three replicates, **** $P < 0.0001$ vs control. The bars represent mean ± SD (n=3).

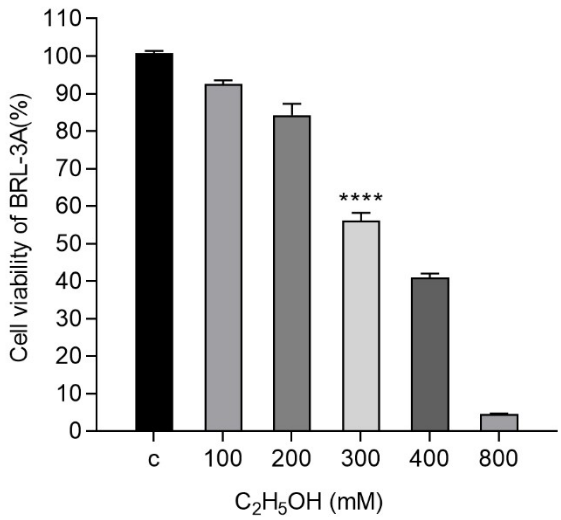

Fig S 4 : Assessment of apoptosis concentration induced by ethanol at different doses (100-800 μM) for 24 h in BRL-3A cell.

Values were the mean ± SD of three replicates, **** $P < 0.0001$ vs control group. The bars represent mean ± SD (n=3).

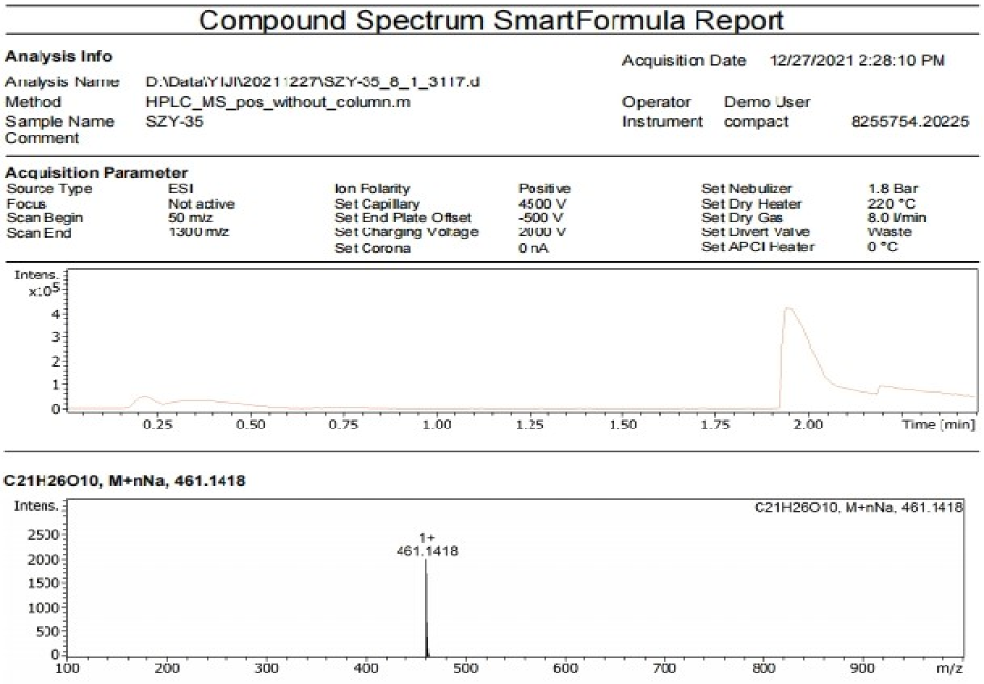

Fig S 5 The HRESIMS spectrum of compound **1**.

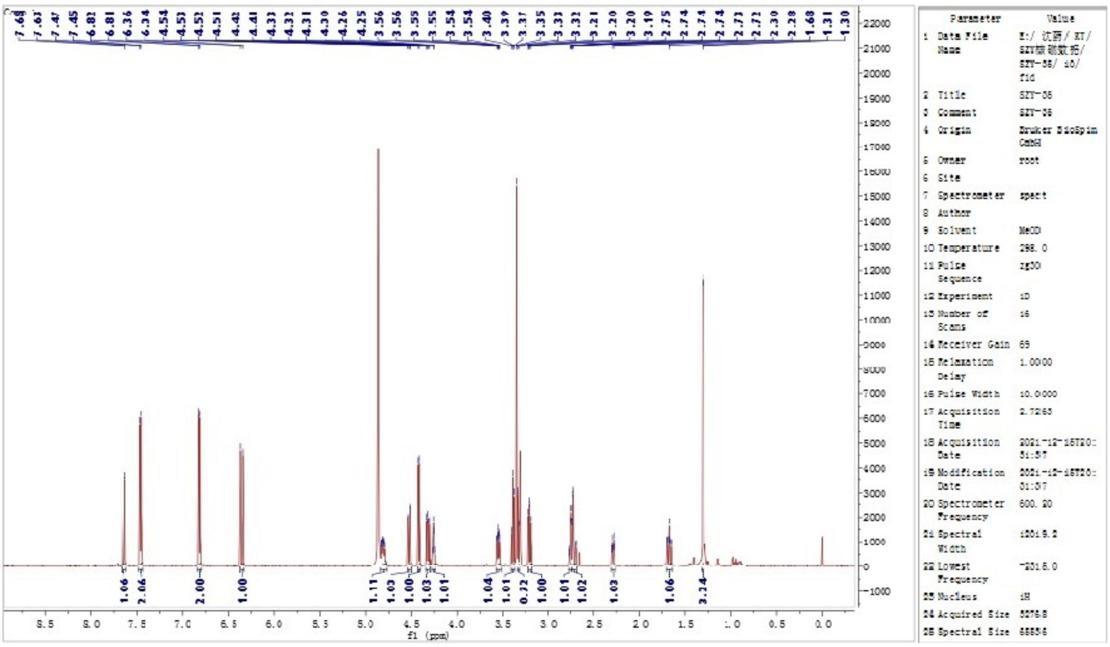

Fig S 6 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **1**.

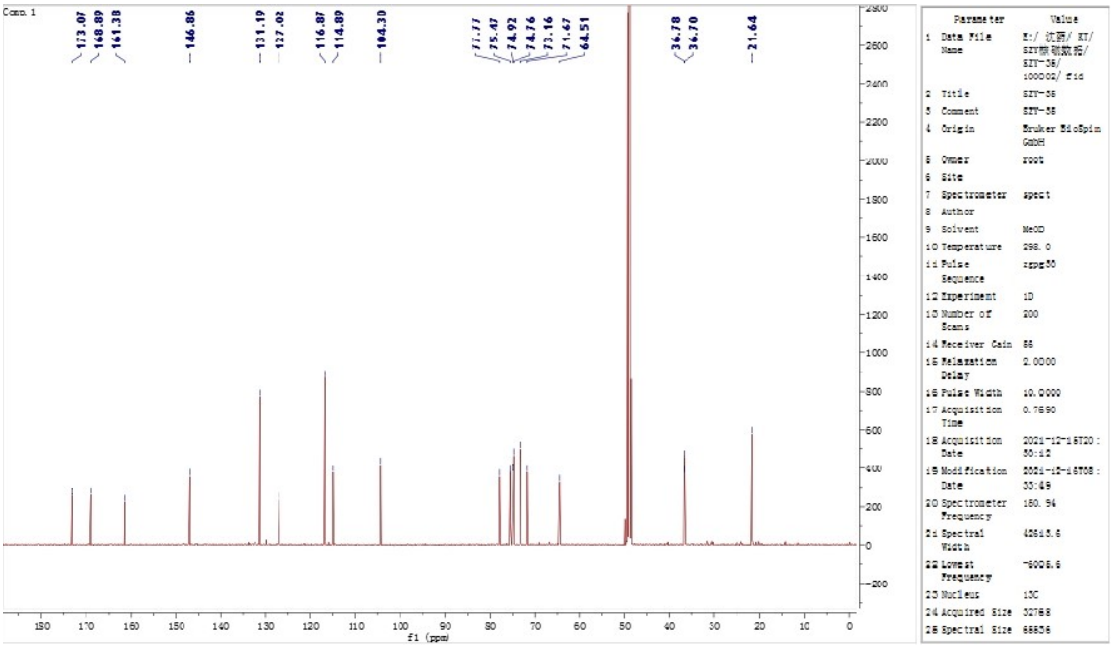

Fig S 7 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **1**.

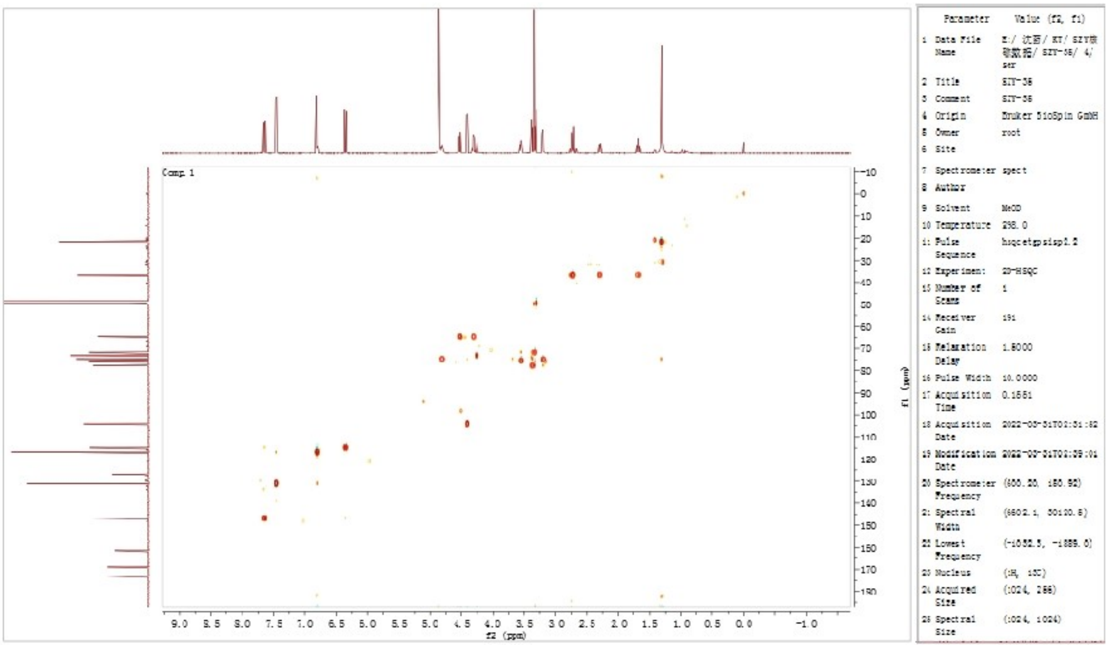

Fig S 8 The HSQC spectrum (600 MHz, Methanol-d_4) of compound **1**.

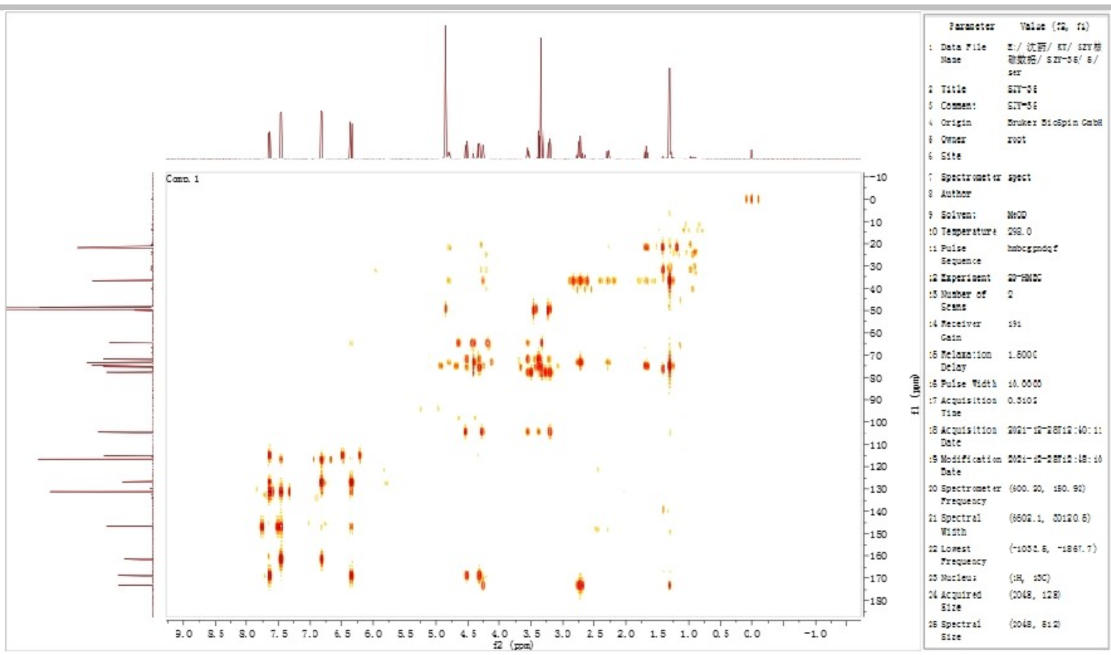

Fig S 9 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **1**.

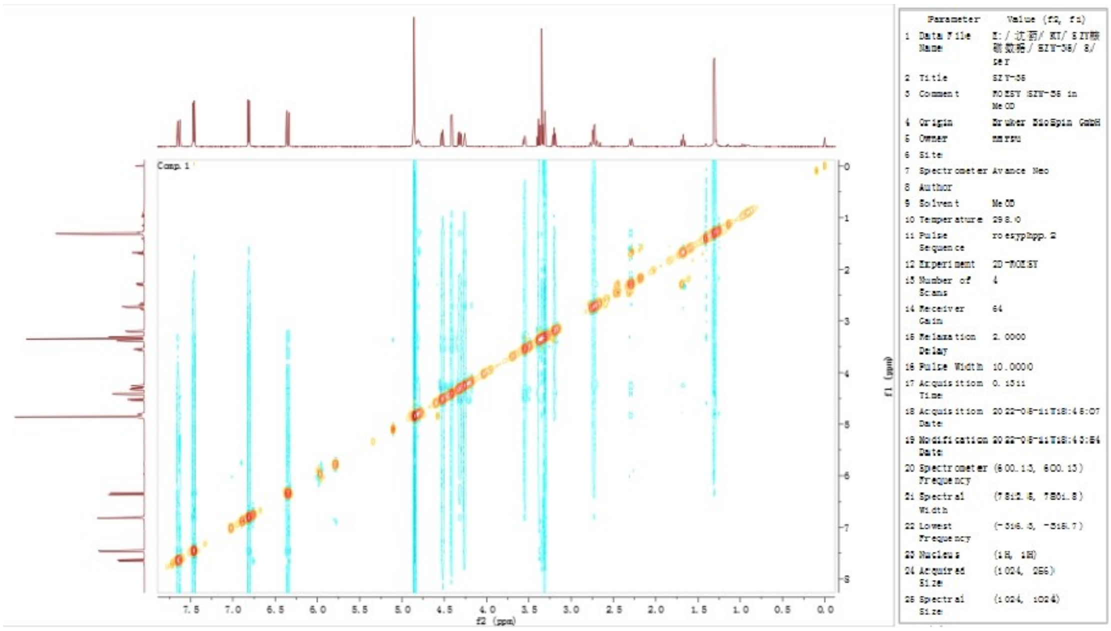

Fig S 10 The ROESY spectrum (600 MHz, Methanol-d_4) of compound **1**.

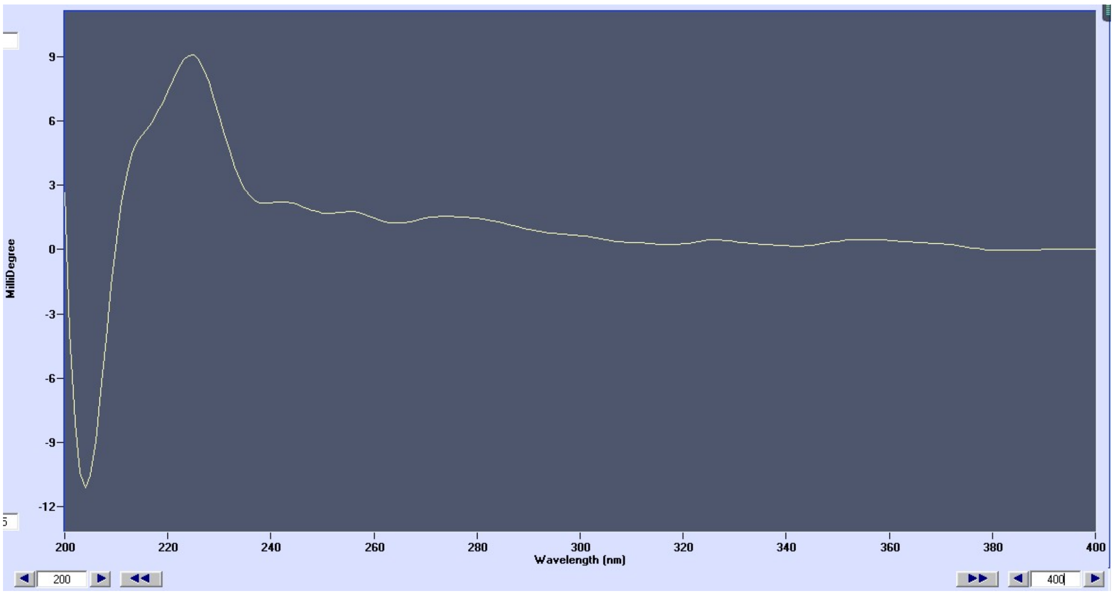

Fig S 11 The CD spectrum ($CDCl_3$) of compound **1′**.

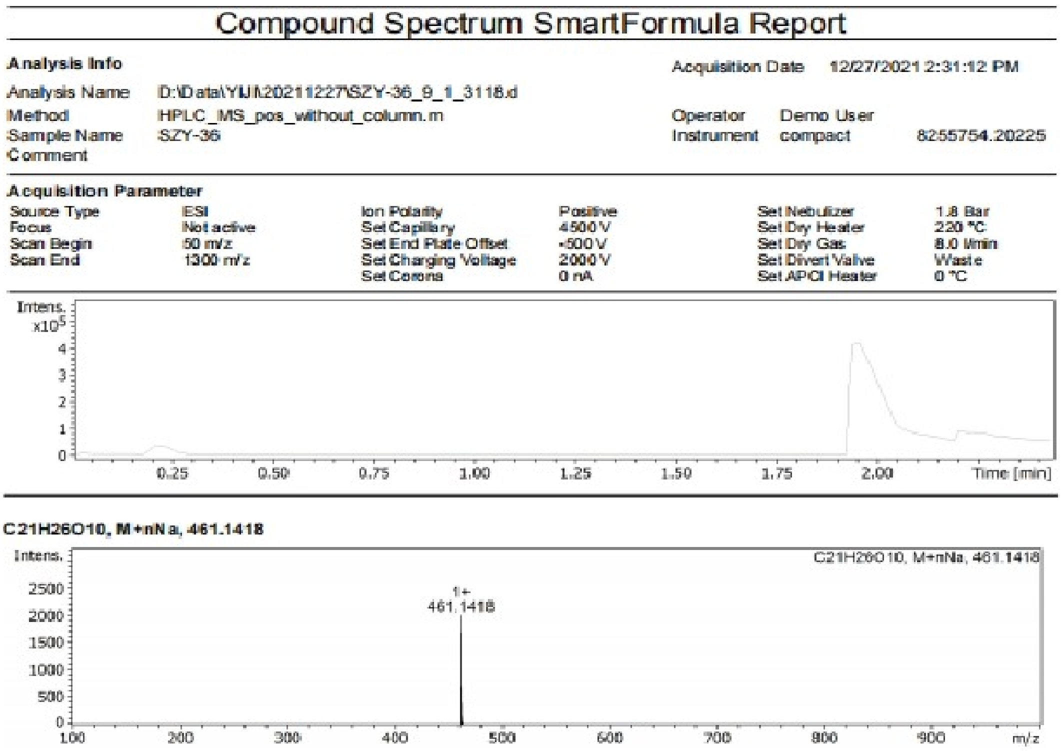

Fig S 12 The HRESIMS spectrum of compound **2**.

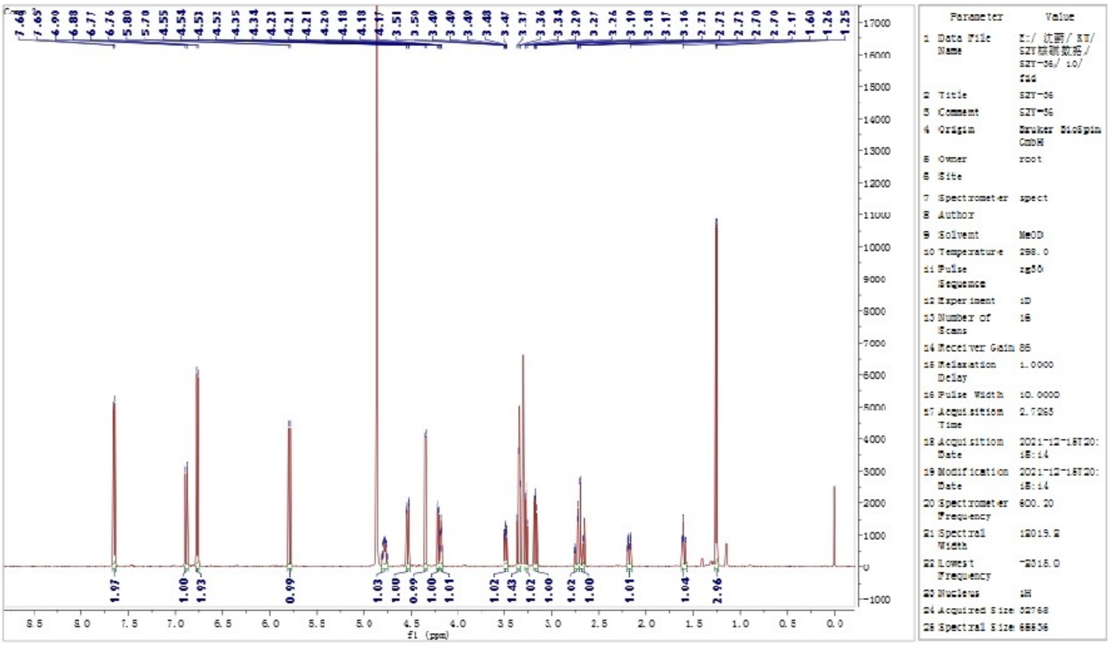

Fig S 13 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **2**.

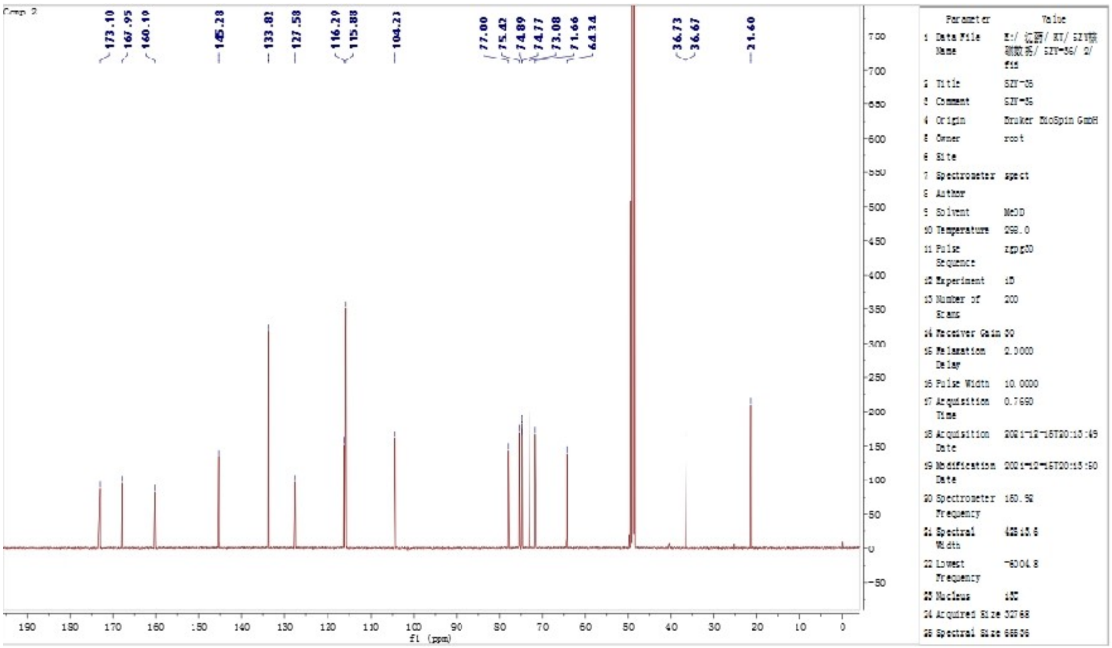

Fig S 14 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **2**.

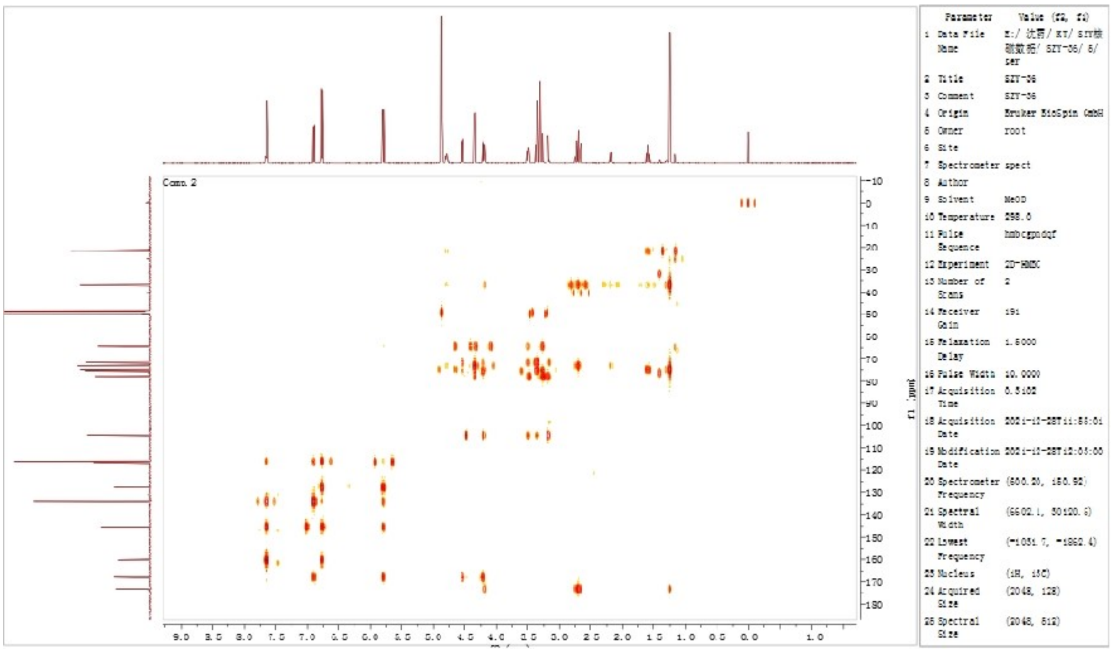

Fig S 15 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **2**.

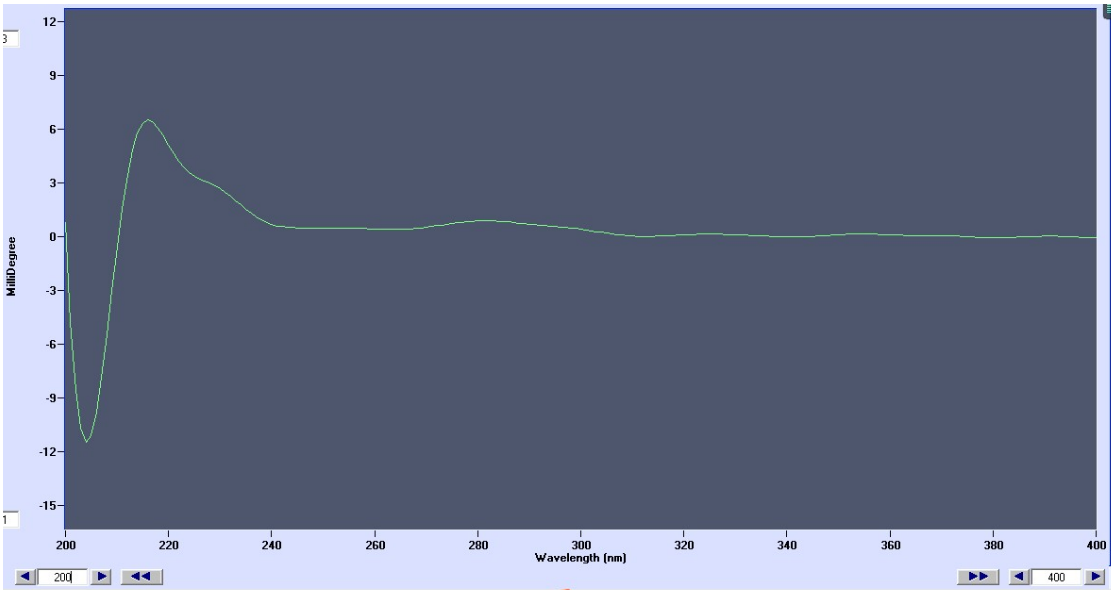

Fig S 16 The CD spectrum ($CDCl_3$) of compound **2′**.

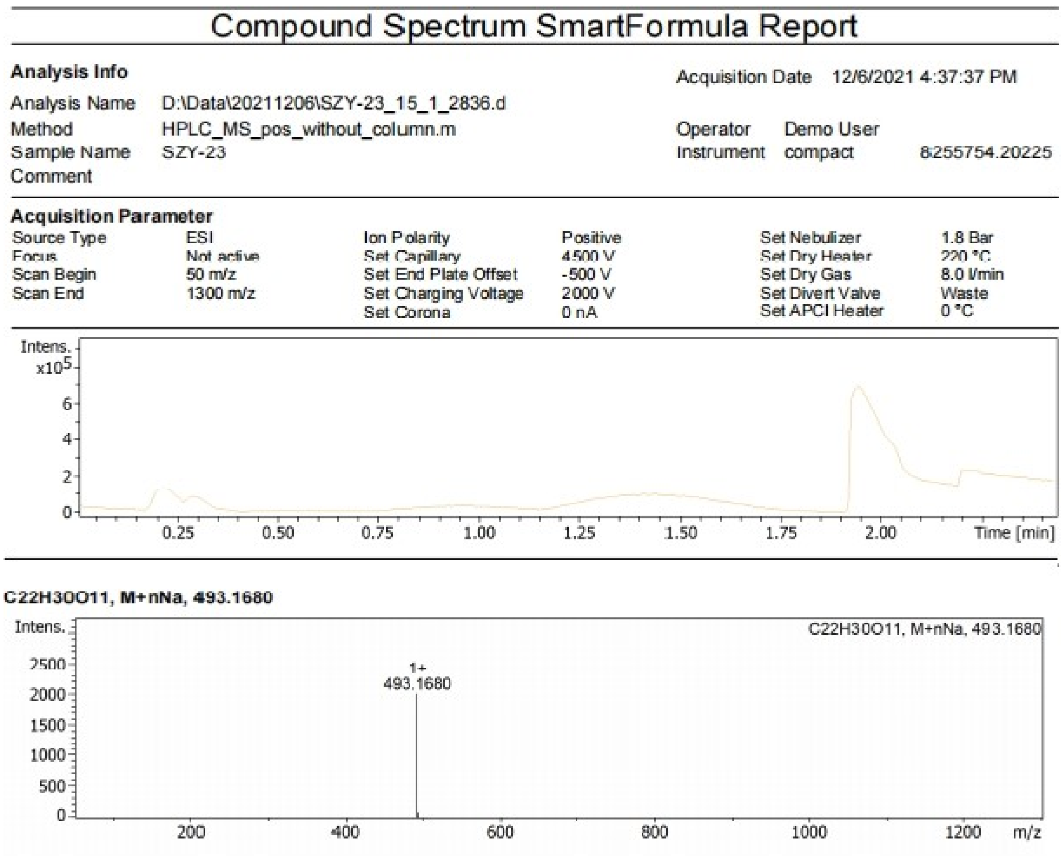

Fig S 17 The HRESIMS spectrum of compound **3**.

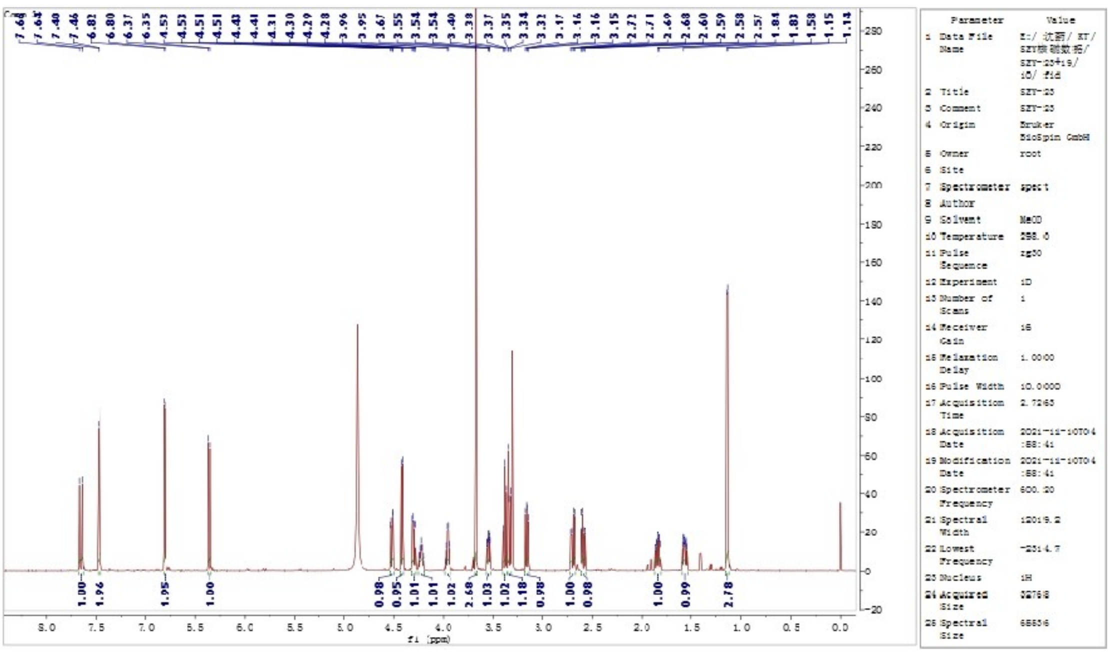

Fig S 18 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **3**.

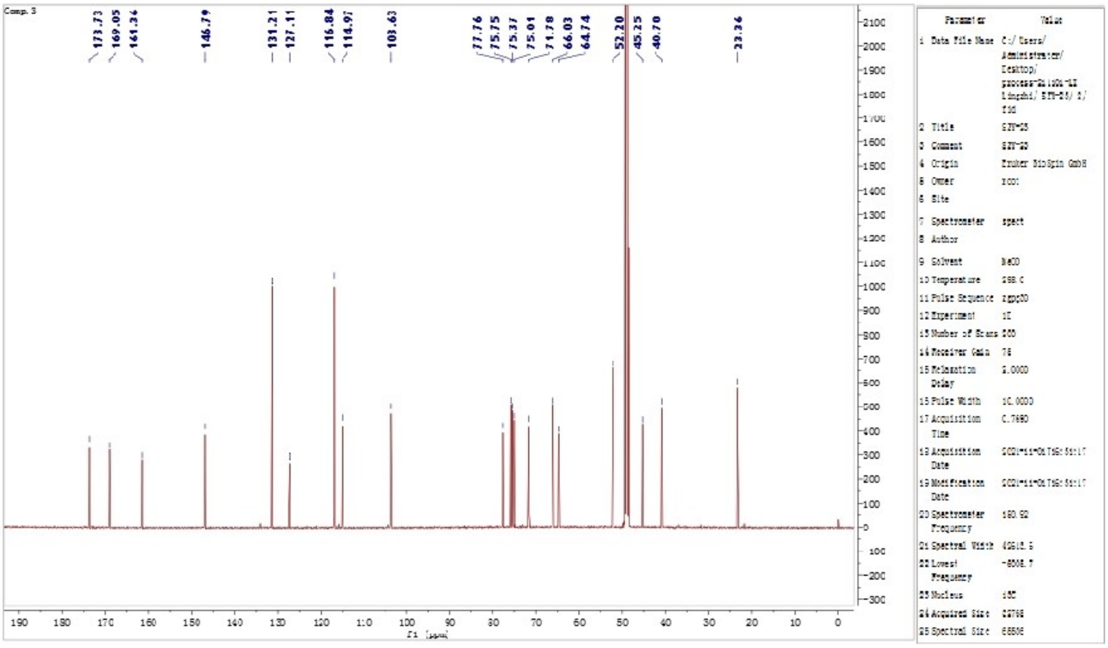

Fig S 19 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **3**.

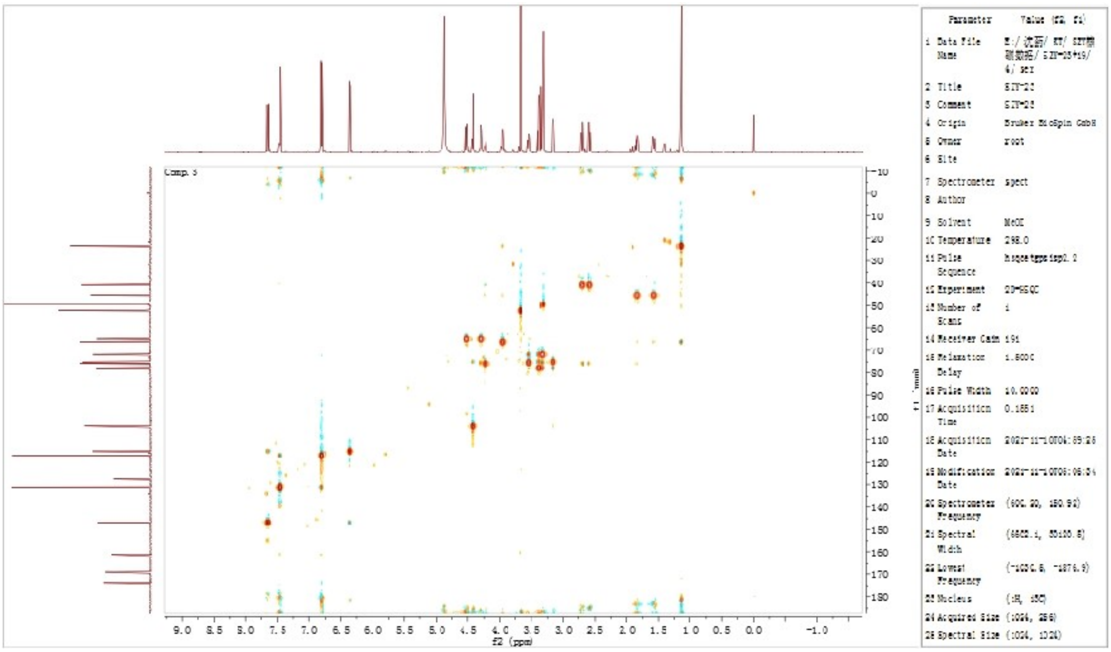

Fig S 20 The HSQC spectrum (600 MHz, Methanol-d_4) of compound **3**.

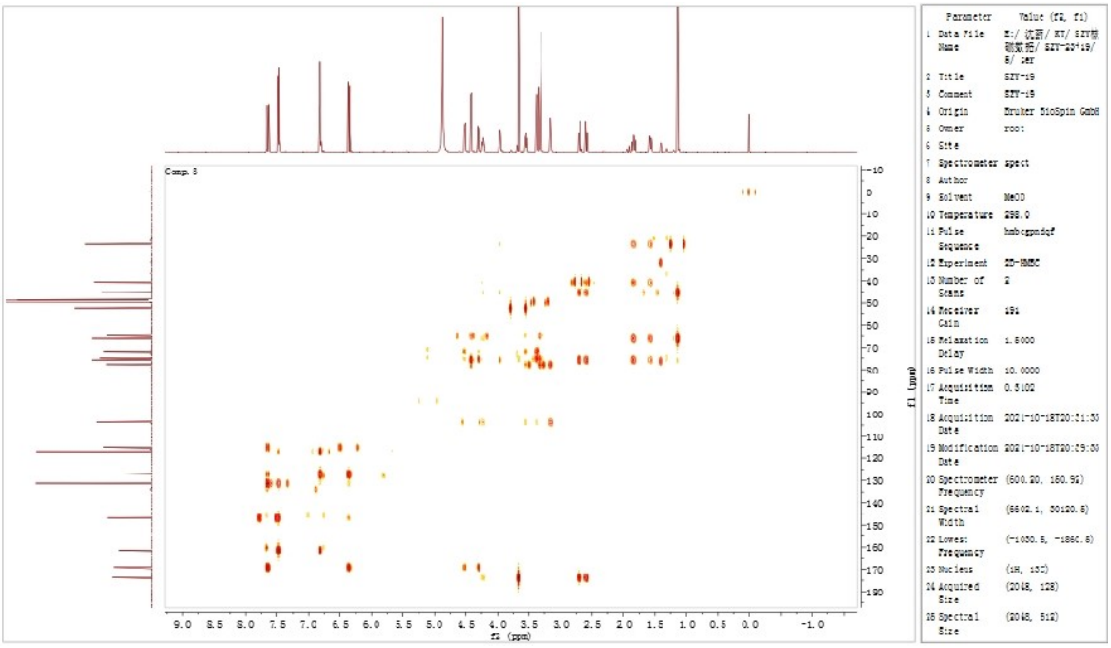

Fig S 21 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **3**.

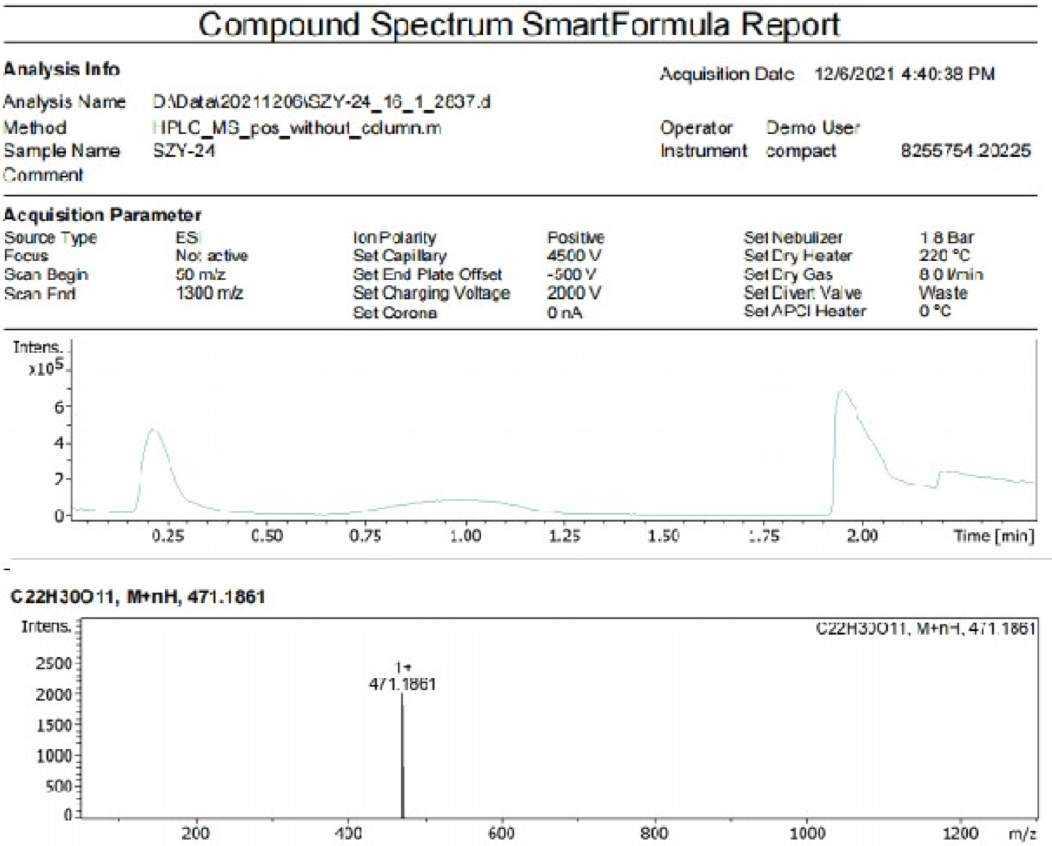

Fig S 22 The HRESIMS spectrum of compound **4**.

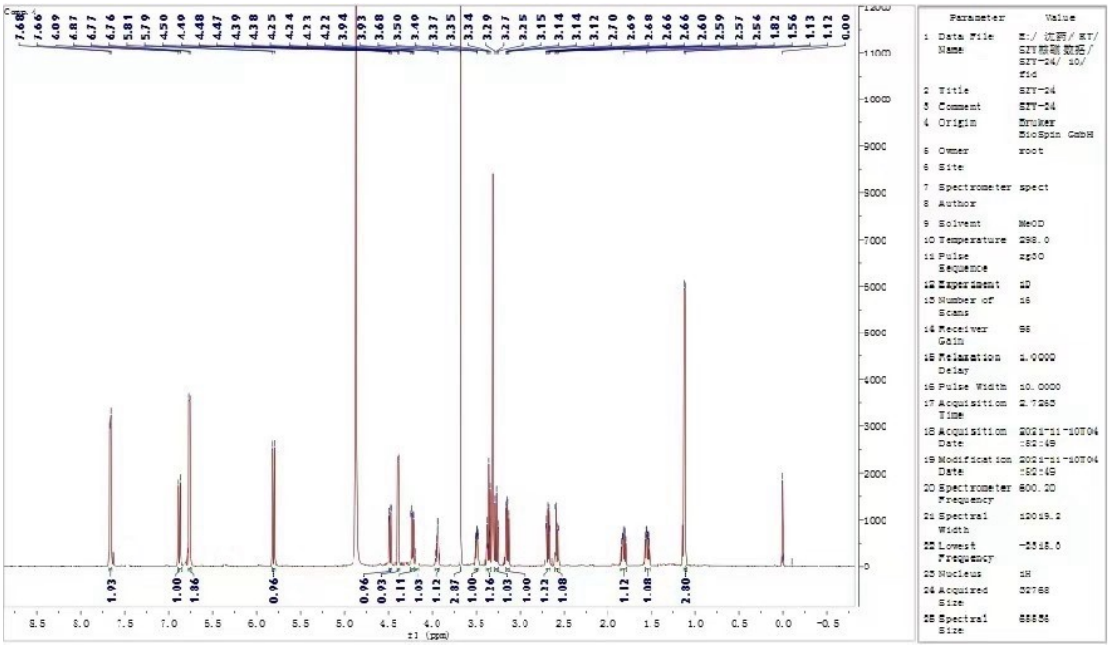

Fig S 23 The [1]H NMR spectrum (600 MHz, Methanol-d_4) of compound **4**.

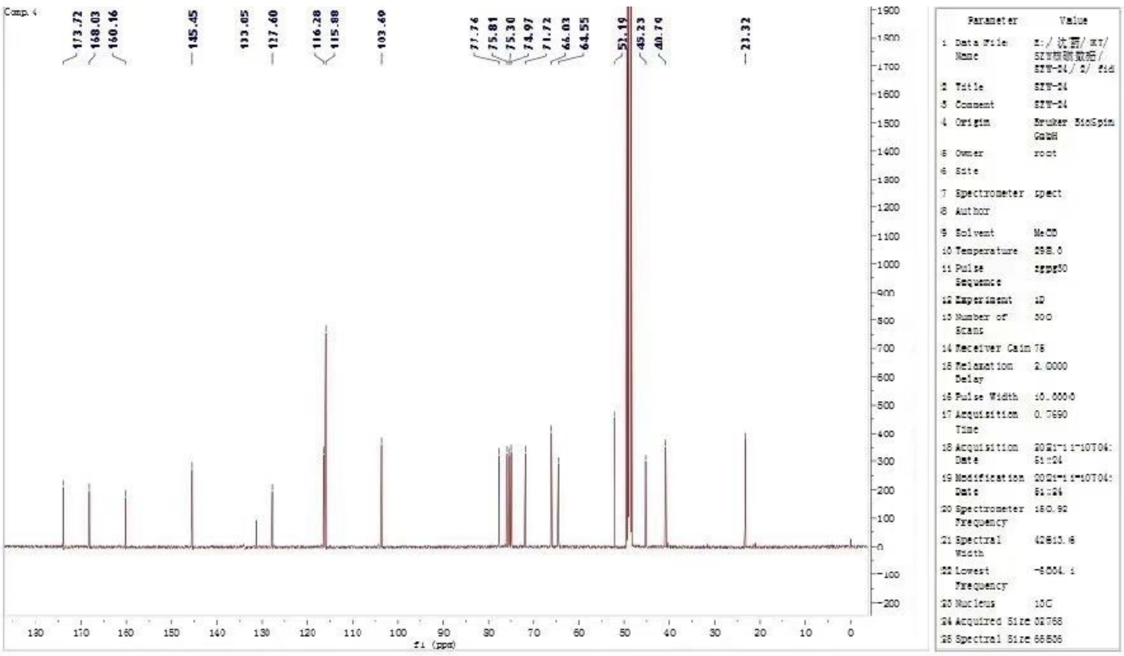

Fig S 24 The [13]C NMR spectrum (150 MHz, Methanol-d_4) of compound **4**.

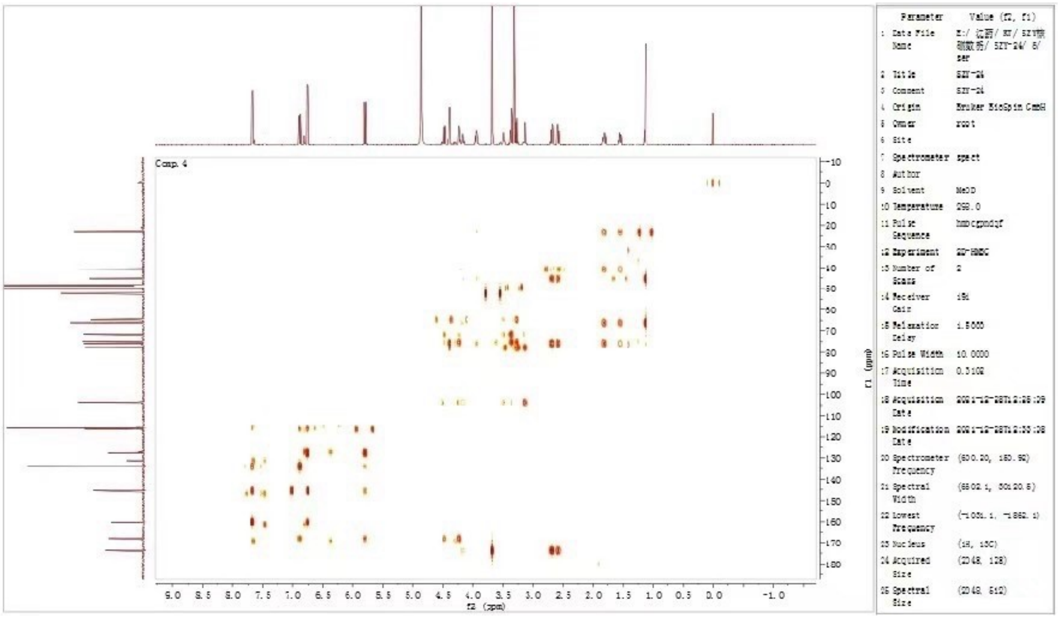

Fig S 25 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **4**.

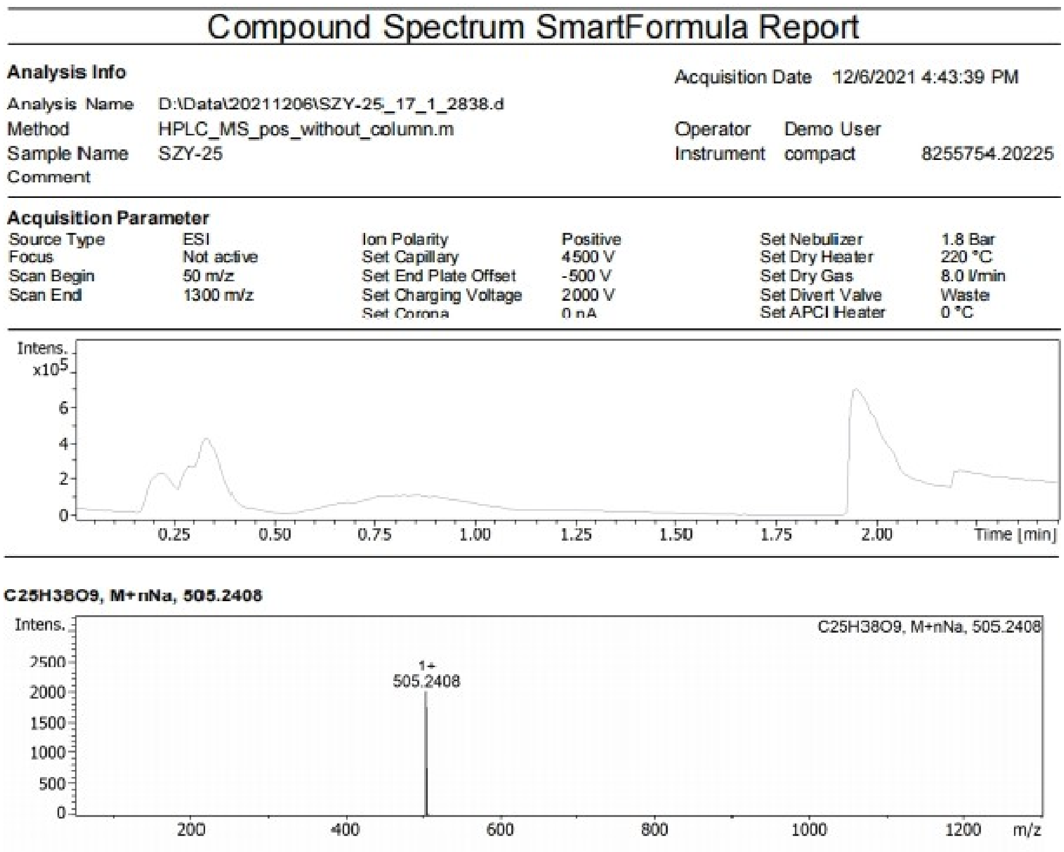

Fig S 26 The HRESIMS spectrum of compound **5**.

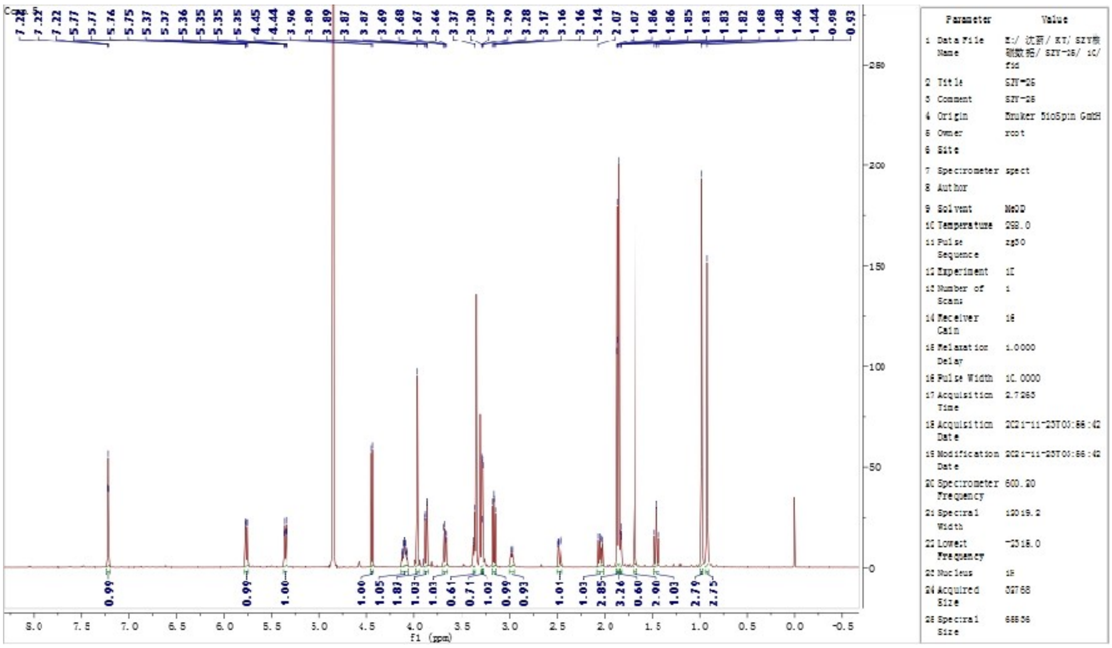

Fig S 27 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **5**.

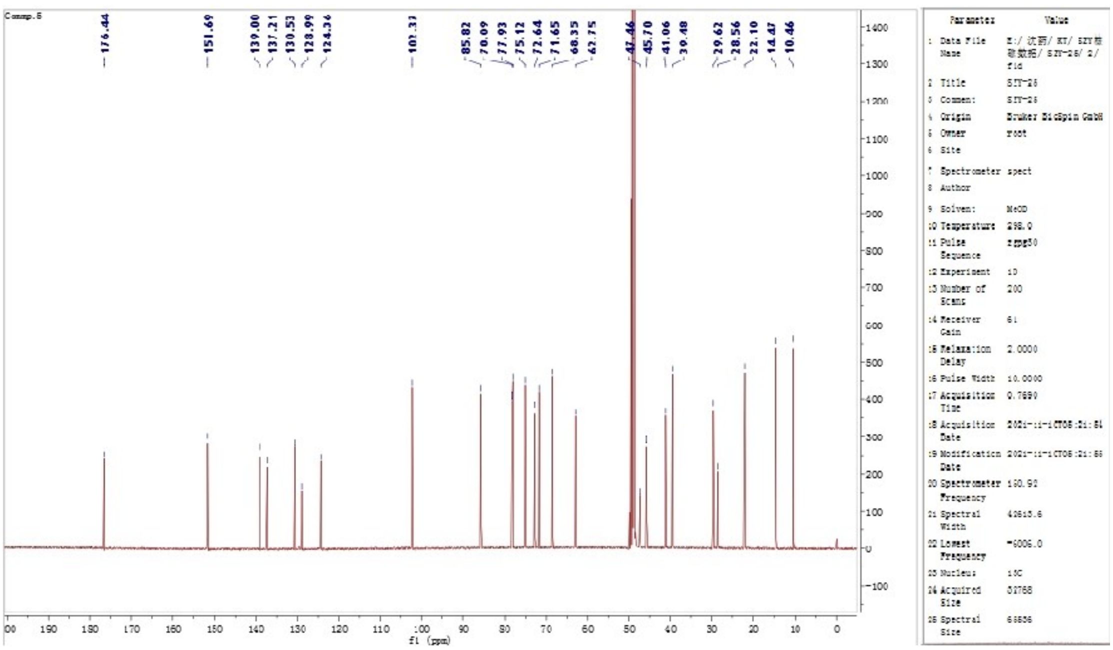

Fig S 28 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **5**.

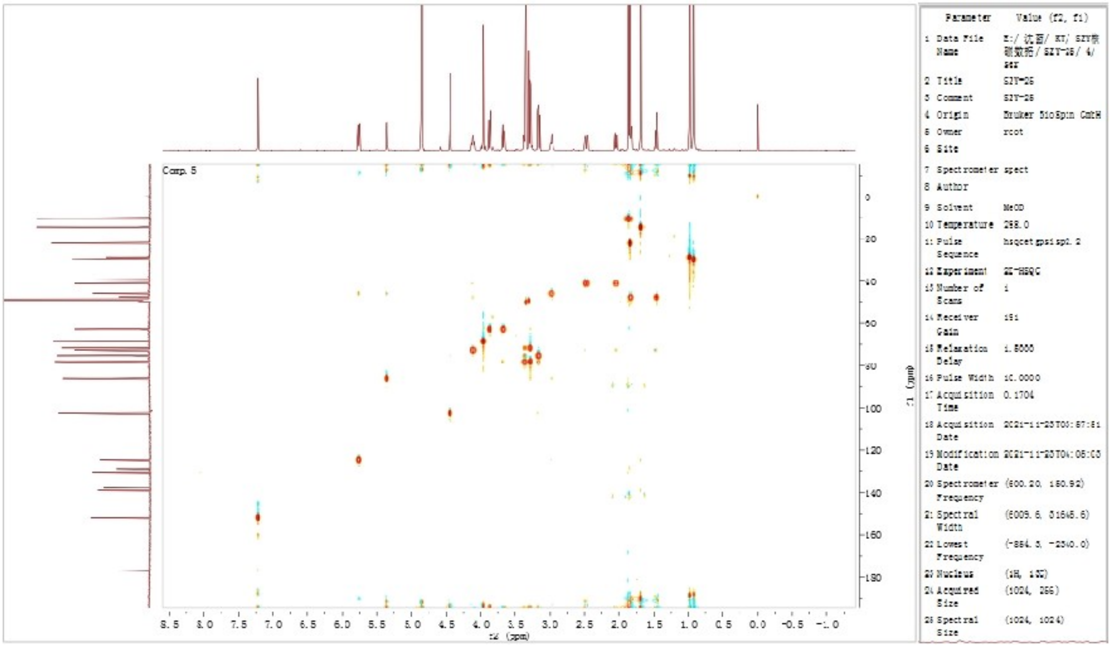

Fig S 29 The HSQC spectrum (600 MHz, Methanol-d_4) of compound **5**.

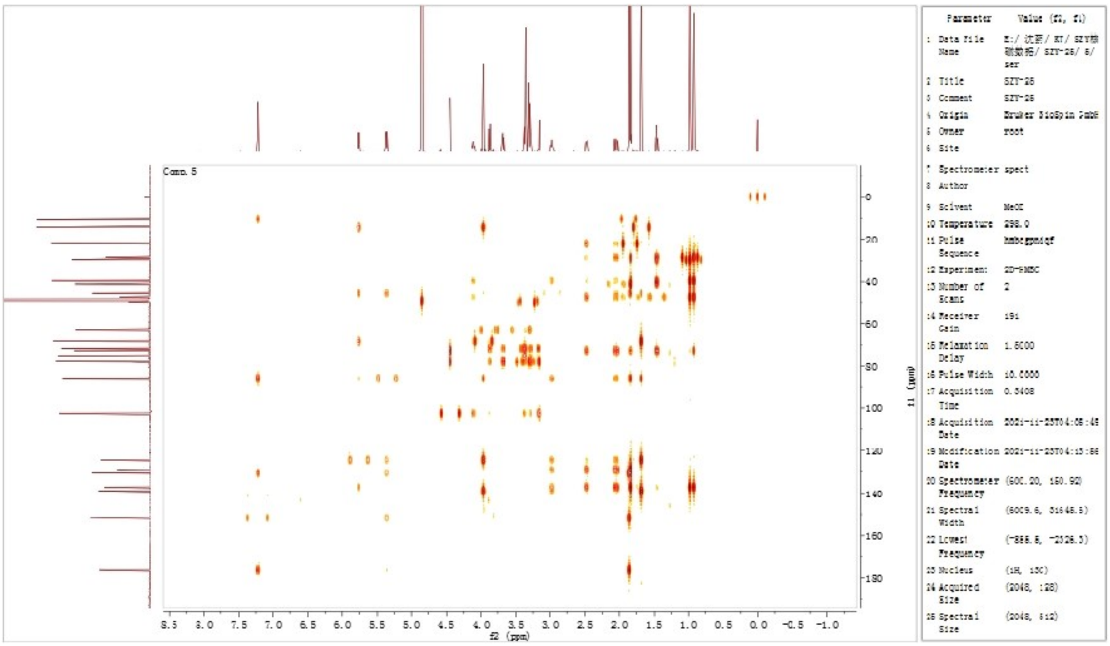

Fig S 30 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **5**.

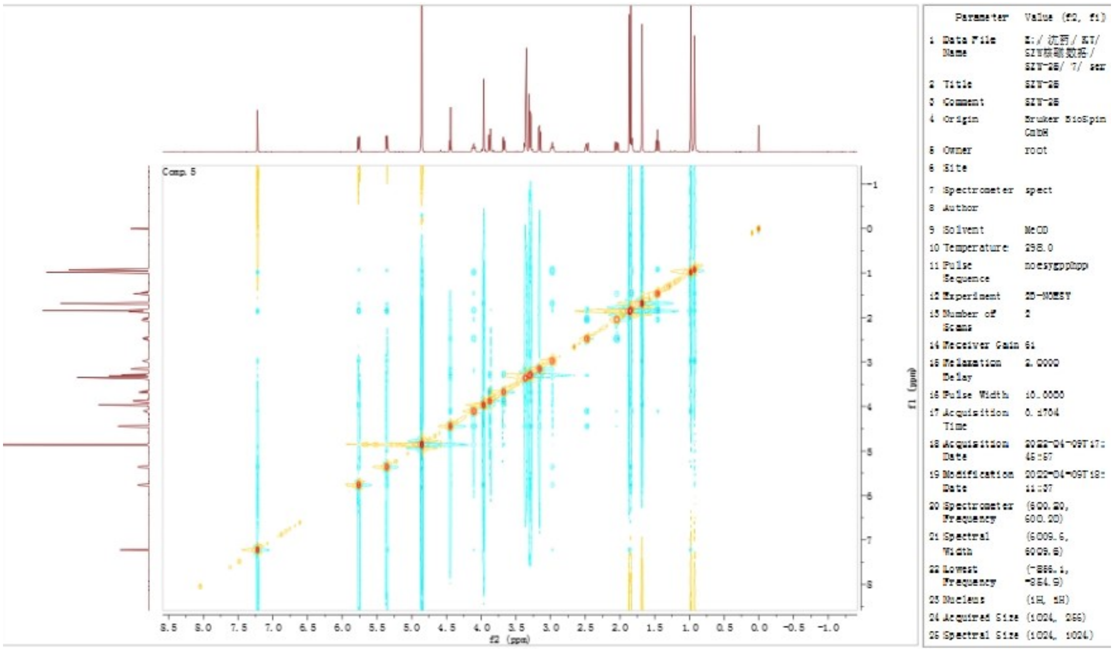

Fig S 31 The NOESY spectrum (600 MHz, Methanol-d_4) of compound **5**.

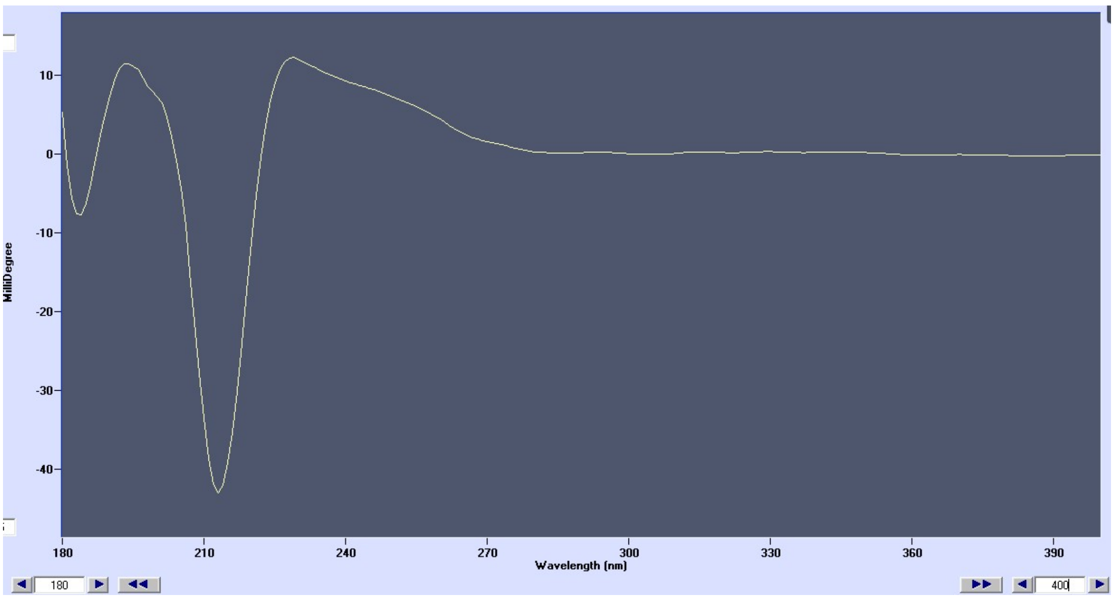

Fig S 32 The CD spectrum (MeOH) of compound **5′**.

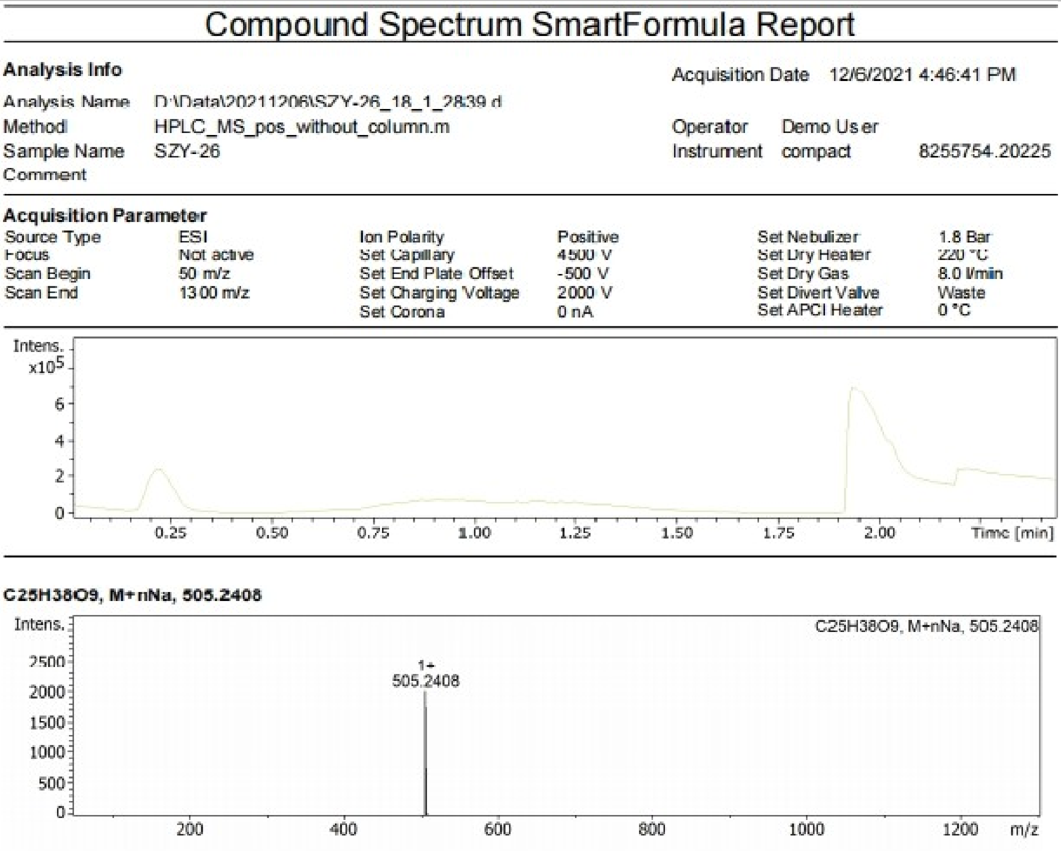

Fig S 33 The HRESIMS spectrum of compound **6**.

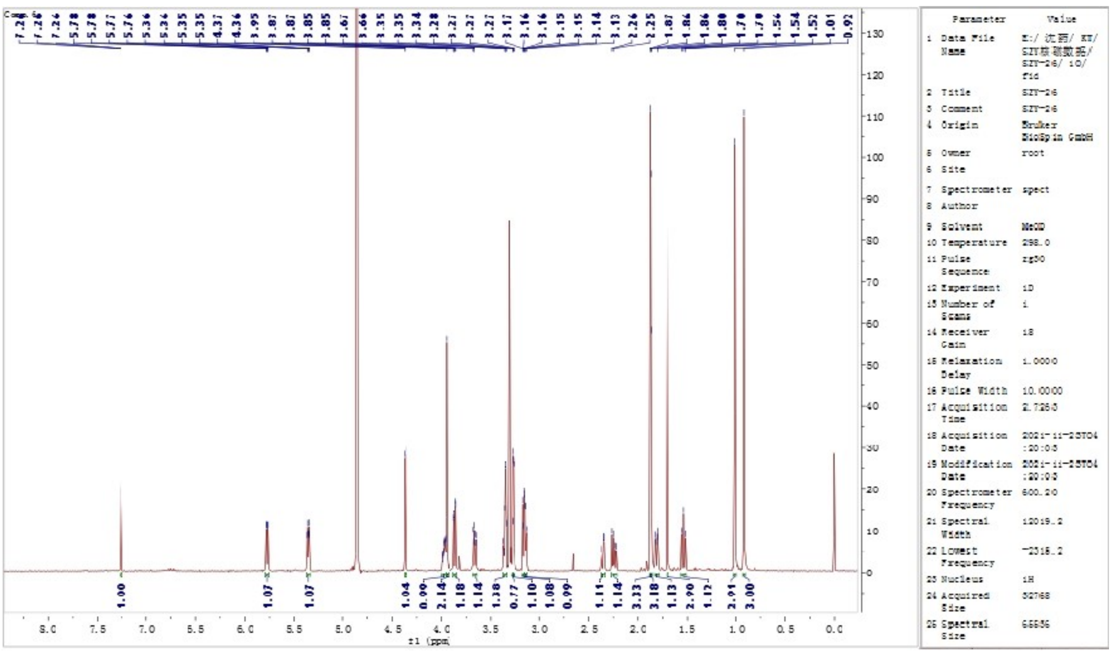

Fig S 34 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **6**.

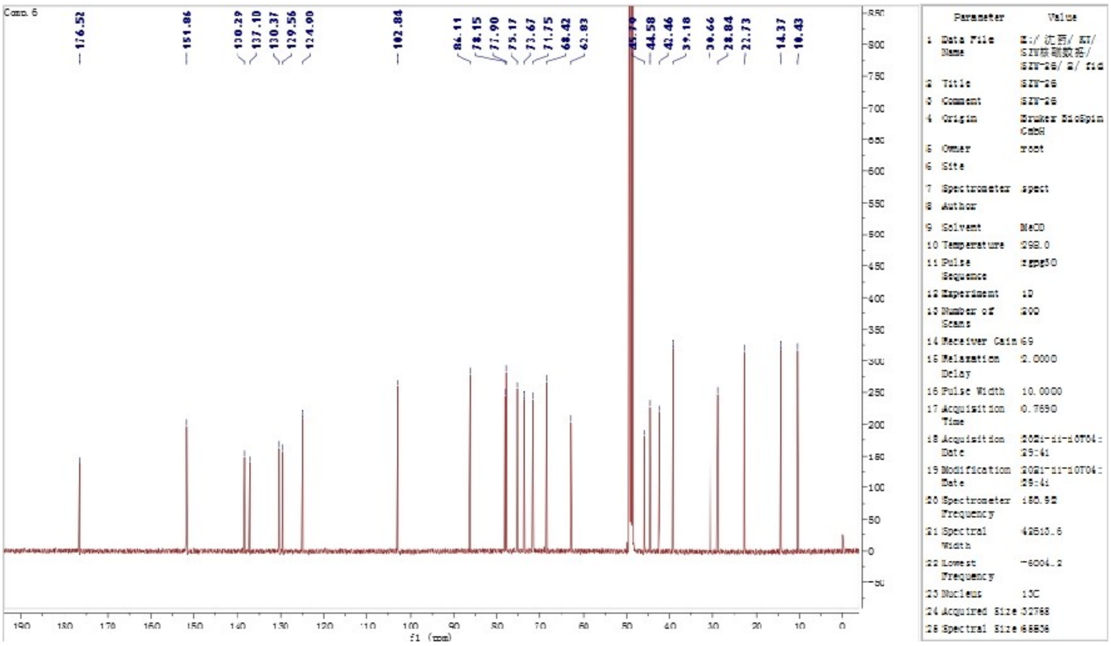

Fig S 35 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **6**.

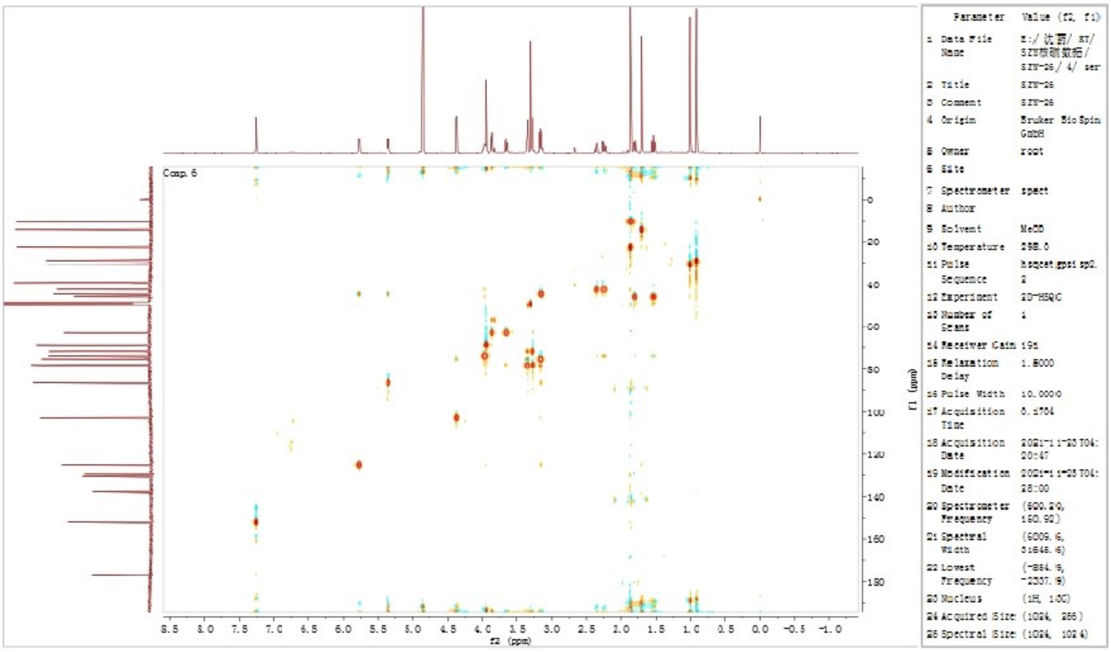

Fig S 36 The HSQC spectrum (600 MHz, Methanol-d_4) of compound **6**.

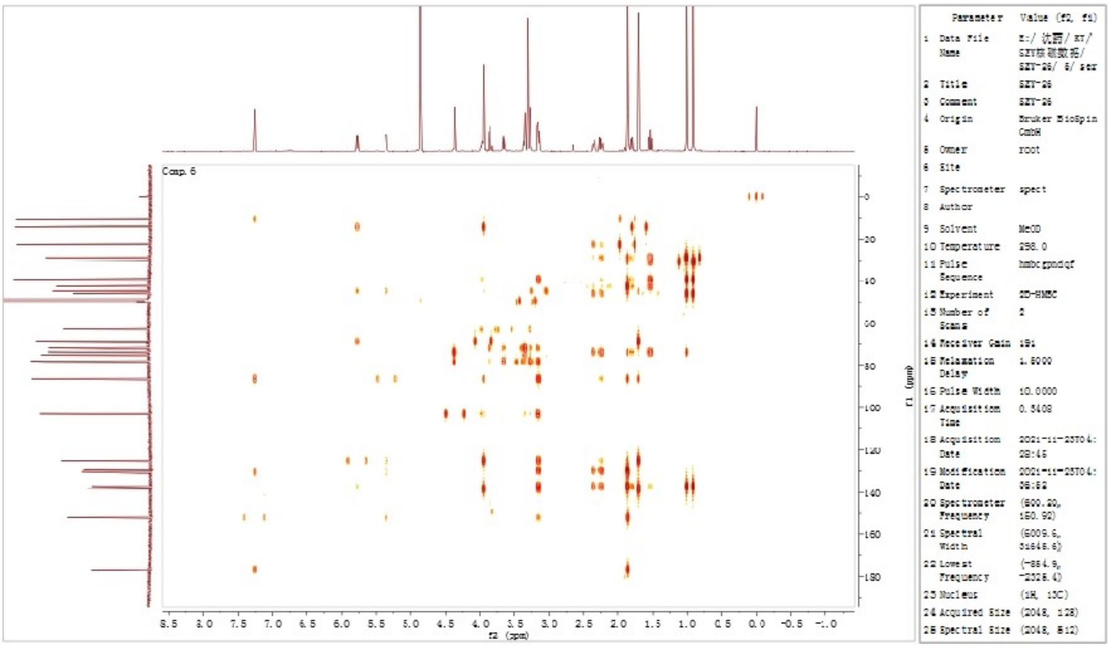

Fig S 37 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **6**.

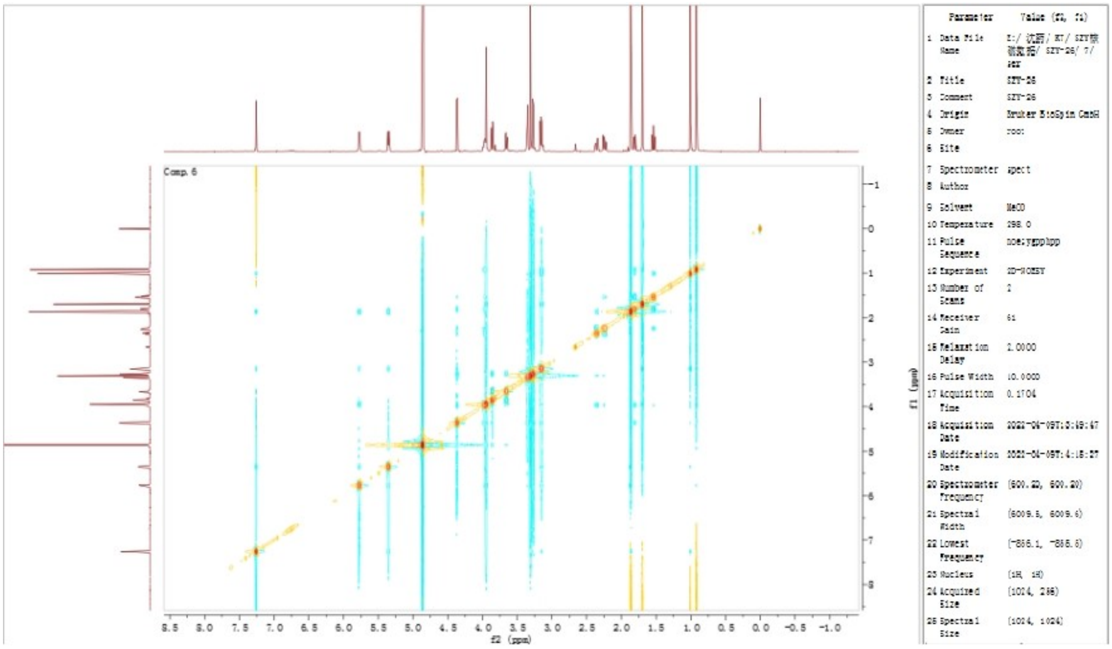

Fig S 38 The NOESY spectrum (600 MHz, Methanol-d_4) of compound **6**.

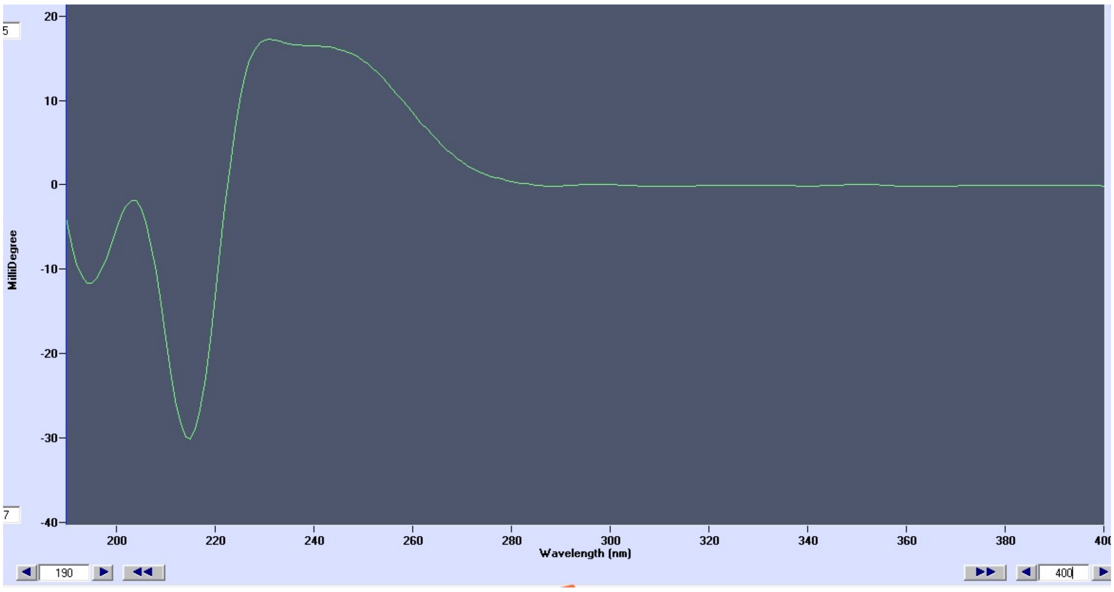

Fig S 39 The CD spectrum (MeOH) of compound **6′**.

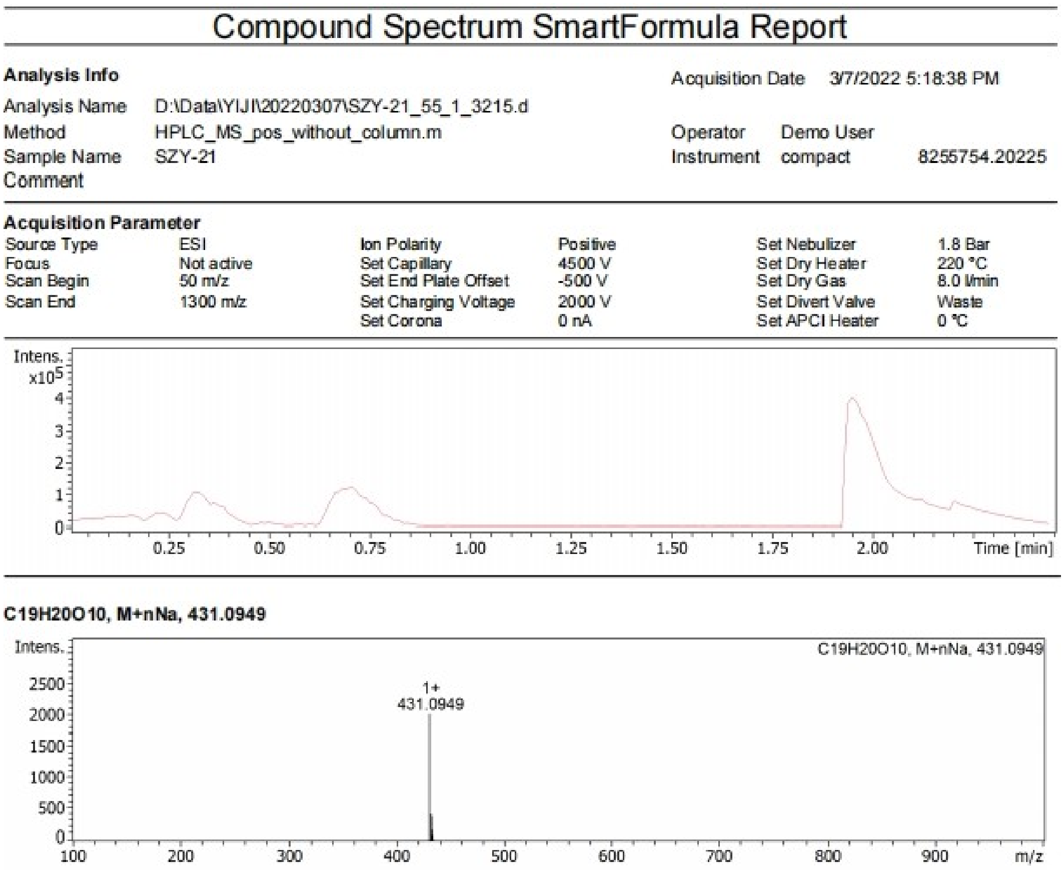

Fig S 40 The HRESIMS spectrum of compound **7**.

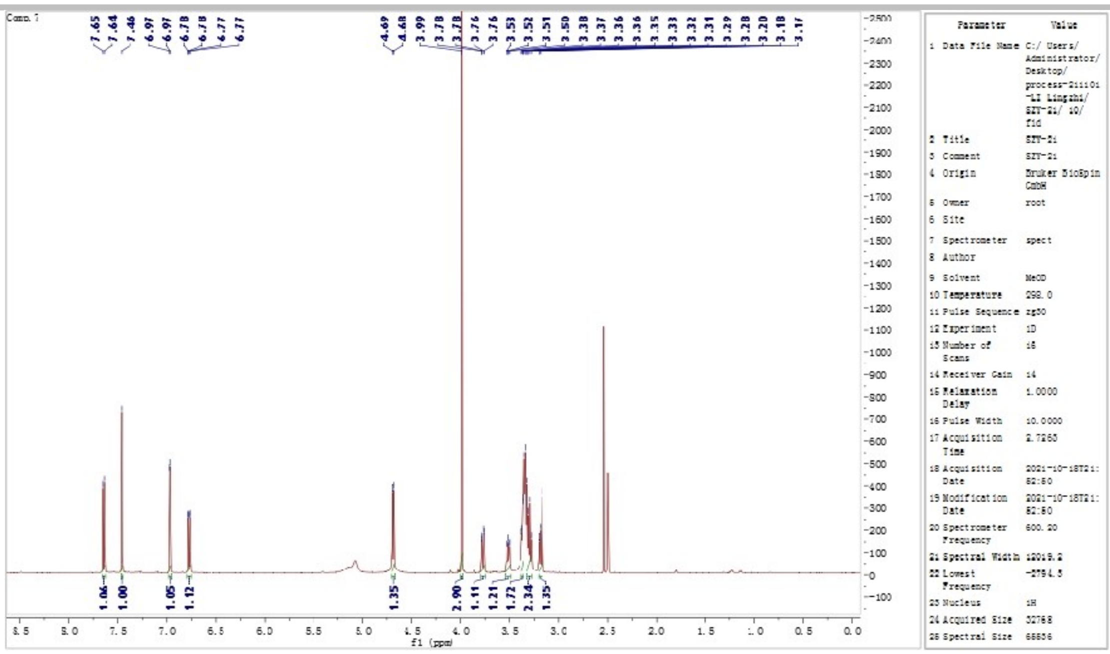

Fig S 41 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **7**.

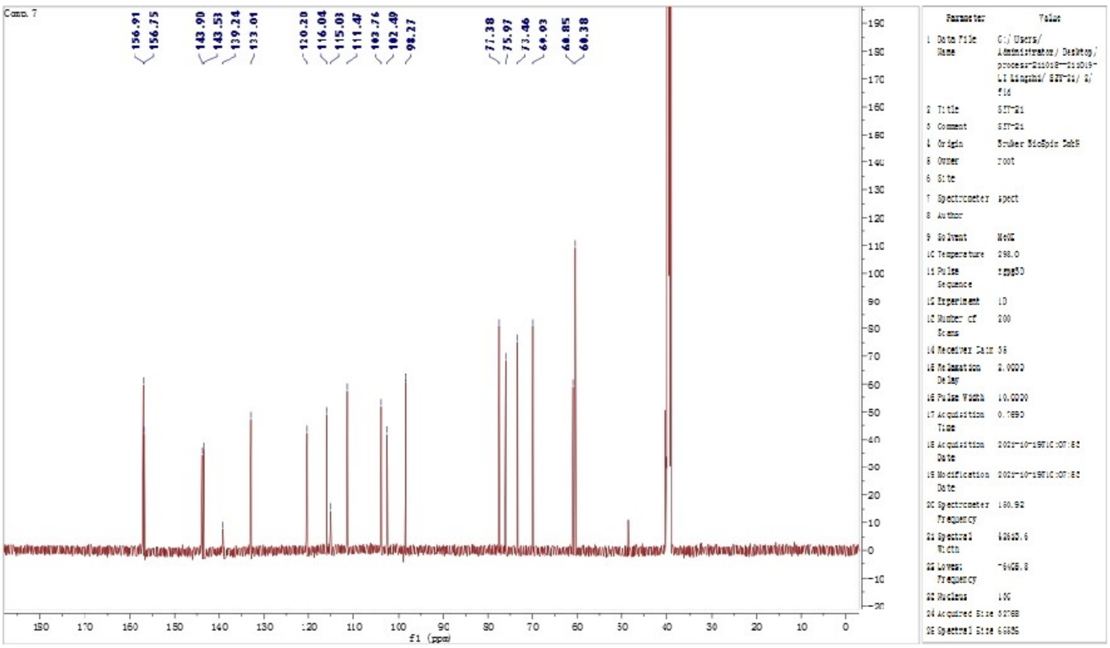

Fig S 42 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **7**.

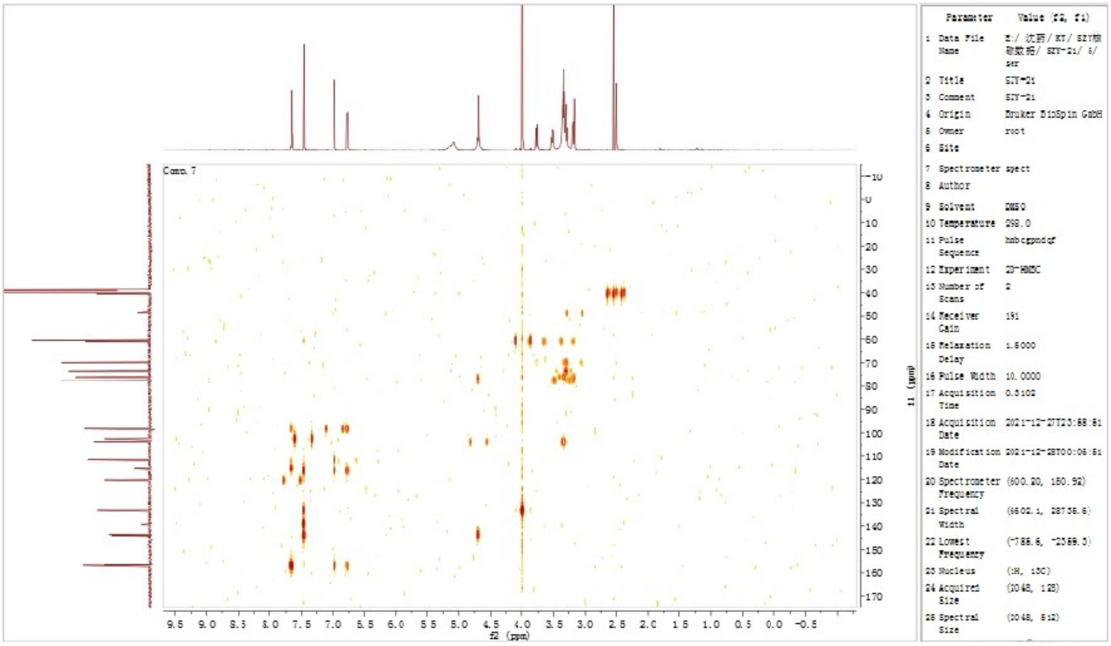

Fig S 43 The HMBC spectrum (600 MHz, DMSO-d_6) of compound **7**.

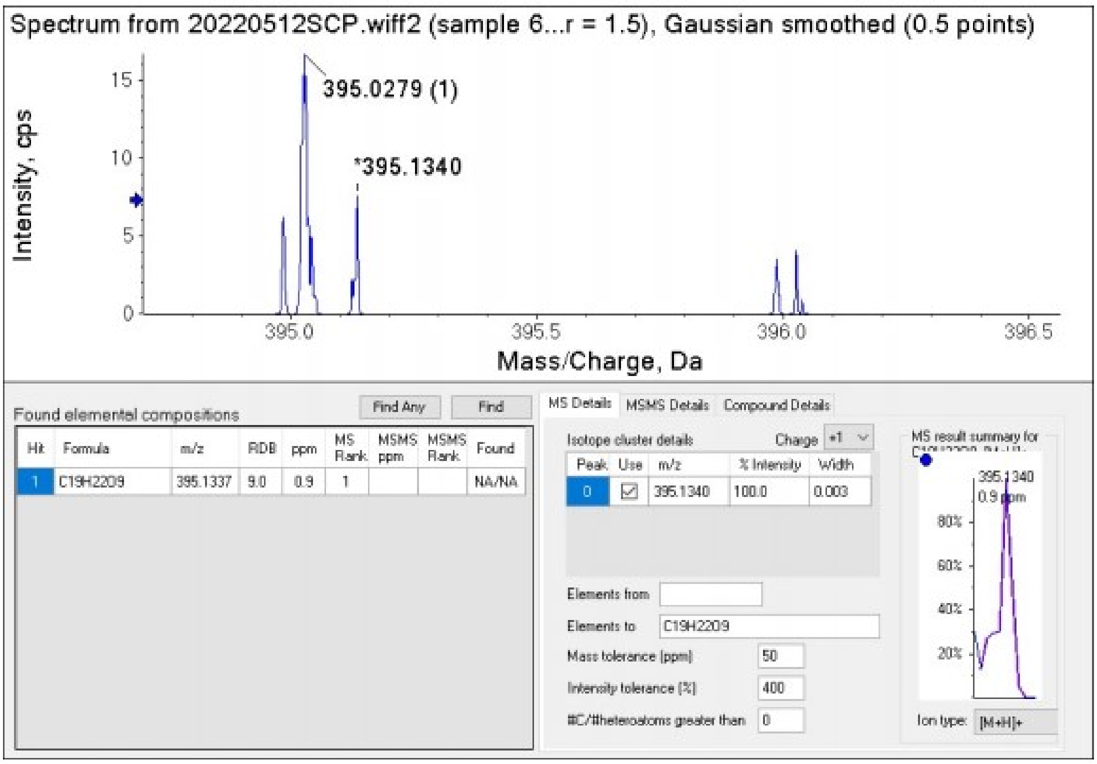

Fig S 44 The HRESIMS spectrum of compound **8**.

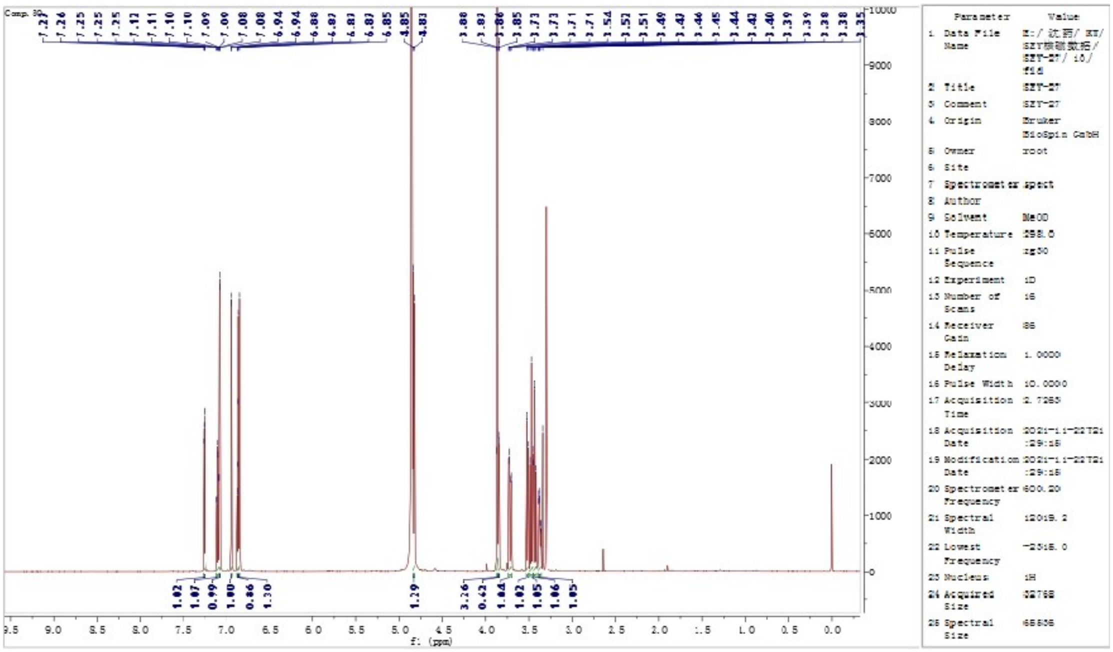

Fig S 45 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **8**.

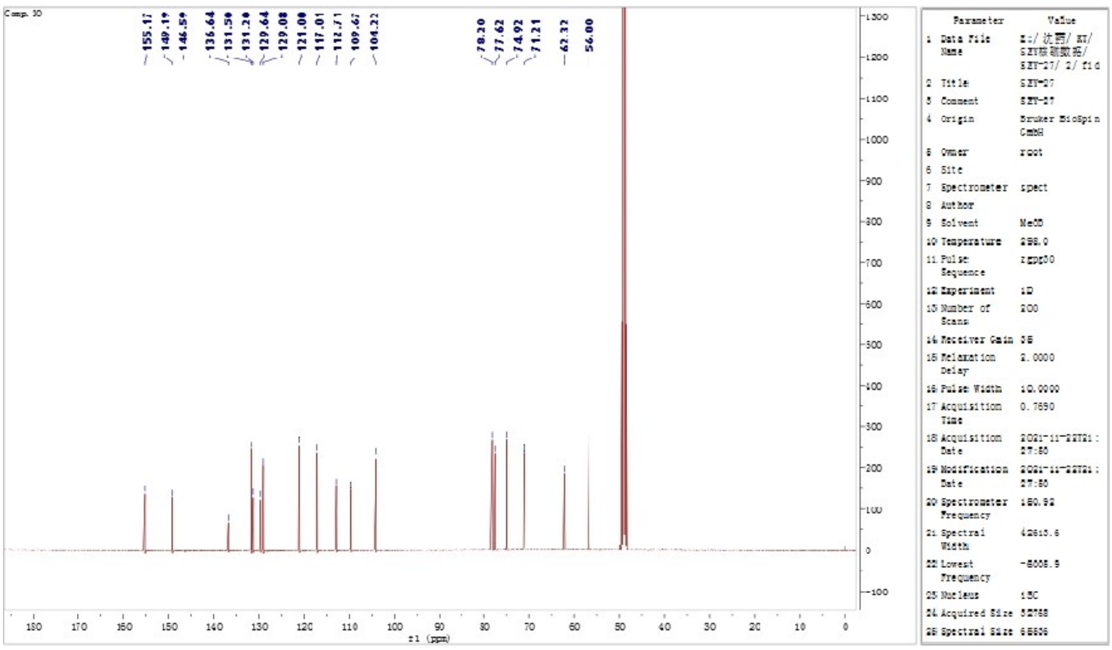

Fig S 46 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **8**.

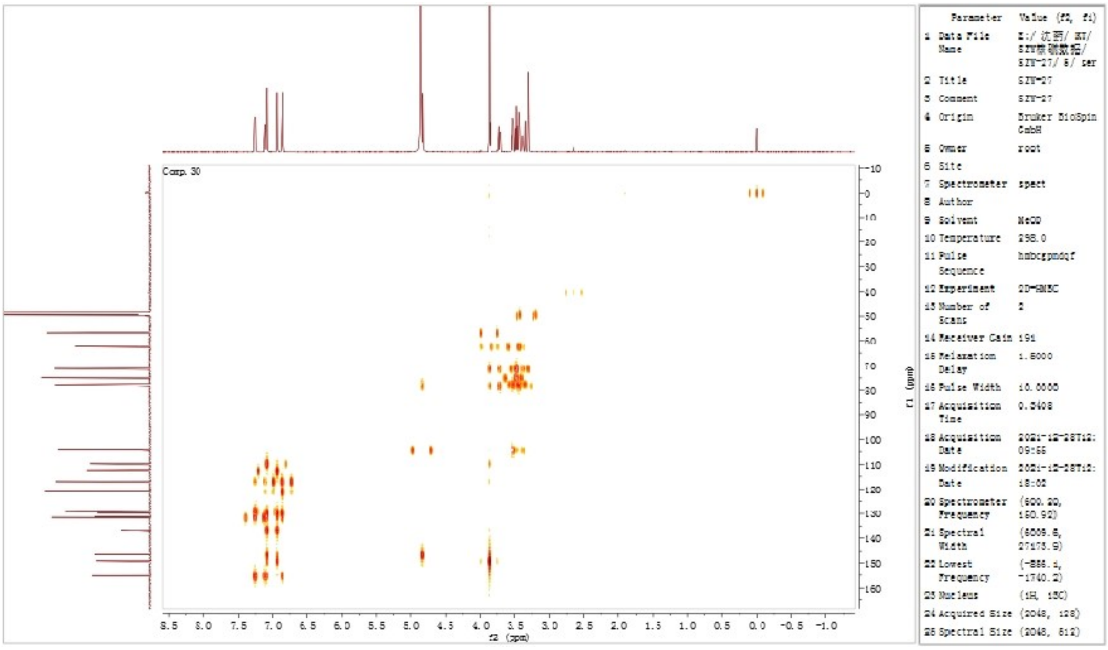

Fig S 47 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **8**.

Compound Spectrum SmartFormula Report

Analysis Info

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Sample Name	SZY-31	Instrument	compact 8255754.20225
Comment			

Acquisition Parameter

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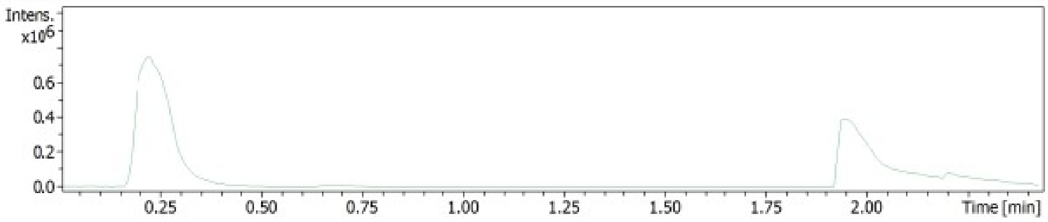


C21H36O11, M+nNa, 487.2150

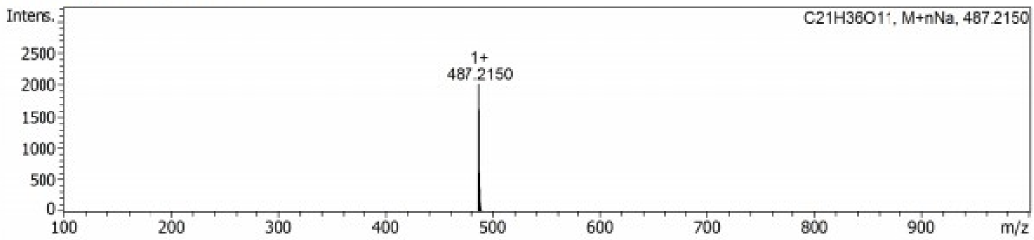


Fig S 48 The HRESIMS spectrum of compound **9**.

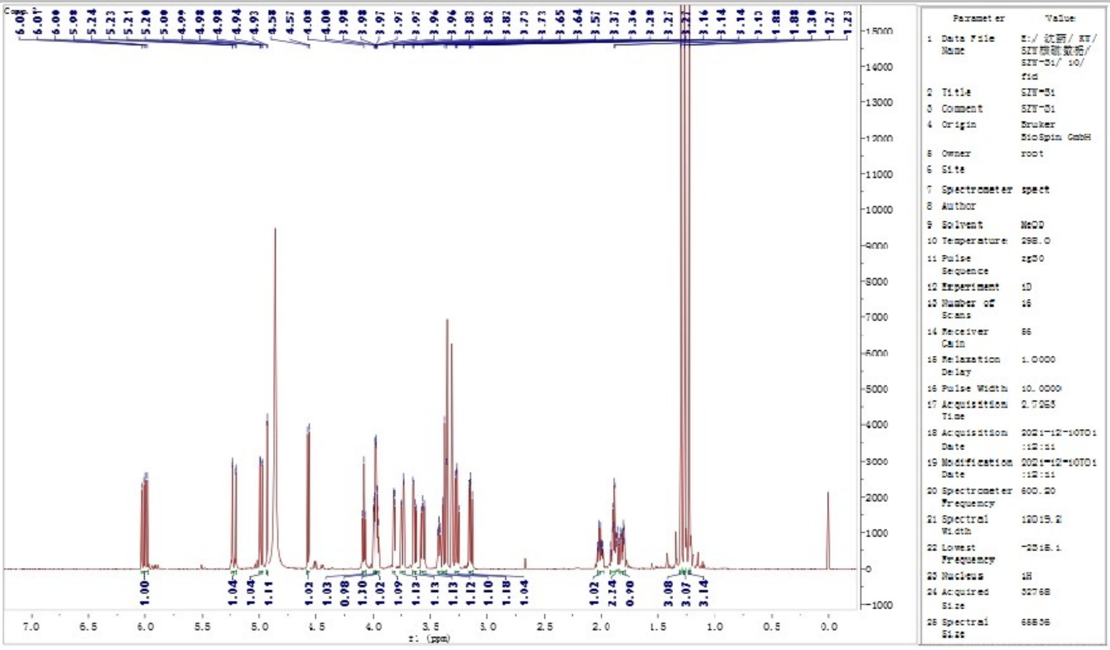


Fig S 49 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **9**.

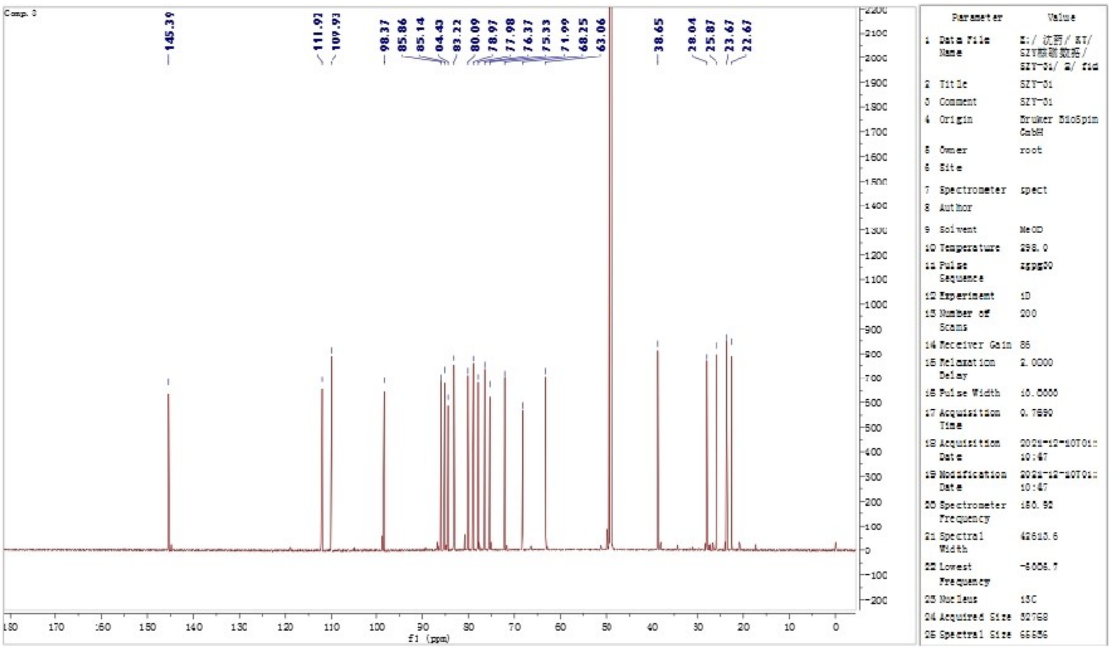


Fig S 50 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **9**.

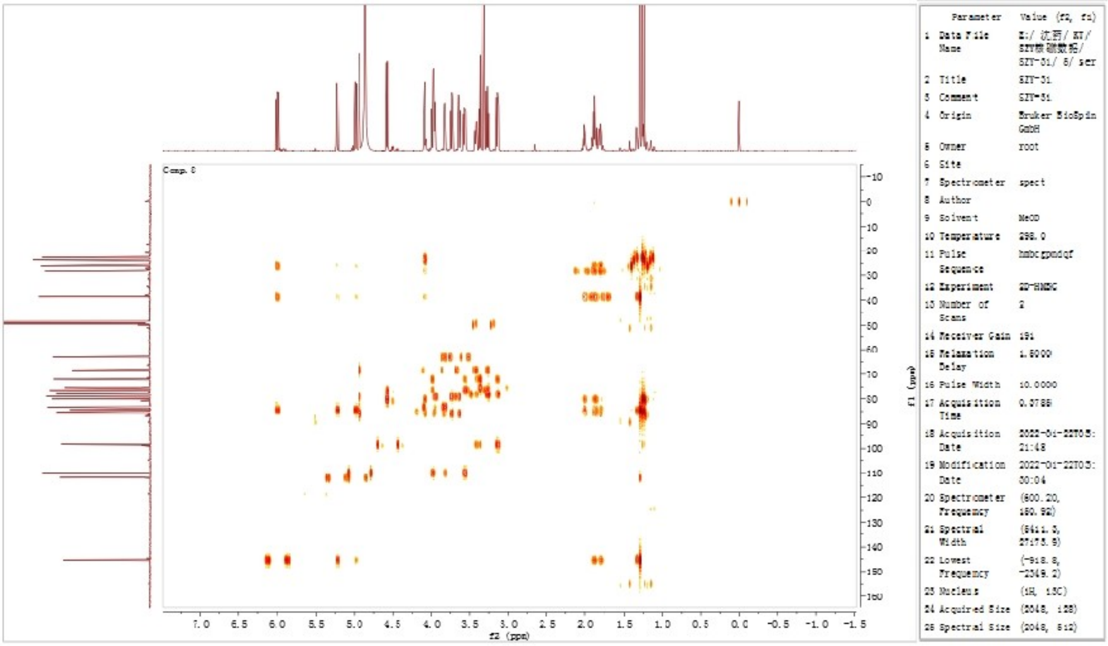


Fig S 51 The HMBC spectrum (600 MHz, Methanol-d_4) of compound **9**.

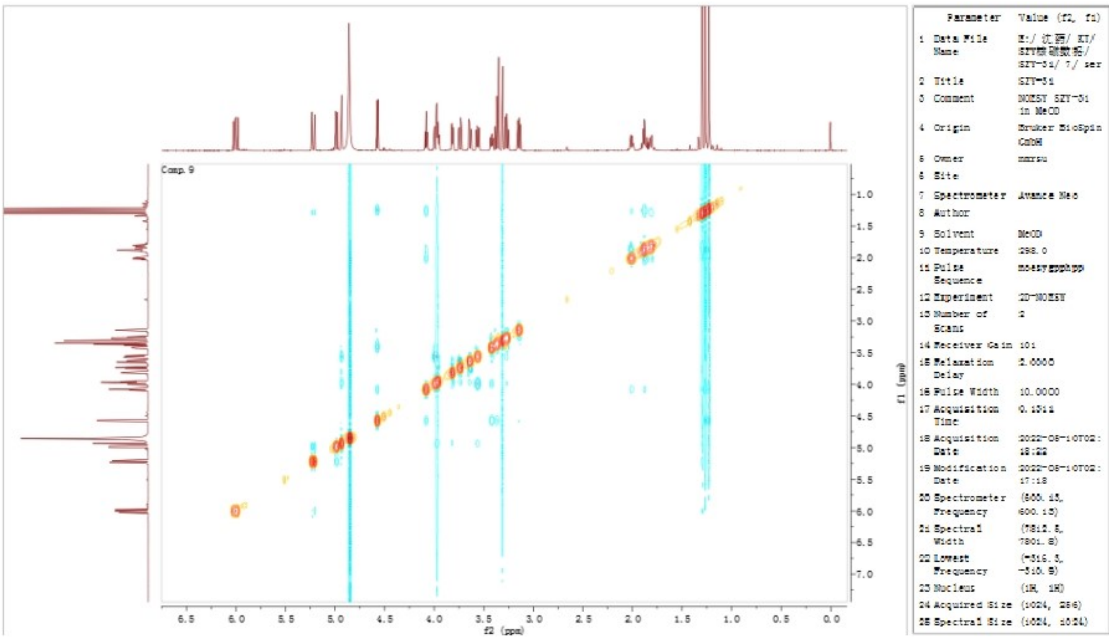


Fig S 52 The NOESY spectrum (600 MHz, Methanol-d_4) of compound **9**.

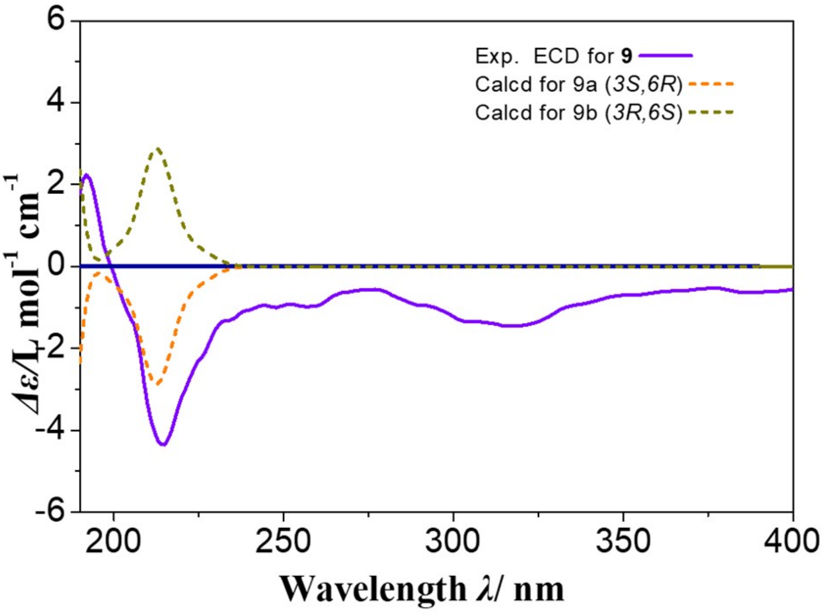


Fig S 53 The CD spectrum (MeOH) of compound **9**.

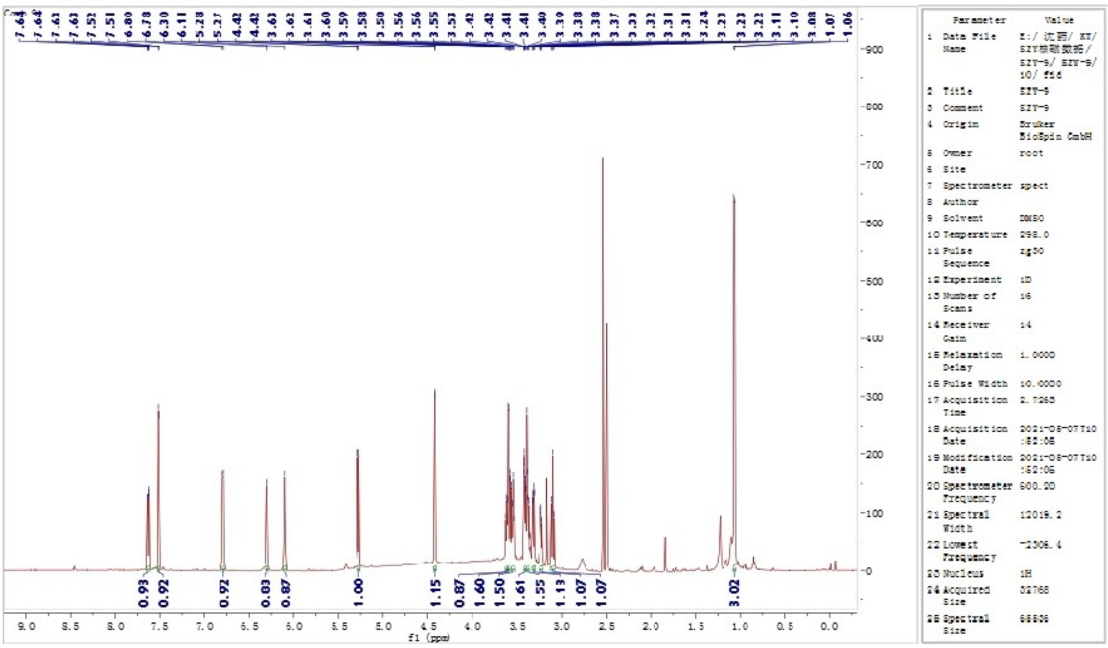


Fig S 54 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **10**.

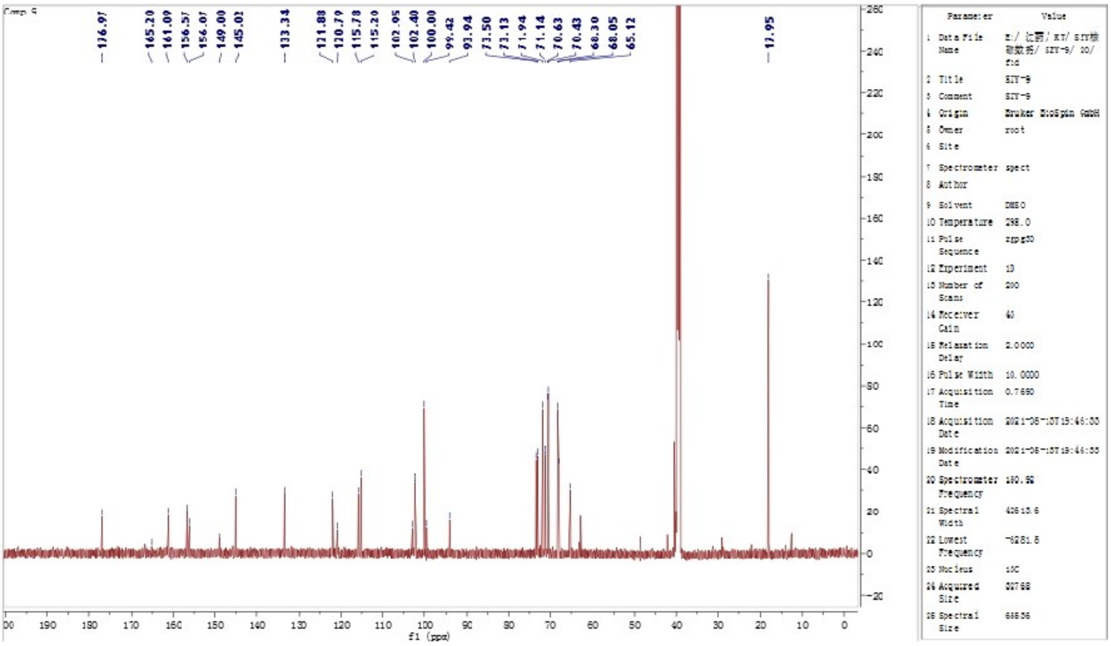


Fig S 55 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **10**.

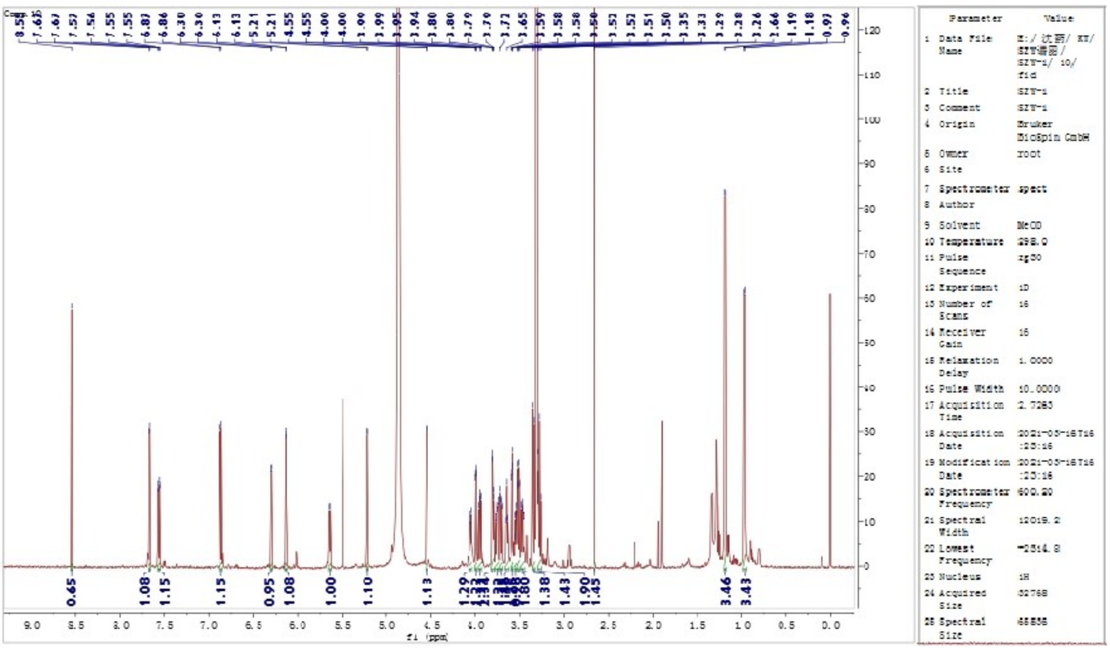


Fig S 56 The ^{1}H NMR spectrum (600 MHz, Methanol-d_4) of compound **11**.

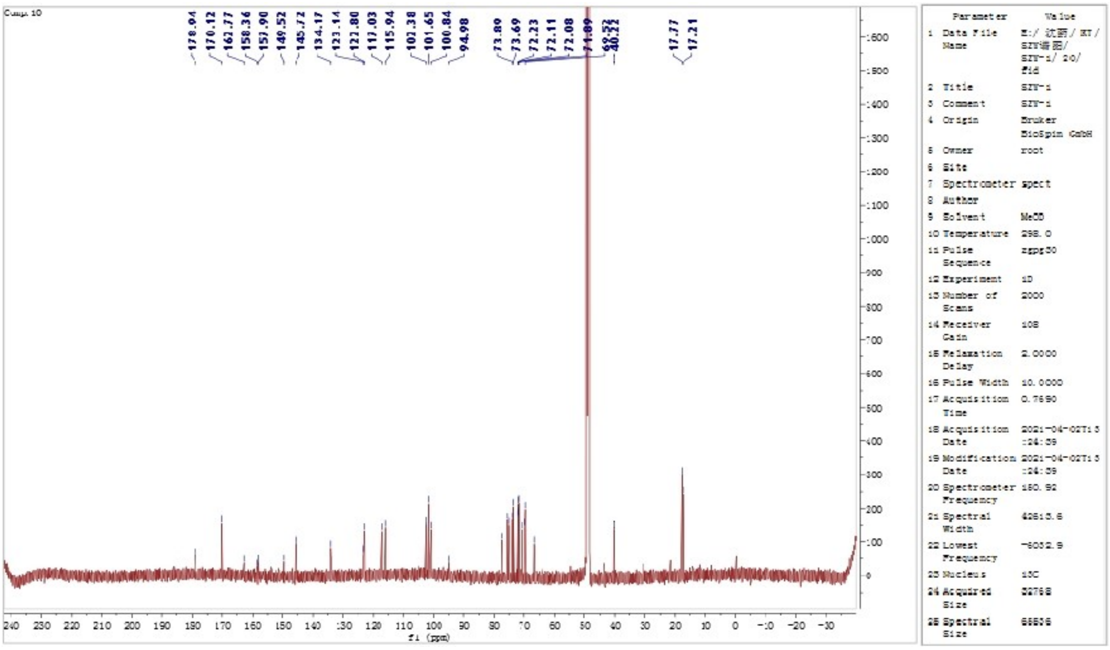


Fig S 57 The ^{13}C NMR spectrum (150 MHz, Methanol-d_4) of compound **11**.

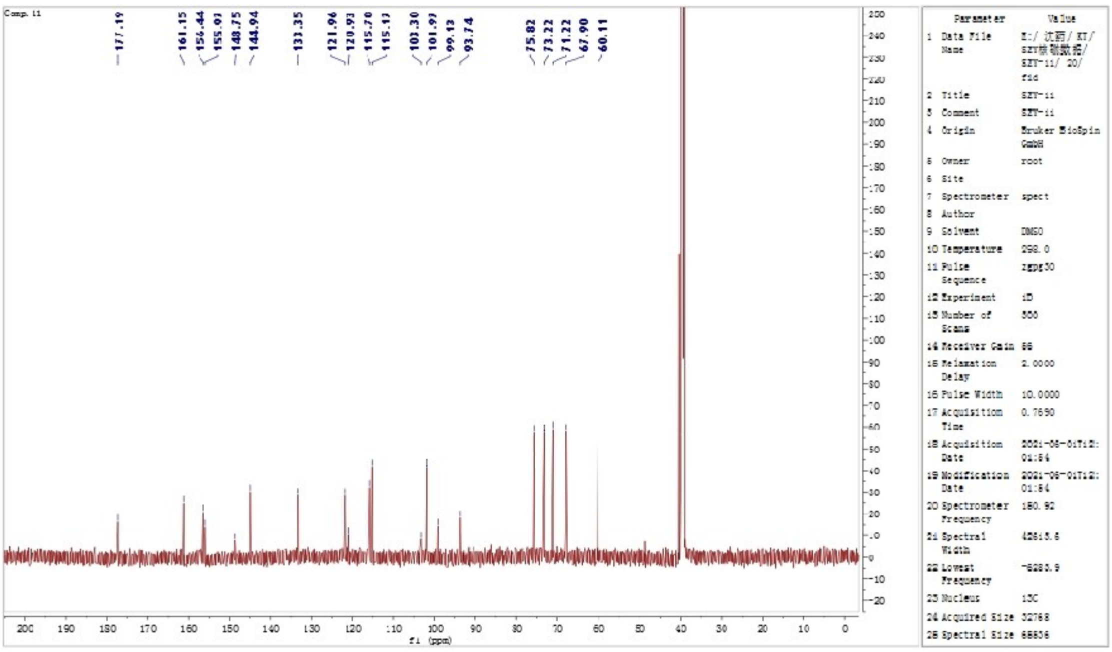


Fig S 58 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **12**.

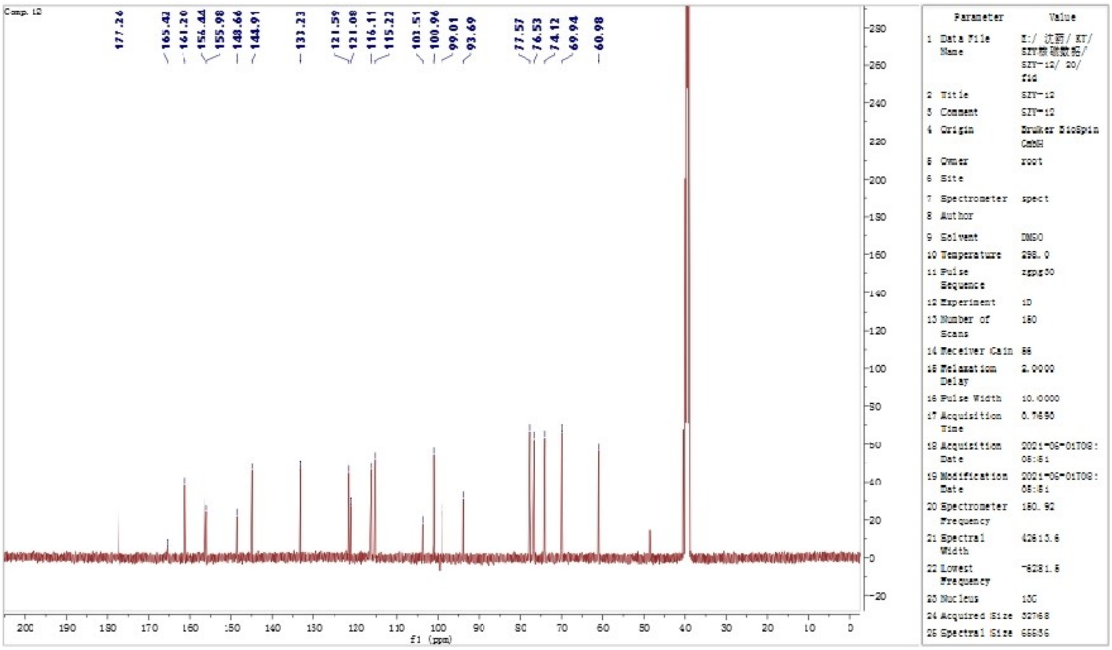


Fig S 59 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **13**.

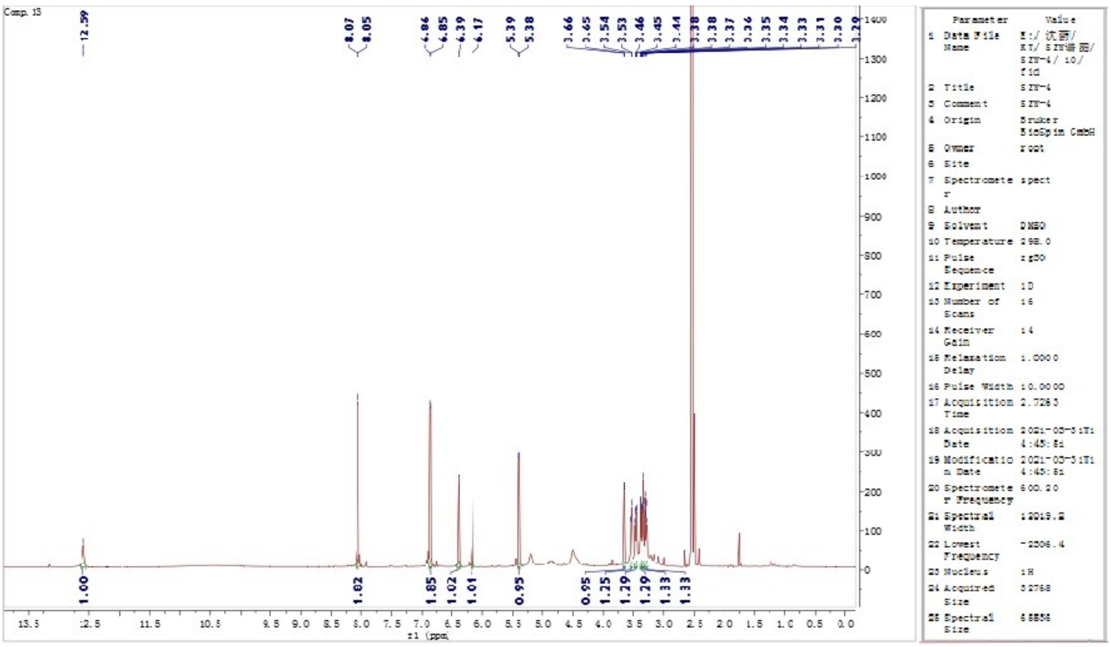


Fig S 60 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **14**.

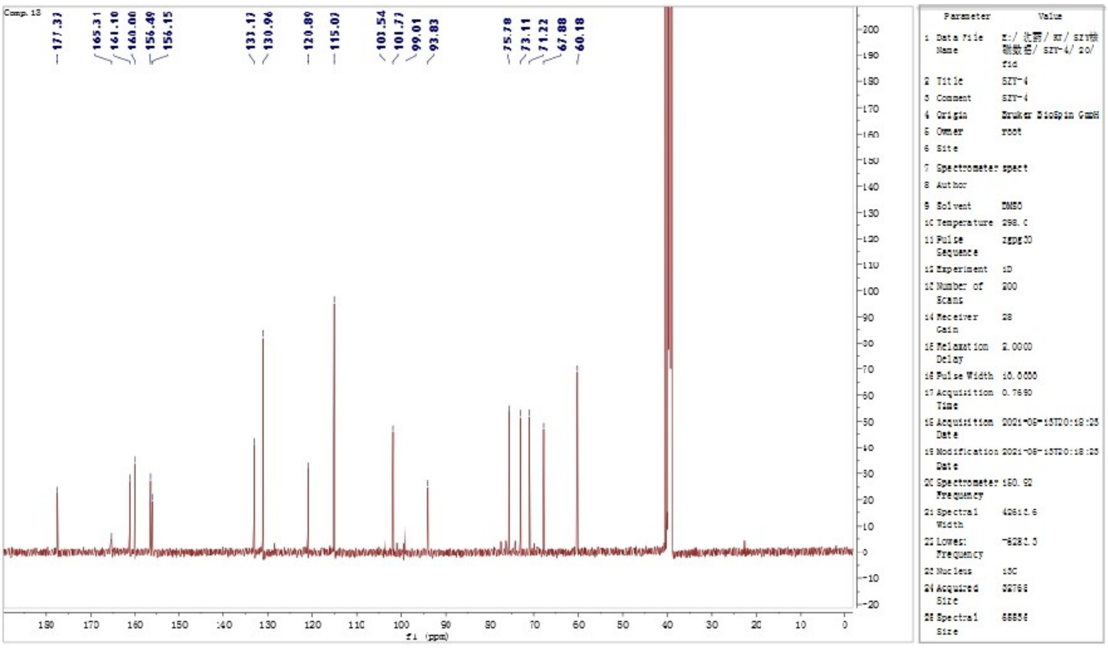


Fig S 61 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **14**.

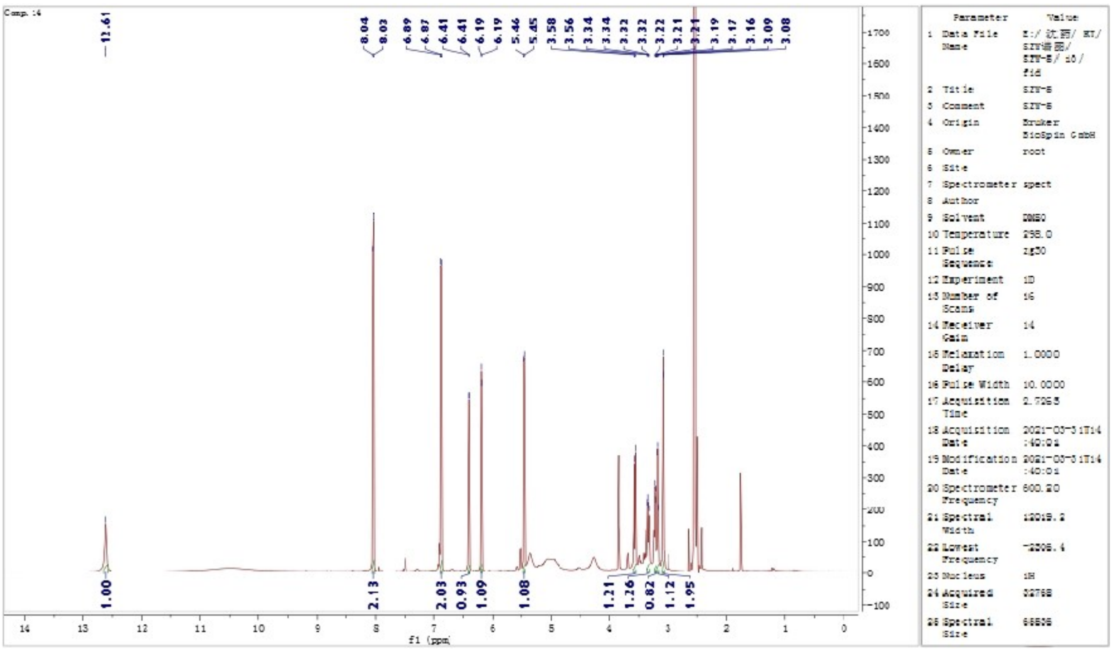


Fig S 62 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **15**.

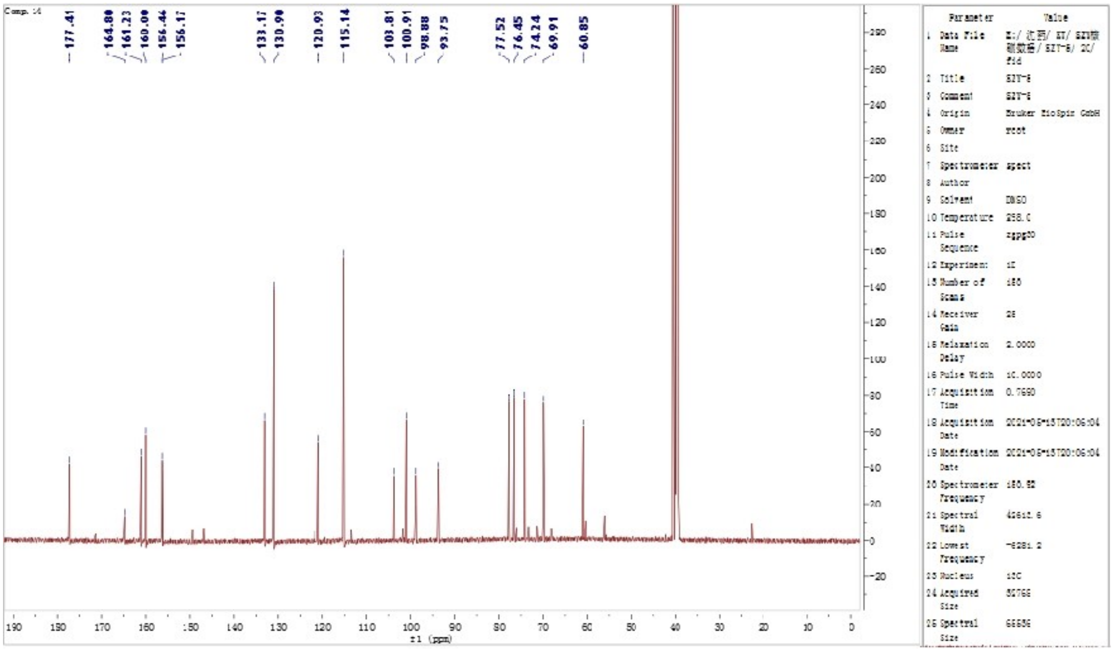


Fig S 63 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **15**.

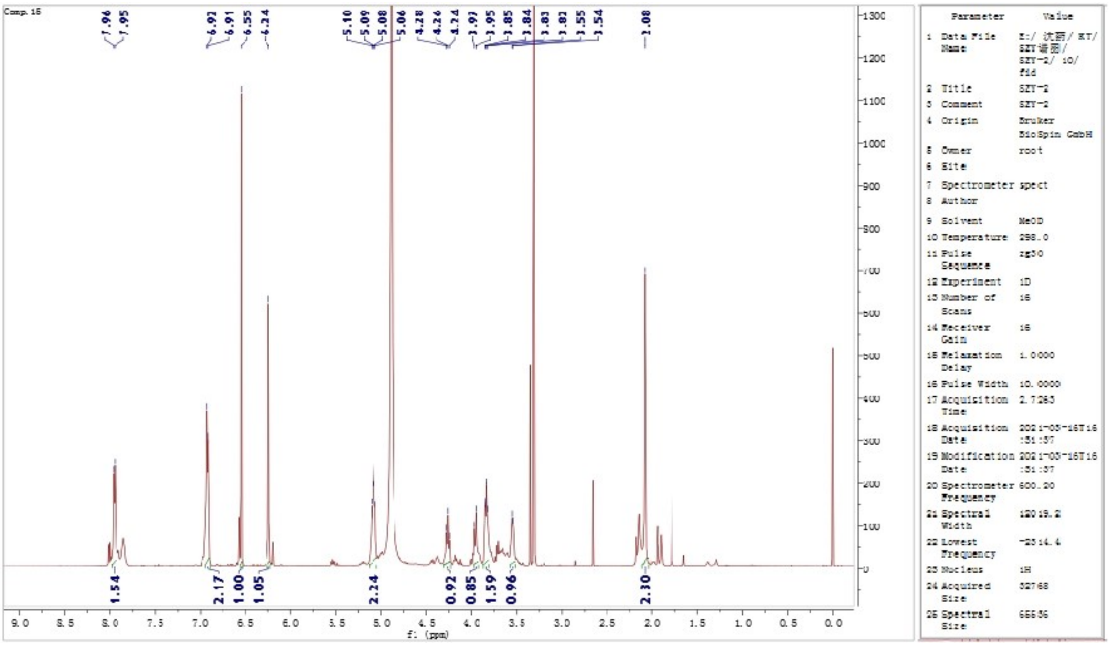


Fig S 64 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **16**.

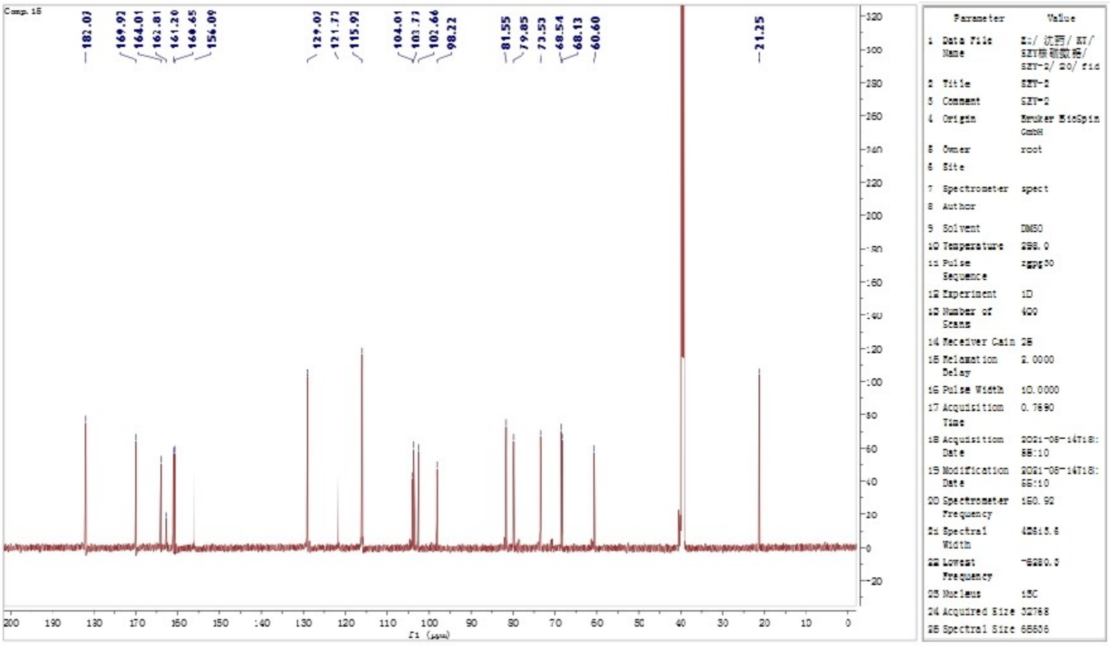


Fig S 65 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **16**.

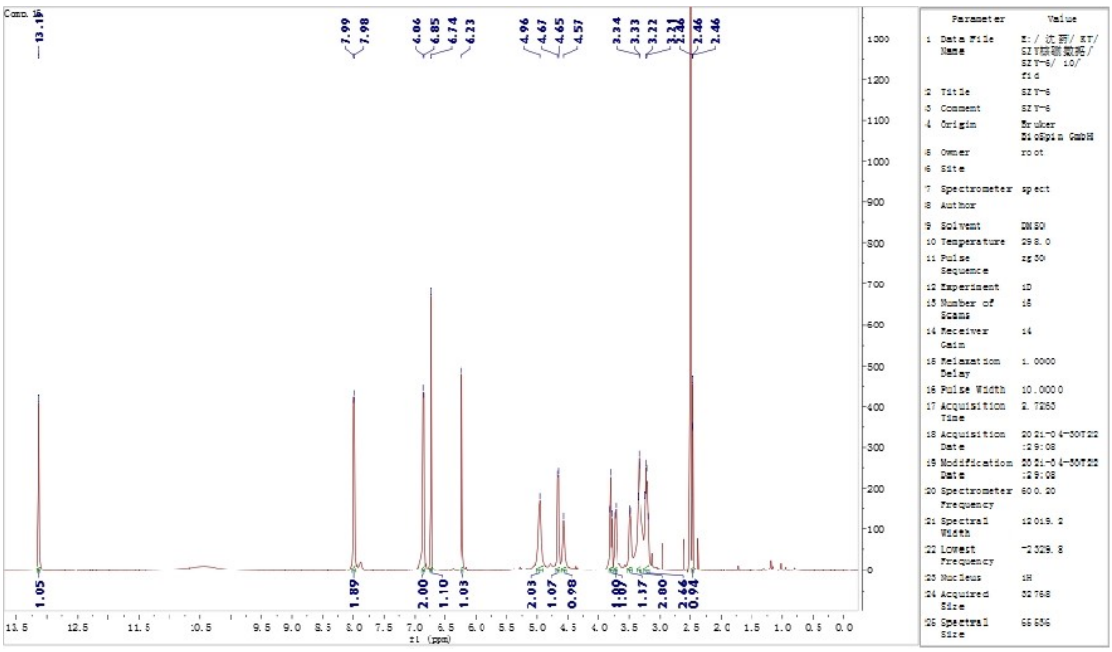


Fig S 66 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **17**.

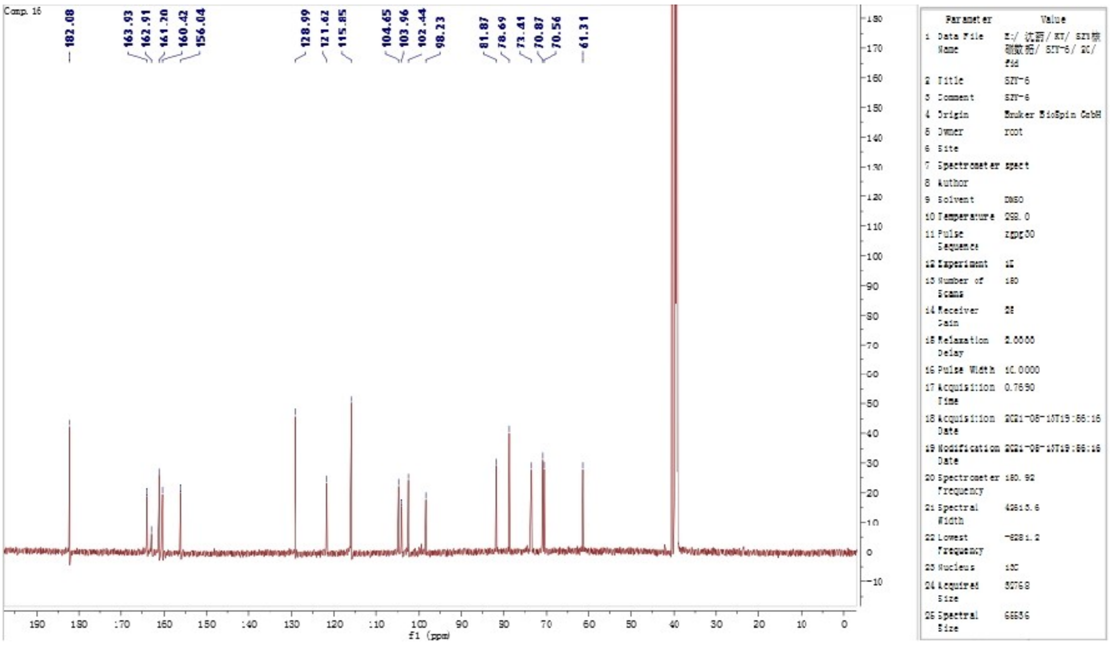


Fig S 67 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **17**.

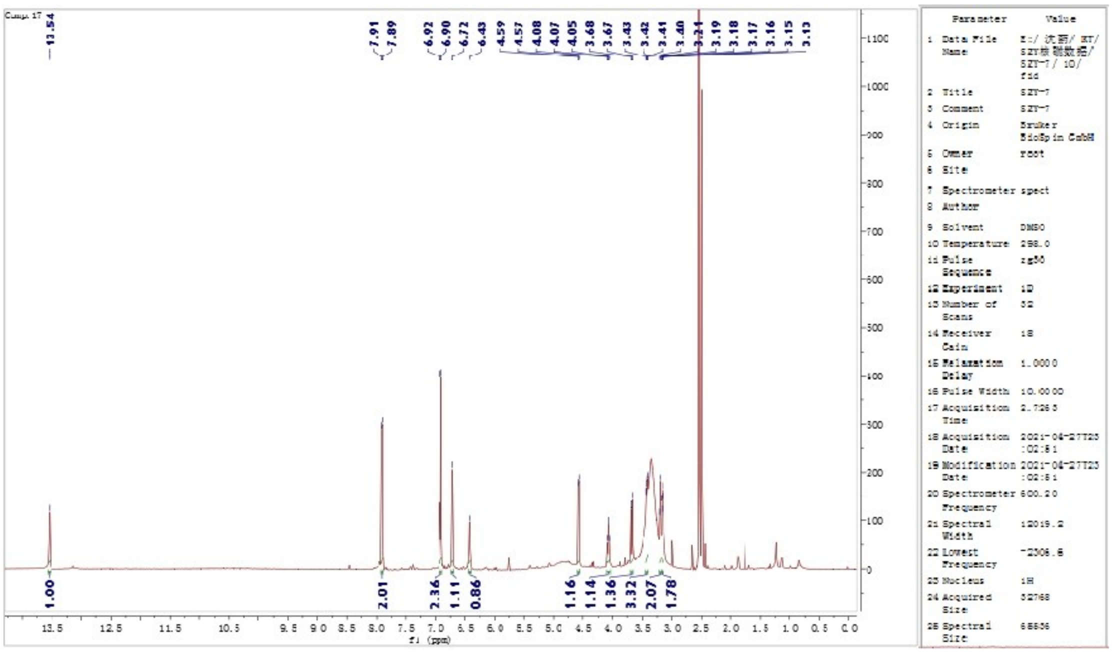


Fig S 68 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **18**.

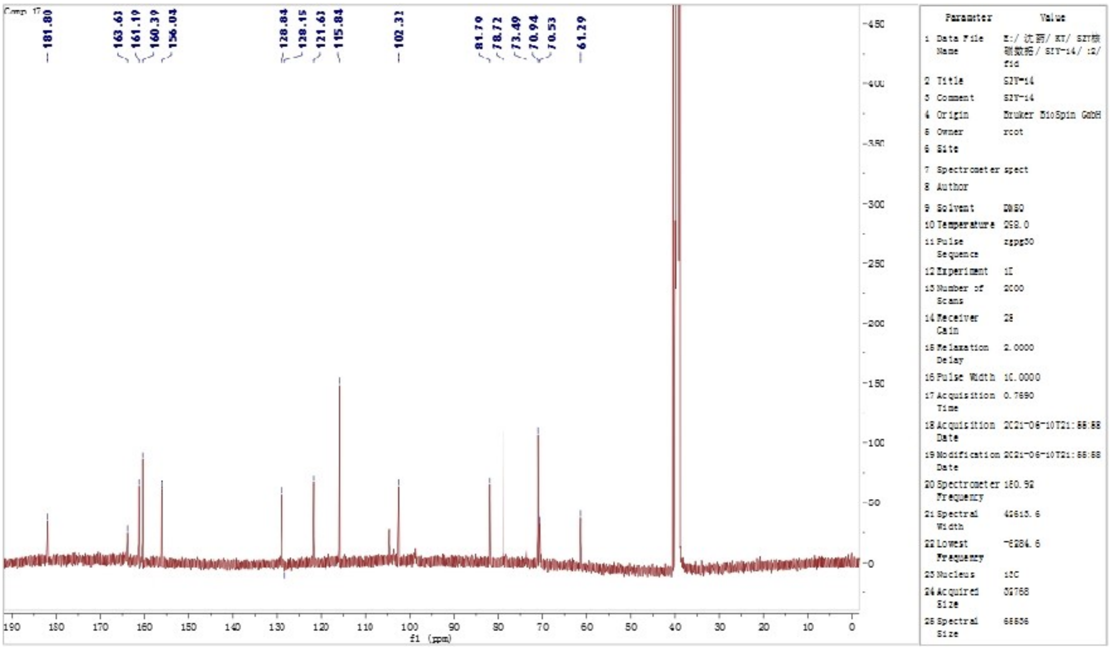


Fig S 69 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **18**.

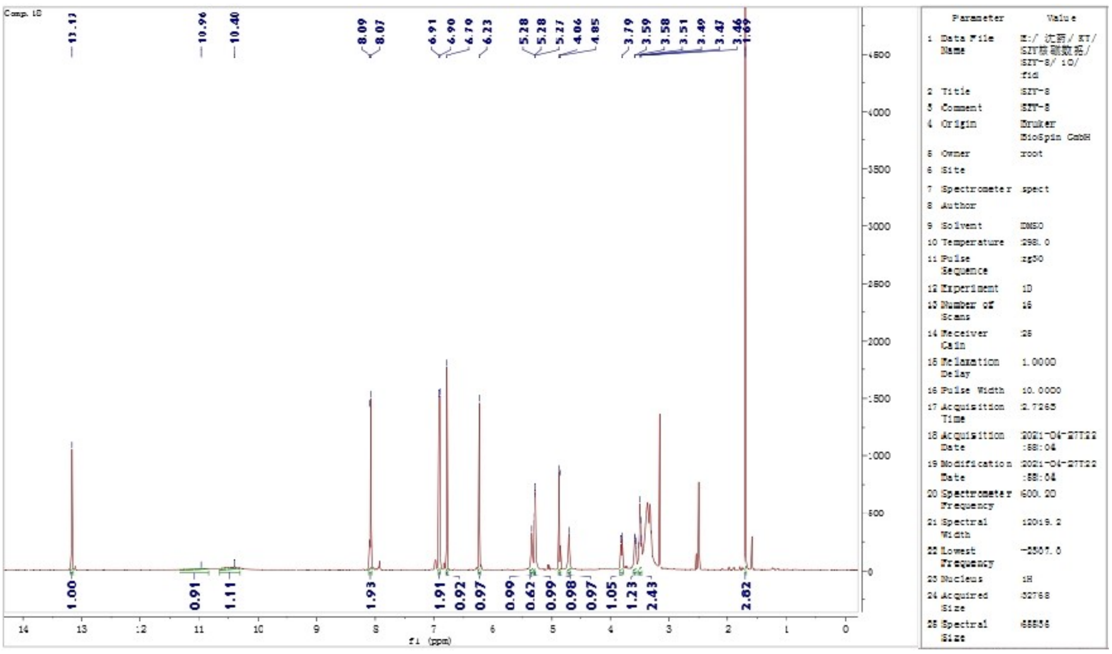


Fig S 70 The ^{1}H NMR spectrum (600 MHz, DMSO-d_6) of compound **19**.

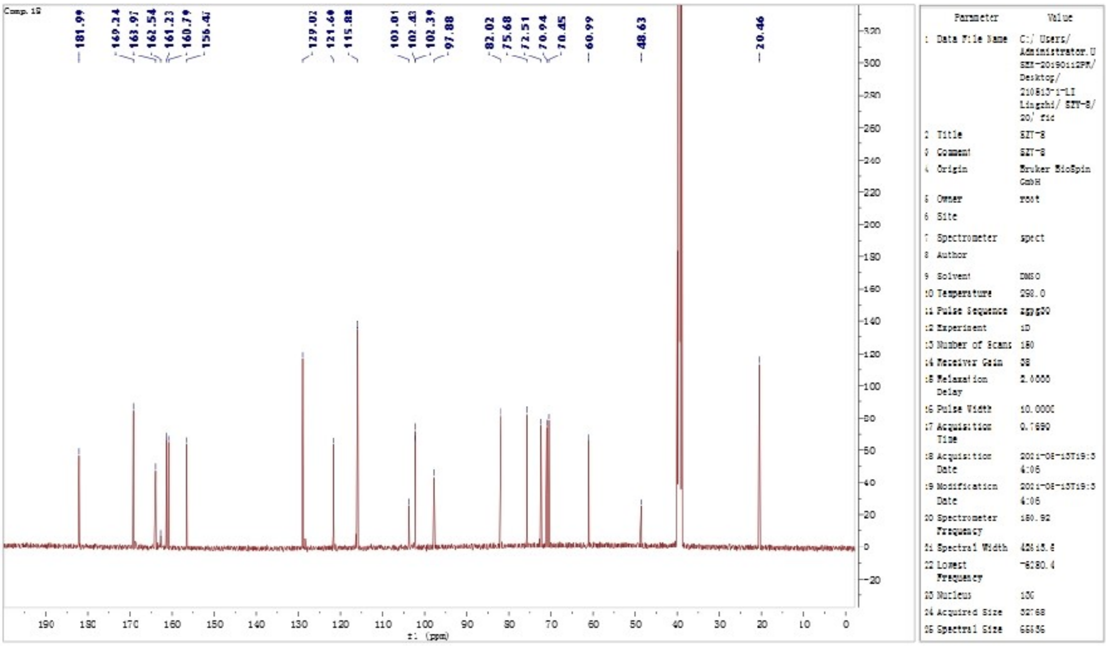


Fig S 71 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **19**.

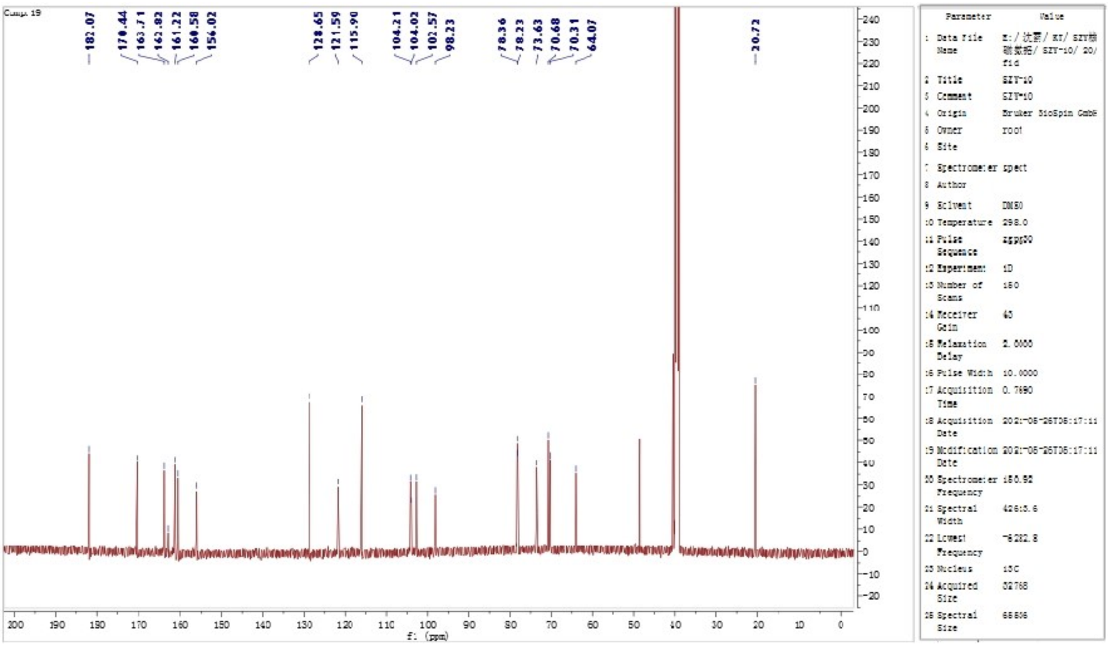


Fig S 72 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **20**.

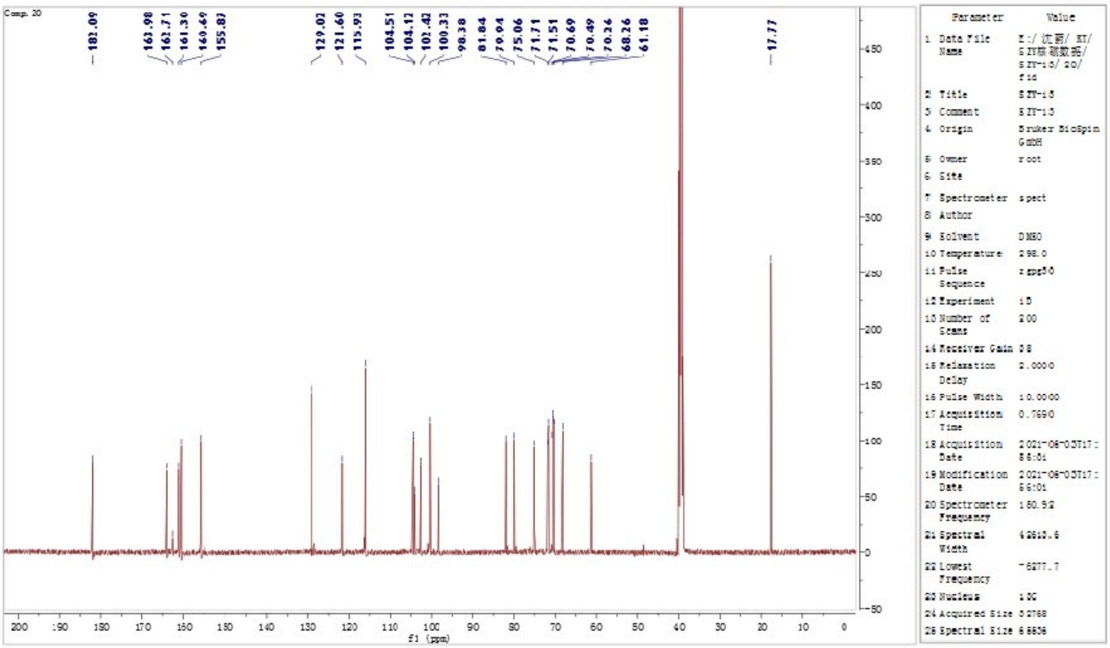


Fig S 73 The ^{13}C NMR spectrum (150 MHz, DMSO-d_6) of compound **21**.

Table S 1 ^{1}H (600 MHz) and ^{13}C (150 MHz) data of compounds **1** and **2** (Methanol-d_4).

No.	**1**		**2**	
	δ_H, mult, J (Hz)	δ_C	δ_H, mult, J (Hz)	δ_C
1		173.1		173.1
2	2.76 (1H, dd, J = 18.0, 1.2 Hz) 2.71 (1H, dd, J = 18.0, 4.8 Hz)	36.7	2.74 (1H, dd, J = 18.0, 1.8 Hz) 2.69 (1H, dd, J = 18.0, 4.8 Hz)	36.6
3	4.26 (1H, m)	73.2	4.18 (1H, m)	73.1
4	2.29 (1H, 1H, m) 1.68 (1H, ddd, J = 14.1, 11.4, 2.6 Hz)	36.8	2.18 (1H, m) 1.60 (1H, ddd, J = 14.2, 11.4, 2.8 Hz)	36.7
5	4.81 (1H, m)	74.8	4.78 (1H, m)	74.8
6	1.31 (3H, d, J = 6.4 Hz)	21.6	1.25 (3H, d, J = 6.4 Hz)	21.6
	Glc	Glc	Glc	Glc
1′	4.41 (1H, d, J = 7.8 Hz)	104.3	4.35 (1H, d, J = 7.8 Hz)	104.3
2′	3.20 (1H, dd, J = 9.0, 8.0 Hz)	74.9	3.17 (1H, dd, J = 9.2, 7.8 Hz)	74.9
3′	3.39 (1H, t, J = 9.0 Hz)	77.8	3.36 (1H, t, J = 9.1 Hz)	77.8
4′	3.33 (1H, m)	71.7	3.27 (1H, d, J = 9.6 Hz)	71.7
5′	3.55 (1H, m)	75.5	3.49 (1H, m)	75.4
6′	4.32 (1H, dd, J = 11.9, 6.4 Hz) 4.53 (1H, dd, J = 11.9, 2.1 Hz)	64.5	4.21 (1H, dd, J = 11.9, 6.6 Hz) 4.54 (1H, dd, J = 11.9, 2.1 Hz)	64.4
1′′		168.9		167.9
2′′	6.35 (1H, d, J = 15.9 Hz)	114.9	5.79 (1H, d, J = 12.8 Hz)	116.3
3′′	7.64 (1H, d, J = 15.9 Hz)	146.9	6.89 (1H, d, J = 12.8 Hz)	145.3
4′′		127.0		127.6
5′′, 9′′	7.46 (2H, d, J = 8.6 Hz)	131.2 × 2	7.65 (2H, d, J = 9.0 Hz)	133.8 × 2
6′′, 8′′	6.81 (2H, d, J = 8.6 Hz)	116.9 × 2	6.77 (2H, d, J = 9.0 Hz)	115.9 × 2
7′′		161.4		160.2

Table S 2 ^{1}H (600 MHz) and ^{13}C (150 MHz) data of compounds **3** and **4** (Methanol-d_4).

No.	**3**		**4**	
	δ_H, mult, J (Hz)	δ_C	δ_H, mult, J (Hz)	δ_C
1		173.7		173.7
2	2.70 (1H, dd, J = 15.8, 6.9 Hz) 2.59 (1H, dd, J = 15.8, 5.8 Hz)	40.8	2.68 (1H, m) 2.58 (1H, dd, J = 15.8, 5.7 Hz)	40.8
3	4.23 (1H, m)	75.7	4.18 (1H, m)	75.8
4	1.84 (1H, m) 1.57 (1H, ddd, J = 14.0, 5.8, 4.7 Hz)	45.2	1.82 (1H, m) 1.55 (1H, ddd, J = 14.1, 5.8, 4.7 Hz)	45.2
5	3.96 (1H, m)	66.0	3.94 (1H, m)	66.0
6	1.14 (3H, d, J = 6.2 Hz)	22.4	1.12 (3H, d, J = 6.2 Hz)	23.3
1-OCH$_3$	3.67 (3H, s)	52.2	3.68 (3H, s)	52.2
	Glc	Glc	Glc	Glc
1′	4.42 (1H, d, J = 7.8 Hz)	103.6	4.38 (1H, d, J = 7.8 Hz)	103.7
2′	3.16 (1H, dd, J = 9.1, 7.8 Hz)	75.0	3.14 (1H, dd, J = 9.2, 7.8 Hz)	75.0
3′	3.38 (1H, t, J = 9.0 Hz)	77.8	3.36 (1H, m)	77.8
4′	3.34 (1H, m)	71.8	3.27 (1H, m)	71.7
5′	3.55 (1H, m)	75.4	3.50 (1H, ddd, J = 9.6, 6.3, 2.1 Hz)	75.3
6′	4.30 (1H, dd, J = 11.9, 6.4 Hz) 4.52 (1H, dd, J = 11.9, 2.1 Hz)	64.7	4.23 (1H, dd, J = 11.9, 6.4 Hz) 4.48 (1H, dd, J = 11.9, 2.1 Hz)	64.5
1′′		169.1		168.0
2′′	6.36 (1H, d, J = 16.0 Hz)	115.0	5.80 (1H, d, J = 12.8 Hz)	116.3
3′′	7.65 (1H, d, J = 16.0 Hz)	146.8	6.88 (1H, d, J = 12.8 Hz)	145.4
4′′		127.1		127.6
5′′, 9′′	7.47 (2H, d, J = 8.6 Hz)	131.2 × 2	7.67 (2H, d, J = 8.6 Hz)	133.8 × 2
6′′, 8′′	6.91 (2H, d, J = 8.6 Hz)	116.8 × 2	6.76 (2H, d, J = 8.6 Hz)	115.9 × 2
7′′		161.4		160.2

Table S 3. Experimental $[\alpha]_D^{20}$ data of aglycone of compounds **3** and **4** at 20 °C with 589 nm laser (methanol as the solvent) and the calculated $[\alpha]_D^{20}$ of their aglycone in four absolute configurations.

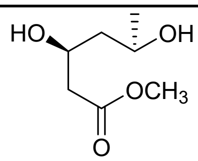
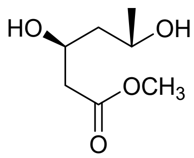
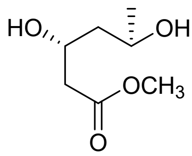
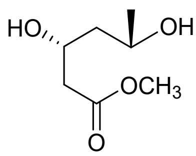
Comp.	structure	calculated $[\alpha]_D^{20}$	experimental $[\alpha]_D^{20}$
3′ a (3R5R)		-27.72718	
3′ b (3R5S)		-1.90662	
3′ c (3S5R)		4.10722	
3′ d (3S5S)		28.43639	
3′			6.6
4′			7.0

Table S 4 ^{1}H (600 MHz) and ^{13}C (150 MHz) data of compounds **5** and **6** (Methanol-d_4).

No.	**5**		**6**	
	δ_H, mult, *J* (Hz)	δ_C	δ_H, mult, *J* (Hz)	δ_C
1		176.4		176.5
2		130.5		130.3
3	7.22 (1H, t, *J* = 1.8 Hz)	151.7	7.26 (1H, t, *J* = 1.8 Hz)	151.9
4	5.36 (1H, dt, *J* = 9.6, 1.8 Hz)	85.8	5.35 (1H, dt, *J* = 9.0, 1.8 Hz)	86.1
5	2.98 (1H, t, *J* = 9.6 Hz)	45.7	3.15 (1H, dd, *J* = 9.6, 9.0 Hz)	44.6
6	5.76 (1H, dd, *J* = 9.6, 1.8 Hz)	124.4	5.77 (1H, dd, *J* = 9.6, 1.8 Hz)	124.9
7		139.0		138.3
8	3.96 (2H, s)	68.3	3.95 (2H, s)	68.4
9	1.68 (3H, s)	14.5	1.70 (3H, s)	14.4
10	1.86 (3H, t, *J* = 1.8 Hz)	10.5	1.86 (3H, t, *J* = 1.8 Hz)	10.4
1′		137.2		137.1
2′		129.0		129.6
3′	2.05 (1H, dd, *J* = 16.8, 9.6 Hz) 2.47 (1H, ddd, *J* = 16.8, 5.4, 1.8 Hz)	41.1	2.24 (1H, dd, *J* = 16.8, 8.4 Hz) 2.36 (1H, ddd, *J* = 16.8, 5.4, 1.2 Hz)	42.5
4′	4.11 (1H, m)	72.6	3.97 (1H, m)	73.7
5′	1.46 (1H, t, *J* = 12.0 Hz) 1.83 (1H, dt, *J* = 12.0, 3.0 Hz)	47.5	1.54 (1H, t, *J* = 12.0 Hz) 1.83 (1H, dt, *J* = 12.0, 2.4 Hz)	45.8
6′		39.5		39.2
7′	1.85 (3H, s)	22.1	1.87 (3H, s)	22.7
8′	0.98 (3H, s)	28.6	0.92 (3H, s)	28.8
9′	0.93 (3H, s)	29.6	1.01 (3H, s)	30.7
		Glc		
1′′	4.44 (1H, d, *J* = 7.8 Hz)	102.4	4.37 (1H, d, *J* = 7.8 Hz)	102.8
2′′	3.16 (1H, dd, *J* = 9.0, 7.8 Hz)	75.1	3.16 (1H, m)	75.2
3′′	3.37 (1H, m)	78.1	3.35 (1H, m)	78.1
4′′	3.28 (1H, m)	71.6	3.28 (1H, m)	71.7
5′′	3.29 (1H, m)	77.9	3.27 (1H, m)	77.9
6′′	3.67 (1H, dd, *J* = 12.0, 2.4 Hz) 3.88 (1H, dd, *J* = 12.0, 1.8 Hz)	62.7	3.66 (1H, dd, *J* = 12.0, 2.4 Hz) 3.86 (1H, dd, *J* = 12.0, 1.8 Hz)	62.8

Table S 5 ^{1}H (600 MHz) and ^{13}C (150 MHz) data of compound **7** (DMSO-d_6).

No.	δ_H, mult, J (Hz)	δ_C
1	7.46 (1H, s)	102.5
2		143.5
3		139.2
4		133.0
4a		143.9
5a		156.7
6	6.97 (1H, d, J = 2.0 Hz)	98.3
7		156.9
8	6.77 (1H, dd, J = 8.4, 2.0 Hz)	115.0
9	7.65 (1H, d, J = 8.4 Hz)	120.3
9a		116.0
9b		111.5
4-OCH_3	3.99 (3H, s)	60.4
	Glc	Glc
1′	4.69 (1H, d, J = 7.6 Hz)	103.8
2′	3.18 (1H, dd, J = 9.0, 7.6 Hz)	73.5
3′	3.36-3.29 (overlapped in DMSO-d_6)	77.4
4′	3.36-3.29 (overlapped in DMSO-d_6)	69.9
5′	3.36-3.29 (overlapped in DMSO-d_6)	76.0
6′	3.51 (1H, dd, J = 11.6, 6.2 Hz) 3.77 (1H, dd, J = 11.6, 1.5 Hz)	60.8

Table S 6 ^{1}H (600 MHz) and ^{13}C (150 MHz) data of compound **8** (Methanol-d_4)

No.	δ_H, mult, J (Hz)	δ_C
1		131.2
2	7.08 (1H, d, J = 1.8 Hz)	112.7
3		146.6
4		136.6
5		149.2
6	6.94 (1H, d, J = 1.8 Hz)	109.7
1′		129.6
2′		155.2
3′	6.86 (1H, dd, J = 8.0, 1.4 Hz)	117.0
4′	7.10 (1H, td, J = 7.9, 1.6 Hz)	129.1
5′	6.89 (1H, td, J = 8.0, 1.4 Hz)	121.0
6′	7.26 (1H, dd, J = 7.9, 1.6 Hz)	131.5
5-OCH_3	3.87 (3H, s)	56.8
	Glc	Glc
1″	4.86 (1H, d, J = 7.7 Hz)	104.2
2″	3.38 (1H, m)	74.9
3″	3.55 (1H, m)	78.2
4″	3.44 (1H, m)	71.2
5″	3.47 (1H, m)	77.6
6″	3.72 (1H, dd, J = 12.0, 5.1 Hz) 3.86 (1H, dd, J = 12.0, 2.4 Hz)	62.3

Table S 7 ^{1}H (600 MHz) and ^{13}C (150 MHz) data of compound **9** (Methanol-d_4).

No.	δ_H, mult, *J* (Hz)	δ_C
1	5.22 (1H, dd, *J* = 17.4, 1.5 Hz) 4.99 (1H, dd, *J* = 10.8, 1.5 Hz)	111.9
2	6.00 (1H, dd, *J* = 17.4, 10.8 Hz)	145.4
3		84.6
4	1.89 (1H, m) 1.81 (1H, m)	38.6
5	2.01 (1H, m) 1.85 (1H, m)	28.0
6	4.08 (1H, t, *J* = 7.2 Hz)	85.1
7		80.1
8	1.27 (3H, s)	23.7
9	1.23 (3H, s)	22.7
10	1.30 (3H, s)	25.9
	7-Glc	
1′	4.57 (1H, d, *J* = 7.8 Hz)	98.4
2′	3.14 (1H, dd, *J* = 9.2, 7.8 Hz)	75.3
3′	3.37 (1H, t, *J* = 9.1 Hz)	78.0
4′	3.27 (1H, dd, *J* = 9.6, 9.1 Hz)	72.0
5′	3.42 (1H, ddd, *J* = 9.5, 6.0, 2.4 Hz)	76.4
6′	3.99 (1H, dd, *J* = 11.0, 6.0 Hz) 3.56 (1H, dd, *J* = 11.4, 2.4 Hz)	68.2
	6′-Ara	
1″	4.94 (1H, d, *J* = 1.2 Hz)	109.9
2″	3.97 (1H, dd, *J* = 3.3, 1.5 Hz)	83.2
3″	3.82 (1H, dd, *J* = 5.9, 3.2 Hz)	79.0
4″	3.96 (1H, dd, *J* = 5.6, 3.4 Hz)	85.9
5″	3.74 (1H, dd, *J* = 11.9, 3.3 Hz) 3.64 (1H, dd, *J* = 11.9, 5.3 Hz)	63.1

Table S 8 ^{1}H (600 MHz) and ^{13}C-NMR (150 MHz) data of compounds **10** and **11**.

No.	**10** (DMSO-d_6)		**11** (Methanol-d_4)	
	δ_H, mult, J (Hz)	δ_C	δ_H, mult, J (Hz)	δ_C
2		156.5		158.3
3		133.3		134.2
4		176.9		178.9
5		161.1		162.8
6	6.11 (1H, s)	99.4	6.13 (1H, d, J = 2.0 Hz)	98.5
7		165.2		170.1
8	6.30 (1H, s)	93.9	6.30 (1H, d, J = 2.0 Hz)	95.0
9		156.1		157.9
10		102.9		105.0
1′		121.8		123.1
2′	7.51 (1H, d, J = 2.1 Hz)	115.2	7.67 (1H, d, J = 2.1 Hz)	117.0
3′		145.0		145.8
4′		149.0		149.5
5′	6.79 (1H, d, J = 8.5 Hz)	115.7	6.87 (1H, d, J = 8.5 Hz)	115.9
6′	7.64 (1H, dd, J = 8.5 ,2.1 Hz)	120.7	7.56 (1H, dd, J = 8.5 ,2.1 Hz)	122.8
3-O-Gal				
1′′	5.28 (1H, d, J = 7.7 Hz)	102.4	5.64 (1H, d, J = 7.7 Hz)	101.0
2′′		71.1	3.95 (1H, dd, J = 9.5, 7.9 Hz)	77.3
3′′		73.1	3.71 (1H, dd, J = 9.6, 3.5 Hz)	75.5
4′′		68.0	3.80 (1H, m)	70.7
5′′		73.5	3.65 (1H, t, J = 6.4 Hz)	75.1
6′′		65.1	3.75 (1H, dd, J = 10.2, 6.1 Hz)	66.7
			3.47 (1H, dd, J = 10.2, 6.6 Hz)	
2′′-O-Rha				
1			5.21 (1H, d, J = 1.1 Hz)	102.4
2			3.99 (1H, dd, J = 3.3, 1.6 Hz)	72.2
3			3.80 (1H, m)	72.1
4			3.34 (1H, t, J = 10.3 Hz)	73.9
5			4.06 (1H, dd, J = 9.7, 6.2 Hz)	69.7
6			0.97 (3H, d, J = 6.2 Hz)	17.2

6′′-O-Rha	4.42 (1H, d, *J* = 0.7 Hz)	100.0		
1		70.4	4.55 (1H, d, *J* = 1.4 Hz)	101.7
2		70.6	3.58 (1H, dd, *J* = 3.4, 1.6 Hz)	71.9
3		71.9	3.51 (1H, dd, *J* = 9.5, 3.5 Hz)	72.1
4		68.3	3.28 (1H, t, *J* = 9.5 Hz)	73.7
5	1.07 (3H, d, *J* = 6.2 Hz)	17.9	3.54 (1H, dd, *J* = 6.2, 3.3 Hz)	69.5
6	4.42 (1H, d, *J* = 0.7 Hz)	100.0	1.19 (3H, d, *J* = 6.2 Hz)	17.8

Table S 9 ^{13}C-NMR (150 MHz) data of compounds **12-15** (DMSO-d_6)

No.	**12**	**13**	**14**	**15**
2	156.4	156.4	156.2	156.2
3	133.4	133.2	133.2	133.2
4	177.2	177.3	177.4	177.4
5	161.2	161.2	161.2	161.2
6	99.1	99.0	99.0	98.9
7	164.1	165.4	164.7	164.8
8	93.7	93.7	93.8	93.8
9	156.0	156.0	156.5	156.5
10	103.3	103.5	103.5	103.8
1′	120.9	121.6	120.9	120.9
2′	115.2	115.2	131.0	130.9
3′	144.9	144.9	115.1	115.1
4′	148.9	148.7	160.4	160.0
5′	115.8	116.1	115.1	115.1
6′	122.0	121.1	131.0	130.9
	3-O-Gal	3-O-Glc	3-O-Gal	3-O-Glc
1′′	102.0	101.0	101.8	100.9
2′′	71.2	74.1	71.2	74.2
3′′	73.2	77.6	73.1	77.5
4′′	67.9	69.9	67.9	70.0
5′′	75.8	76.5	75.8	76.5
6′′	60.1	61.0	60.2	61.0

Table S 10 ^{13}C-NMR (150 MHz) data of compounds **16-21** (DMSO-d_6)

No.	**16**	**17**	**18**	**19**	**20**	**21**
2	164.0	163.9	163.6	164.0	163.7	164.0
3	102.6	102.4	103.1	102.4	102.6	102.4
4	182.0	182.1	182.1	182.0	182.1	182.1
5	161.2	161.2	161.1	161.2	161.2	161.3
6	98.2	98.2	109.5	97.9	98.2	98.4
7	162.8	162.9	163.6	162.5	162.8	162.7
8	103.7	104.7	93.2	102.4	104.0	104.5
9	156.0	156.0	156.9	156.5	156.0	155.9
10	103.8	104.0	103.1	103.8	104.2	104.1
1′	121.7	121.6	121.6	121.6	121.6	121.6
2′, 6′	129.0 × 2	129.0 × 2	128.8 × 2	129.0 × 2	128.7 × 2	129.0 × 2
3′, 5′	115.9 × 2	115.9 × 2	116.5 × 2	115.9 × 2	115.9 × 2	115.9 × 2
4′	160.6	160.4	161.7	160.8	160.6	160.7
	8-Glc	8-Glc	6-Glc	8-Glc	8-Glc	8-Glc
1′′	73.5	73.4	73.7	70.9	73.7	71.7
2′′	68.5	70.9	70.3	72.5	70.7	75.1
3′′	79.8	78.7	79.5	75.7	78.2	79.9
4′′	68.1	70.6	70.6	70.5	70.3	70.7
5′′	81.5	81.9	82.0	80.0	78.3	81.8
6′′	60.6	61.3	61.9	61.0	64.1	61.2
	3′′-O-$COCH_3$			2′′-O-$COCH_3$	6′′-O-$COCH_3$	2′′-O-Rha
1′′′	169.9			169.2	170.4	100.3
2′′′	21.2			20.5	20.6	70.3
3′′′						71.5
4′′′						70.5
5′′′						68.3
6′′′						17.2

Table S 11 Antioxidant activity of separation fractions of the leaves of *Crataegus pinnatifida* Bge.in vitro

Fraction	IC_{50}(mg/ml)		No.	IC_{50}(mg/ml)	
	DPPH•	ABTS·+		DPPH•	ABTS·+
Fr.1	30.9±0.94	5.80±0.03	Fr.3.5	>80	29.2±0.81
Fr.2	52.4±1.14	22.2±0.44	Fr.5.1	>80	>80
Fr.3	49.1±1.20	13.3±0.21	Fr.5.2	19.9±1.25	11.1±0.42
Fr.4	>80	27.6±0.80	Fr.5.3	13.1±0.87	13.6±0.46
Fr.5	21.1±1.07	4.9±0.09	Fr.5.4	51.8±1.53	26.4±0.73
Fr.6	>80	65.7±1.12	VC	33.7±1.41	6.4±0.13

(VC: Positive control)

Table S 12 Antioxidant activity of compounds **1-21** in vitro

No.	IC_{50}(μM)		No.	IC_{50}(μM)	
	DPPH•	ABTS·+		DPPH•	ABTS·+
1	>200	63.1±0.01	**12**	125.2±0.64	13.0±0.86
2	>200	>200	**13**	>200	28.6±1.04
3	>200	69.1±0.99	**14**	>200	143.7±1.12
4	>200	>200	**15**	>200	155.5±0.86
5	>200	>200	**16**	>200	>200
6	>200	>200	**17**	>200	164.2±1.30
7	149.3±0.65	16.5±1.42	**18**	>200	38.2±1.07
8	54.9±0.95	11.0±0.03	**19**	>200	>200
9	>200	165.5±1.44	**20**	>200	>200
10	83.9±0.60	3.4±0.28	**21**	>200	118.3±0.96
11	>200	59.5±0.75	VC	157.5±0.90	17.1±1.05

(VC: Positive control)

Table S 13 The protective effect of flavonoids **1-21** on SH-SY5Y cells at 25, 50, 100 μM.

No.	concentration (μM)				No.	concentration (μM)			
	25	50	100	300		25	50	100	300
1	48.2	47.7	53.0		**13**	53.7	67.0	81.9	
2	37.7	40.6	37.4		VE				75.1
3	48.2	46.6	40.1		**14**	57.5	76.1	76.1	
4	48.0	47.0	40.6		**15**	65.5	68.7	70.6	
VE				55.1	VE				71.5
5	49.3	50.9	57.0		**16**	48.2	54.4	75.4	
6	49.6	50.8	46.6		**17**	49.3	68.9	70.6	
7	53.5	45.3	52.2		VE				76.6
8	46.4	52.5	43.1		**18**	59.0	73.3	86.7	
9	56.6	62.0	58.5		**19**	66.4	68.2	83.2	
VE				72.3	VE				58.7
10	73.3	71.5	78.1		**20**	50.2	55.5	64.7	
11			66.0		**21**	42.1	50.4	56.5	
VE				72.9	VE				59.0
12	61.5	72.7	79.3						

(Positive control**:** VE)

Table S 14 The protective effect of flavonoids **10**, **12-21** on alcoholic hepatocyte injury at 25, 50, 100 μM.

No.	concentration (μM)			No.	concentration (μM)		
	25	50	100		25	50	100
10	59.9	61.5	46.3	**17**	58.8	77.7	58.6
12	59.8	59.9	45.3	**18**	62.4	72.5	59.3
13	71.8	81.7	73.5	**19**	56.4	73.1	58.9
14	65.1	67.0	71.6	**20**	64.8	78.0	74.3
15	62.1	73.4	67.4	**21**	66.6	62.0	65.6
16	66.0	78.0	69.0	3'g	85.2	99.8	92.3

(3'g: Positive control)