SUPPORTING INFORMATION

In *vitro* and in *silico* docking *and* molecular dynamic of antimicrobial activities, alpha-glucosidase, and anti-inflammatory activity of compounds from the aerial parts of *Mussaenda saigonensis*

1. Physio-chemical properties of 1-12

Shanzilactone (**1**). White amorphous powder. ^{1}H-NMR (600 MHz, DMSO-d_6) and ^{13}C-NMR (150 MHz, DMSO-d_6): see **Table S1**. The NMR data were consistent with those reported in the literature [25].

6-Acetyl shanzhiside methyl ester (**2**): White amorphous powder. ^{1}H-NMR (600 MHz, methanol-d_4) and ^{13}C-NMR (150 MHz, methanol-d_4): see **Table S2**. The NMR data were consistent with those reported in the literature [26].

Barlerin (**3**): White amorphous powder. ^{1}H-NMR (500 MHz, methanol-d_4) and ^{13}C-NMR (125 MHz, methanol-d_4): see Table S3. The NMR data were consistent with those reported in the literature [26].

Harpagoside (**4**): White amorphous powder. ^{1}H-NMR (500 MHz, DMSO-d_6) and ^{13}C-NMR (125 MHz, DMSO-d_6): see **Table S4.** The NMR data were consistent with those reported in the literature [27].

(3*S*,5*R*,6*R*,7*E*,9*S*)-Megastiman-7-ene-3,5,6,9-tetraol (**5**): White amorphous powder. ^{1}H-NMR (600 MHz, DMSO-d_6) and ^{13}C-NMR (150 MHz, DMSO-d_6): see **Table S5**. The NMR data were consistent with those reported in the literature [28].

Indole-3-carboxylic acid (**6**): White amorphous powder. ^{1}H-NMR (500 MHz, DMSO-d_6) and ^{13}C-NMR (125 MHz, DMSO-d_6): see **Table S6**. The NMR data were consistent with those reported in the literature [29].

Ursolic acid (**7**): White amorphous powder. ^{1}H-NMR (500 MHz, $CDCl_3$) and ^{13}C-NMR (125 MHz, $CDCl_3$): see **Table S7**. The NMR data were consistent with those reported in the literature [30].

Quinovic acid (**8**): White amorphous powder. ^{1}H-NMR (600 MHz, methanol-d_4) and ^{13}C-NMR (150 MHz, methanol-d_4): see **Table S8**. The NMR data were consistent with those reported in the literature [31].

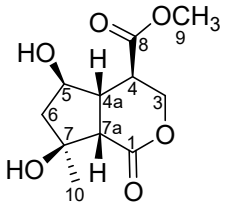
Rotundic acid (**9**): White amorphous powder. ^{1}H-NMR (500 MHz, DMSO-d_6) and ^{13}C-NMR (125 MHz, DMSO-d_6): see **Table S9**. The NMR data were consistent with those reported in the literature [32].

Clethric acid (**10**): White amorphous powder. ^{1}H-NMR (500 MHz, methanol-d_4) and ^{13}C-NMR (125 MHz, methanol-d_4): see **Table S10**. The NMR data were consistent with those reported in the literature [33].

Martynoside (**11**): White amorphous powder. ^{1}H-NMR (600 MHz, methanol-d_4) and ^{13}C-NMR (150 MHz, methanol-d_4): see **Table S11**. The NMR data were consistent with those reported in the literature [34].

Verbacoside (**12**): White amorphous powder. ^{1}H-NMR (600 MHz, DMSO-d_6) and ^{13}C-NMR (150 MHz, DMSO-d_6): see **Table S12**. The NMR data were consistent with those reported in the literature [35].

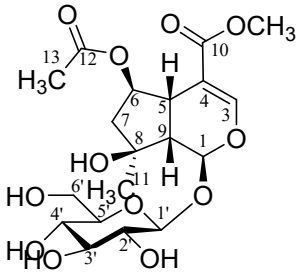
Table S1. NMR data of compound **1**



1

No	**Compound 1** (DMSO-d_6)		
	δ_H (*J*, Hz) 600 MHz	**δ_C (150 MHz)**	**HMBC ($^1H \rightarrow ^{13}C$)**
1		169.5	
3	4.27 (1H, *d*, 8.5)	64.9	4a, 5
4	3.10 (1H, *t*, 7.5)	38.8	
4a	2.67 (1H, *m*)	44.4	4, 7a, 3, 5
5	3.88 (1H, *ddd*, 10.0, 7.0, 3.5, 8.5)	68.8	4, 4a, 1
6	1.88 (1H, *dd*, 12.0, 6.0) 1.79 (1H, t, 11.0)	50.1	4, 4a, 7a, 5, 7
7		76.5	
7a	3.15 (1H, *d*, 12.0)	53.5	10, 4a, 4, 7, 1, 8
8		170.9	
9	3.57 (3H, *s*)	51.4	
10	1.11 (3H, *s*)	25.6	6, 7

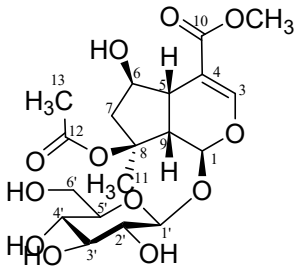
Table S2. NMR data of compound **2**



2

No	**Compound 2** (CD_3OD)		
	δ_H (*J*, Hz), 600 MHz	**δ_C (150 MHz)**	**HMBC ($^1H \rightarrow ^{13}C$)**
1	5.53 (1H, *d*, 4.2)	94.9	C-3, C-5, C-1'
3	7.46 (1H, *d*, 1.2)	153.3	C-1, C-4, C-5, C-10
4		109.9	
5	3.33 (1H, *m*)	39.1	C-1, C-3, C-4, C-6, C-7, C-8, C-9
6	5.09 (1H, *m*)	79.2	C-12, C-7, C-8
7	2.24 (1H, *dd*, 14.4, 7.4) 1.82 (1H, *dd*, 14.4, 4.8)	47.5	C-5, C-6, C-8, C-11
8		78.9	
9	2.51(1H, *dd*, 9.6, 4.8)	51.5	C-1, C-3, C-4, C-5, C-6, C-7, C-9, C-11
10		168.8	
11	1.31 (3H, *s*)	25.4	C-7, C-8, C-9
12		172.5	
13	2.07 (3H, *s*)	21.2	C-12
10-OMe	3.69 (3H, *s*)	51.7	C-10
1'	4.70 (1H, *d*, 7.8)	99.8	C-1
2'	3.21 (1H, *dd*, 10.8, 7.8)	74.6	
3'	3.38 (1H, *t*, 9.0)	78.0	
4'	3.26 (1H, *t*, 9.0)	71.7	
5'	3.32 (1H, *m*)	78.4	
6'	3.93(1H, *dd*, 12.0, 2.4) 3.66 (1H, *dd*, 12.0, 4.8)	62.9	

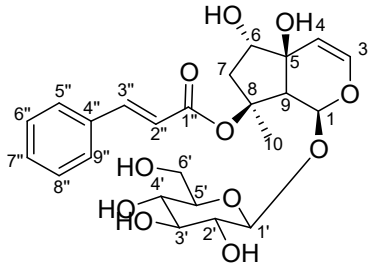
Table S3. NMR data of compound **3**



3

No	**Compound 3** (CD_3OD)		
	δ_H (*J*, Hz) 500 MHz	**δ_C (125 MHz)**	**HMBC ($^1H \rightarrow ^{13}C$)**
1	5.76 (1H, *d*, 2.5)	93.4	C-3, C-5, C-1'
3	7.38 (1H, *d*, 1.5)	151.6	C-1, C-4, C-5, C-10
4		108.1	
5	2.87 (1H, *dd*, 9.0, 1.0)	40.4	C-1, C-3, C-4, C-6, C-7, C-8, C-9
6	4.40 (1H, *m*)	73.4	
7	2.10 (1H, *d*, 14.5) 1.89 (1H, *dd*, 14.5, 5.5)	46.4	C-5, C-6, C-8, C-11
8		87.7	
9	2.82 (1H, *dd*, 8.5, 2.0)	48.2	C-1, C-3, C-4, C-5, C-6, C-7, C-9, C-11
10		166.5	
11	1.42 (3H, *s*)	21.8	C-7, C-8, C-9
12		170.1	
13	1.94 (3H, *s*)	22.0	C-12
10-OMe	3.64 (3H, *s*)	51.0	C-10
1'	4.46 (1H, *d*, 8.0)	98.5	C-1
2'	2.95 (1H, *m*)	73.0	
3'	3.14 (1H, *m*)	77.1	
4'	3.04 (1H, *m*)	70.0	
5'	3.13(1H, *m*)	76.7	
6'	3.70 (1H, *m*) 3.46 (1H, *m*)	61.2	

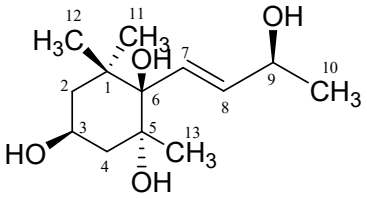
Table S4. NMR data of compound **4**



4

No	**Compound 4** (DMSO-d_6)		
	δ_H ppm (*J*, Hz) 500 MHz	**δ_C ppm 125 MHz**	**HMBC ($^1H \rightarrow ^{13}C$)**
1	5.97 (1H, *d*, 1.5)	92.3	3, 1’
3	6.38 (1H, *d*, 8.5)	141.1	1, 4, 5
4	4.91 (1H, *dd*, 7.0, 2.0)	107.3	3, 6, 9
5		71.2	
6	3.18 (1H, *m*)	77.1	5
7	1.87 (1H, *dd,* 4.5, 15.0, H-7a) 2.21 (1H, d, 15.0, H-7b)	44.4	5, 6, 8
8		86.7	
9	2.74 (1H, *s*)	54.2	1, 5
10	1.45 (1H, *s*)	22.1	7, 8, 9
1'	4.41 (1H, *d,* 7.5)	97.1	1
2'	3.01(1H, *ddd,* 4.5*,* 8.5, 12.5)	73.0	1’
3'	3.16 (1H, *m*)	76.1	2’
4'	3.10 (1H, *dd*, 5.5, 9.0)	70.1	3’
5'	3.62 (1H, *m*)	75.6	6’
6'	3.51 (1H, m, H-6’a) 3.73 (1H, *m,* H-6’b)	61.0	5’
1"		165.7	
2"	6.55 (1H, *d,* 16.0)	119.4	1’’, 4’’
3"	7.61 (1H, *d,* 15.5)	144.0	4’’
4"		134.0	
5"	7.69 (1H, *m*)	128.2	3’’, 6’’
6"	7.42 (1H, *m*)	128.8	4’’, 5’’
7"	7.41 (1H, *m*)	130.2	5’’, 6’’
8"	7.42 (1H, *m*)	128.8	
9"	7.69 (1H, *m*)	128.2	

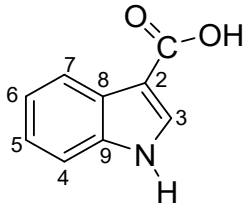
Table S5. NMR data of compound **5**



5

No	**Compound 5** (DMSO-d_6)		
	δ_H ppm (*J*, Hz) 600 MHz	**δ_C ppm (150 MHz)**	**HMBC (^{1}H→^{13}C)**
1		40.0	
2	1.24 (1H, *m*) 1.57 (1H, *dd*, 12.0, 16.0)	45.8	C1, C3, C4, C6
3	3.85 (1H, *m*)	62.6	C1, C5
4	1.61 (2H, *m*)	45.2	C3, C5, C6
5		75.8	
6		76.8	
7	5.92 (1H, *dd*, 1.2, 16.2)	129.0	C6, C8, C9
8	5.67 (1H, *dd*, 6.0, 16.2)	134.8	C6, C7, C9, C10
9	4.19 (1H, *m*)	66.9	C8, C10
10	1.13 (3H, *d*, 6.0)	24.5	C8, C9
11	0.72 (3H, *s*)	27.0	C1, C2, C6
12	1.08 (3H, *s*)	26.8	C5, C6
13	0.99 (3H, *s*)	25.7	C8, C9

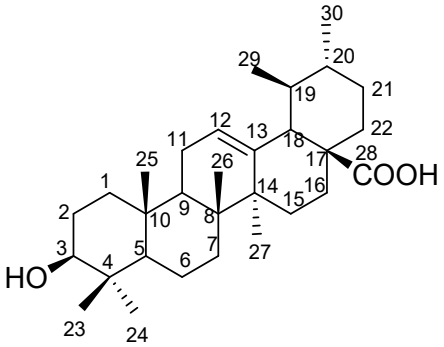
Table S6. NMR data of compound 6



6

No.	**Compound 6** (DMSO-d_6)		
	δ_H ppm (*J*, Hz) 500 MHz	**δ_C ppm 125 MHz**	**HMBC H→C**
1		169.5	
2	7.98 (1H; d; 2.4, H-2)	132.1	C-8, C-9
3		136.3	
4	7.44 (1H; d, 7.8)	112.1	C-5 C-9
5	7.14 (1H; t, 7.2)	120.8	C-4, C-9
6	7.16 (1H; t, 7.8)	122.0	C-7
7	8.0 (1H; d, 7.2)	120.5	C-3
8		107.0	
9		125.6	

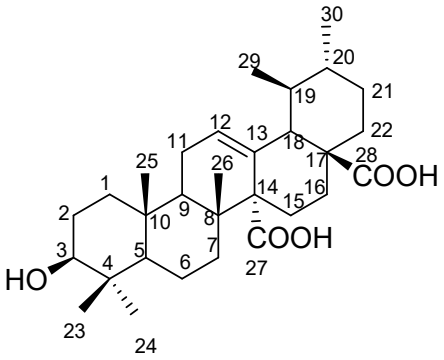
Table S7. NMR data of compound 7



7

No.	**Compound 7** ($CDCl_3$)		
	δ_C ppm, 125 MHz	**δ_H ppm (*J*, Hz), 500 MHz**	**HMBC $^1H \rightarrow ^{13}C$**
1	38.6		
2	27.2		
3	79.0	3.23 (1H, *dd*,11.0, 5.0 Hz)	
4	38.7		
5	55.2		
6	18.3		
7	30.6		
8	39.5		
9	47.9		
10	37.0		
11	23.6		
12	125.9	5.26 (1H, *t*, 3.5 Hz)	C-9, C-11,C-14
13	137.9		
14	42.0		
15	33.0		
16	24.2		
17	47.6		
18	52.7	2.19 (1H, *m*)	C-12,C-13, C-14, C-19, C-20, C-27
19	39.0		
20	38.8		
21	28.0		
22	36.7		
23	28.1	0.92 (3H, *s*)	C-3, C-4, C-5, C-24
24	17.0	0.78 (3H, *s*)	C-3, C-4, C-5, C-23
25	15.4	0.93 (3H, *s*)	C-1, C-5, C-9, C-10
26	15.6	0.80 (3H, *s*)	C-7, C-8, C-9, C-14
27	23.5	1.08 (3H, *s*)	C-8, C-13, C-14
28	181.0		
29	17.1	0.86 (3H, *d*, 6.5 Hz)	C-18, C-20, C-19
30	21.1	0.95 (3H, *d*, 6.5 Hz)	C-18, C-20, C-19

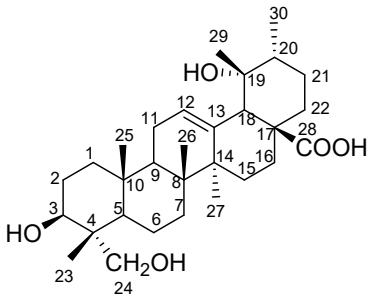
Table S8. NMR data of compound 8



8

No.	**Compound 8** (CD_3OD)		
	δ_H ppm (J, Hz) 600 MHz	**δ_C ppm 150 MHz**	**HMBC (H → C)**
1		40.0	
2		28.0	
3	3.13 (1H, *dd*, 11.4, 4.8)	79.5	23, 24, 1
4		40.7	
5		56.4	
6		19.1	
7		39.8	
8		38.1	
9		48.1	
10		38.3	
11		23.7	
12	5.63 (1H, *dd,* 4.8, 2.4)	130.4	9, 11, 14, 18
13		133.9	
14		57.3	
15		25.6	27
16		26.5	
17		49.5	
18	2.28 (1H, *m*)	55.5	17, 20, 22, 28
19		40.4	
20		38.0	
21		30.7	
22		37.6	
23	0.95 (3H, *s*)	28.7	3, 4, 5, 24
24	0.78 (3H, *s*)	16.4	3, 4, 5, 23
25	0.99 (3H, *s*)	16.8	1, 5, 9, 10
26	0.92 (3H, *s*)	18.1	7, 8, 9, 14
27		179.0*	
28		181.1*	
29	0.93 (3H, *d*, 5.4)	19.5	18, 19, 20
30	0.94 (3H, *d,* 6.0)	21.5	19, 20, 21

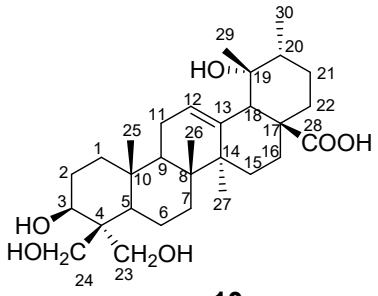
Table S9. NMR data of compound 9



9

No.	**Compound 9** (DMSO-d_6)		
	δ_C ppm (125 MHz)	**δ_H ppm (*J*, Hz), 500 MHz**	**HMBC $^1H \rightarrow ^{13}C$**
1	38.0		
2	26.5		
3	70.4	3.45 (1H, t, 6.0)	C4, C23, C24
4	41.3		
5	46.7		
6	17.5		
7	32.5		
8	39.1		
9	46.4		
10	36.2		
11	23.1		
12	126.8	5.16 (1H, brs)	C14
13	138.6		
14	41.1		
15	28.0		
16	25.1		
17	46.9		
18	53.1	2.36 (1H, brs)	C17
19	71.6		
20	46.4		
21	25.8		
22	37.2		
23	64.5	3.08 (1H, d, 10.0) 3.25 (1H, m)	C3,C4,C5,C24
24	12.6	0.54 (3H, s)	C3,C4,C5,C23
25	15.3	0.87 (3H, s)	C5,C9
26	16.6	0.70 (3H, s)	C9,C14
27	24.0	1.29 (3H, s)	C8,C13,C14,C15
28	179.0		
29	26.4	1.08 (3H, s)	C19,C20,C21,C30
30	16.2	0.85 (3H, d, 6.5)	C19,C20,C21,C29

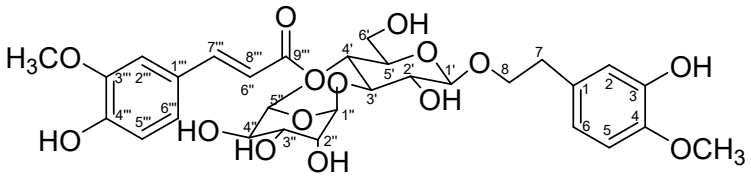
Table S10. NMR data of compound 10



10

No.	Compound 10 (CD_3OD)		
	δ_C ppm, 125 MHz	δ_H ppm (*J*, Hz), 500 MHz	HMBC $^1H \rightarrow ^{13}C$
1	39.0		
2	28.0		
3	74.8	3.77 (1H, d, 11.5, 5.0)	C-23, C24
4	48.4		
5	49.0		C6
6	19.8		
7	34.0		C6
8	41.0		
9	48.6		
10	37.4		
11	24.8		
12	129.2	5.30 (1H, brs)	C9, C14
13	140.0		
14	42.5		
15	29.6		
16	26.6		
17	47.1		
18	55.1	2.52 (1H, brs)	C13, C19
19	73.6		
20	39.3		
21	27.3		
22	39.3		
23	64.2	3.67 (1H, d, 11.0) 4.09 (1H, d, 11.0)	C3,C4,C5,C24
24	63.7	3.57 (1H, d, 11.5) 4.16 (1H, d, 11.5)	C3,C4,C5,C23
25	16.2	0.98 (3H, s)	C1,C5,C9
26	17.4	0.80 (3H, s)	C7,C8,C9,C14
27	24.8	1.35 (3H, s)	C8,C13,C14,C15
28	182.0*		
29	27.0	1.21 (3H, s)	C19,C20,C21,C30
30	16.6	0.95 (3H, d, 6.5)	C19,C20,C21,C29

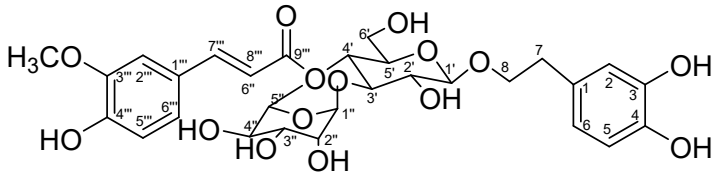
Table S11. NMR data of compound 11



11

No.	Compound **11** (CD_3OD)		
	δ_C ppm (150 MHz)	**δ_H ppm (*J*, Hz) 600 MHz**	**HMBC $^1H \rightarrow ^{13}C$**
Aglycone			
1	132.9		
2	117.0	6.76 (1H, *d*, 1.8 Hz)	C1, C3, C4, C6, C7
3	147.3		
4	147.5		
5	112.9	6.83 (1H, *d*, 8.4 Hz)	C1, C3
6	121.1	6.71 (1H, *dd*, 8.4, 2.4 Hz)	C7, C2, C4, C5
7	36.5	2.85 (2H, *m*)	C2, C1, C6
8	72.0	3.77 (1H, *m*) 4.09 (1H, *m*)	C1', C1, C7
4-OCH_3	56.5	3.83 (3H, *s*)	
trans-feruloyl			
1'''	127.6	-	
2'''	111.8	7.21 (1H, *d*, 1.8 Hz)	C6''', C4''', C3'''
3'''	149.3		
4'''	150.8		
5'''	116.5	6.84 (1H, *d*, 8.4 Hz)	C2''', C1''', C3''', C4'''
6'''	124.3	7.10 (1H, *dd*, 8.4, 1.8 Hz)	C2''', C3''', C4'''
7'''	147.8	7.69 (1H, *d*, 15.6 Hz)	C8''', C6''', C1''', C9'''
8'''	115.1	6.40 (1H, *d*, 15.6 Hz)	C1''' , C7''', C9'''
9'''	168.2		
3'''-OCH_3	56.4	3.90 (3H, *s*)	
β-D-glucose			
1'	104.2	4.40 (1H, *d*, 8.4 Hz)	C2', C5'
2'	76.1	3.43 (1H, *dd*, 9.6, 8.4 Hz)	C1'
3'	81.5	3.84 (1H, *d*, 9.6 Hz)	C1'
4'	70.6	4.94 (1H, *t*, 9.6 Hz)	C9''', C6', C3'
5'	76.0	3.55 (1H, *d*, 9.0 Hz)	
6'	62.3	3.56 (1H, *d*, 9.0 Hz) 3.66 (1H, *d*, 9.6 Hz)	
α-L-rhamnose			
1''	102.9	5.22 (1H, *d*, 1.8 Hz)	C3', C2'', C3''
2''	72.3	3.94 (1H, *dd*, 3.0, 1.8 Hz)	C1'', C4'', C5''
3''	72.0	3.62 (1H, *m*)	C1''
4''	73.7	3.33 (1H, *m*)	C6''
5''	70.3	3.60 (1H, *m*)	C6'', C3''
6''	18.4	1.13 (3H, *d*, 6.6 Hz)	C4'', C5''

Table S12. NMR data of compound 12



12

No.	**Compound 12** (DMSO-d_6)		
	δ_C ppm (150 MHz)	**δ_H ppm *(J*, Hz) 600 MHz**	**HMBC $^1H \rightarrow ^{13}C$**
Aglycone			
1	129.0		
2	115.4	6.62 (1H, *s*)	C1, C3, C4, C6, C7
3	144.9		
4	143.5		
5	116.2	6.63 (1H, *d*, 7.8 Hz)	C1, C3
6	119.4	6.50 (1H, *dd*, 7.8, 1.8 Hz)	C7, C2, C4, C5
7	34.9	7.02 (2H, *m*)	C2, C1, C6
8	70.1	3.62 (1H, *m*) 3.88 (1H, *m*)	C1', C1, C7
trans-caffeoyl			
1'''	125.4		
2'''	114.6	7.02 (1H, *d*, 2.4 Hz)	C6''', C4''', C3'''
3'''	144.9		
4'''	148.2		
5'''	115.7	6.76 (1H, *d*, 7.8 Hz)	C2''', C1''', C3''', C4'''
6'''	121.3	6.98 (1H, *dd*, 8.4, 1.8 Hz)	C2''', C3''', C4'''
7'''	145.5	7.46 (1H, *d*, 16.2 Hz)	C8''', C6''', C1''', C9'''
8'''	113.5	6.20 (1H, *d*, 16.2 Hz)	C1''' , C7''', C9'''
9'''	165.6		
β-D-glucose			
1'	102.2	4.35 (1H, *d*, 7.8 Hz)	C2', C5'
2'	74.4	3.22 (1H, *t*, 8.4 Hz)	C1'
3'	79.0	3.71 (1H, *t*, 9.0 Hz)	C1'
4'	69.1	4.72 (1H, *t*, 9.6 Hz)	C9''', C6', C3'
5'	74.4	3.48 (1H, *m*)	C4''
6'	60.6	3.33 (1H, *m*) 3.40 (1H, *m*)	
α-L-rhamnose			
1''	101.1	5.02 (1H, *d*, 1.2 Hz)	C3', C2'', C3''
2''	70.4	3.68 (1H, *t*, 1.8 Hz)	C1'', C4'', C5''
3''	70.3	3.29 (1H, *m*)	C1''
4''	71.6	3.12 (1H, *t*, 9.0 Hz)	C6''
5''	68.7	3.35 (1H, *m*)	C6'', C3''
6''	18.0	0.96 (3H, *d*, 6.6 Hz)	C4'', C5''

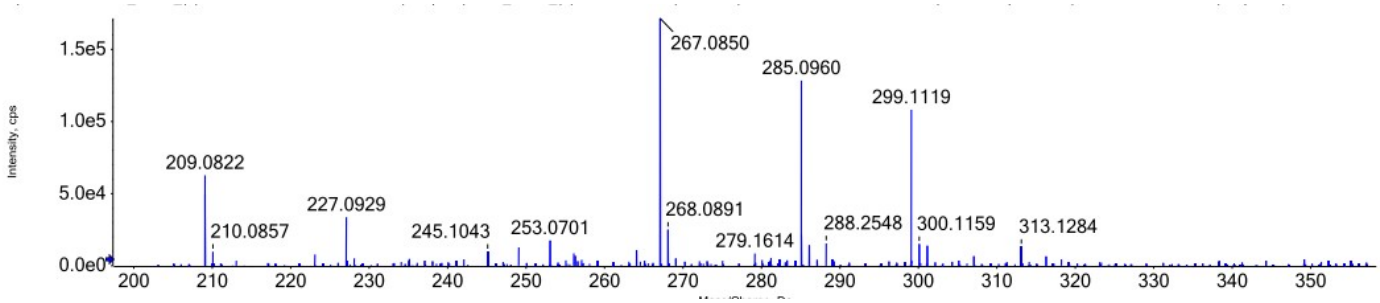


Figure S13.1. MS spectra of compound **1** (DMSO–d_6)

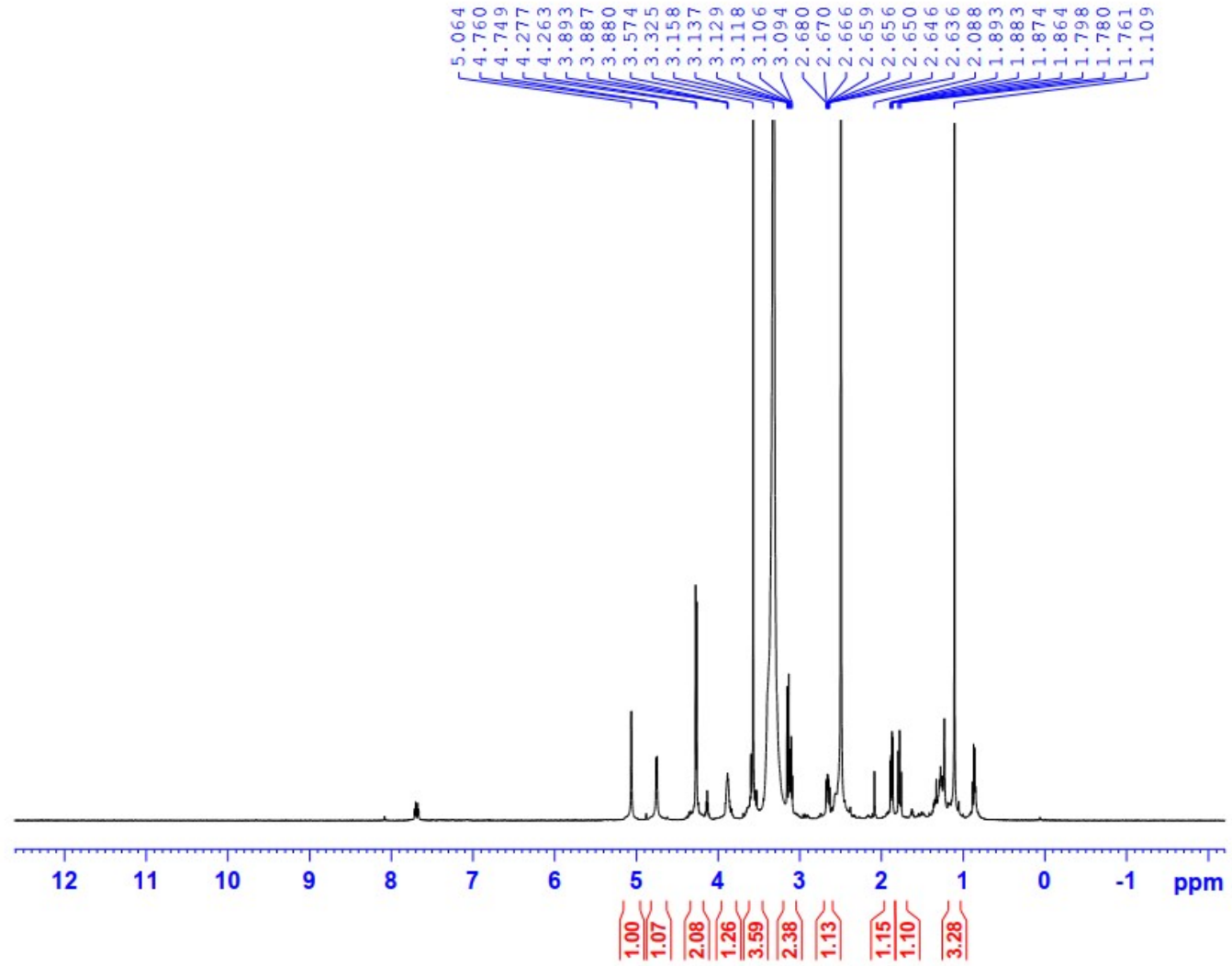


Figure S13.2. ^{1}H NMR spectra of compound **1** (DMSO–d_6)

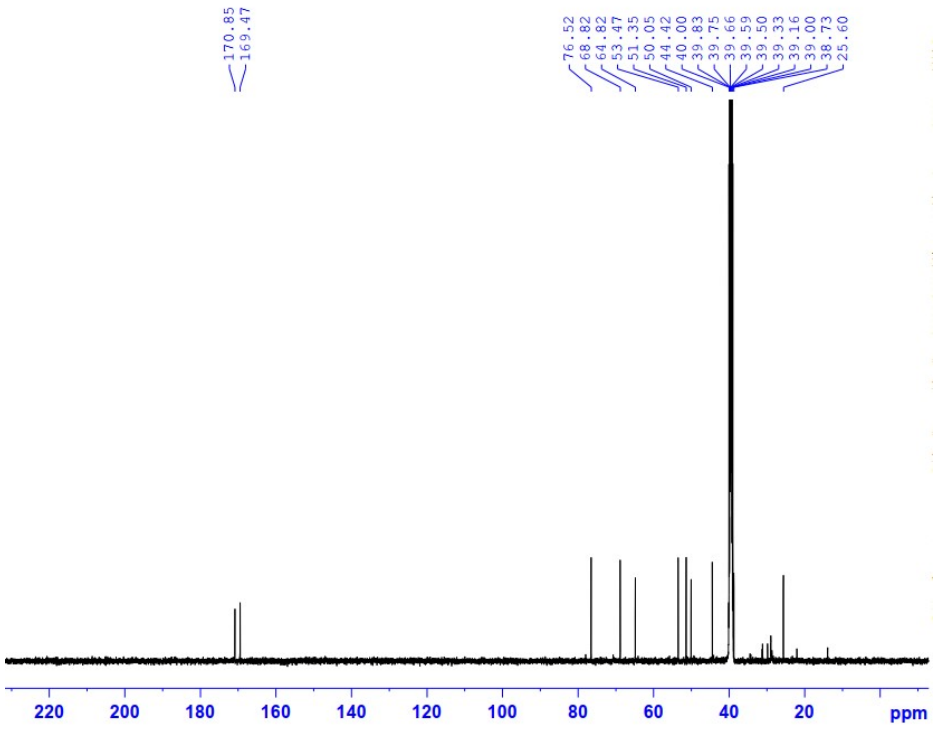


Figure S13.3. ^{13}C NMR spectra of compound **1** (DMSO–d_6)

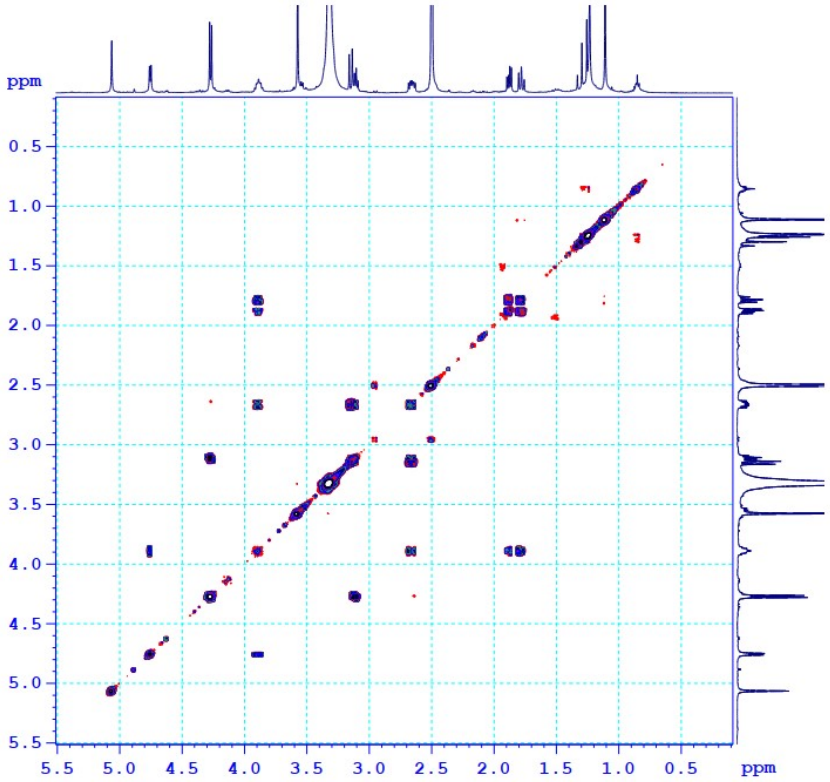


Figure S13.4. COSY spectra of compound **1** (DMSO–d_6)

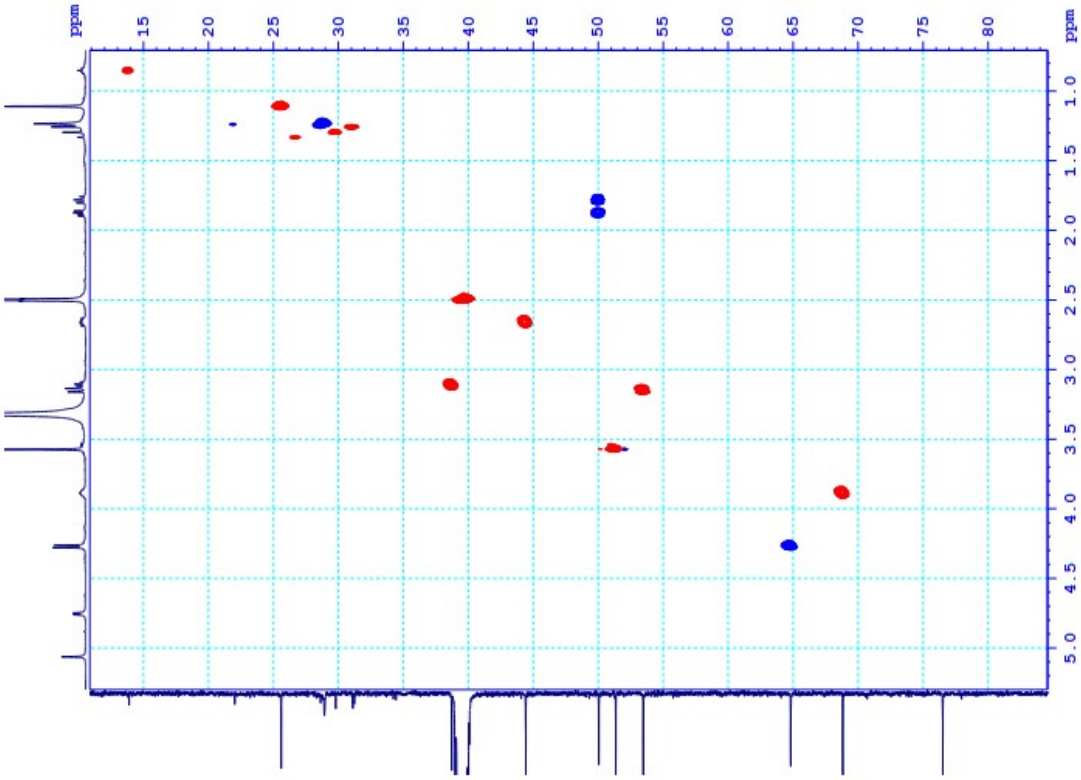


Figure S13.5. HSQC spectra of compound **1** (DMSO–d_6)

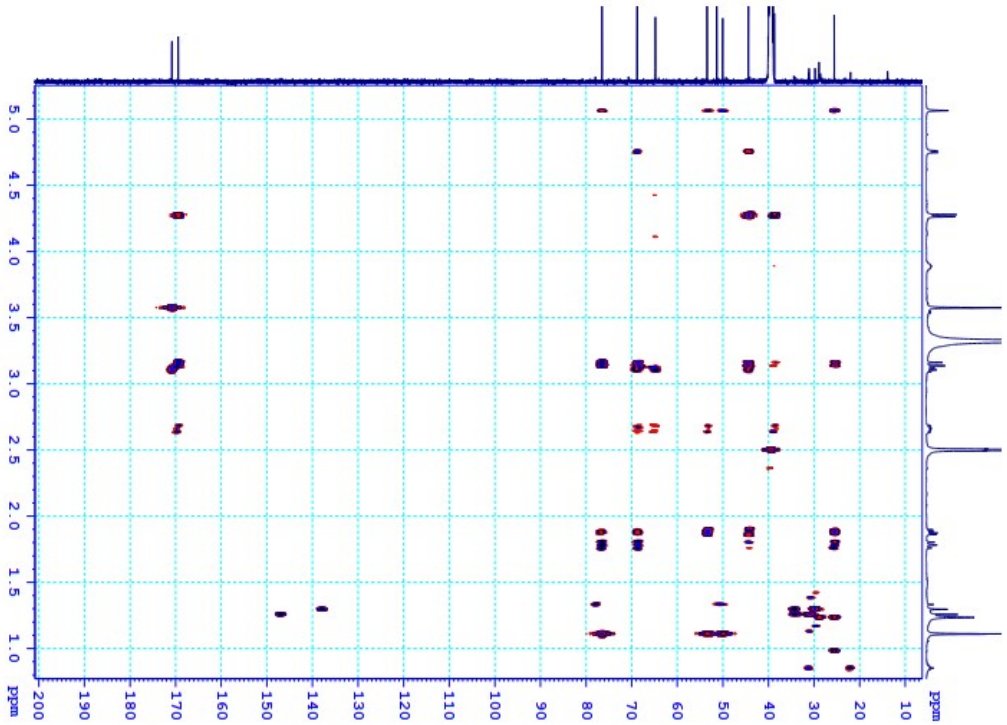


Figure S13.6. HMBC spectra of compound **1** (DMSO–d_6)

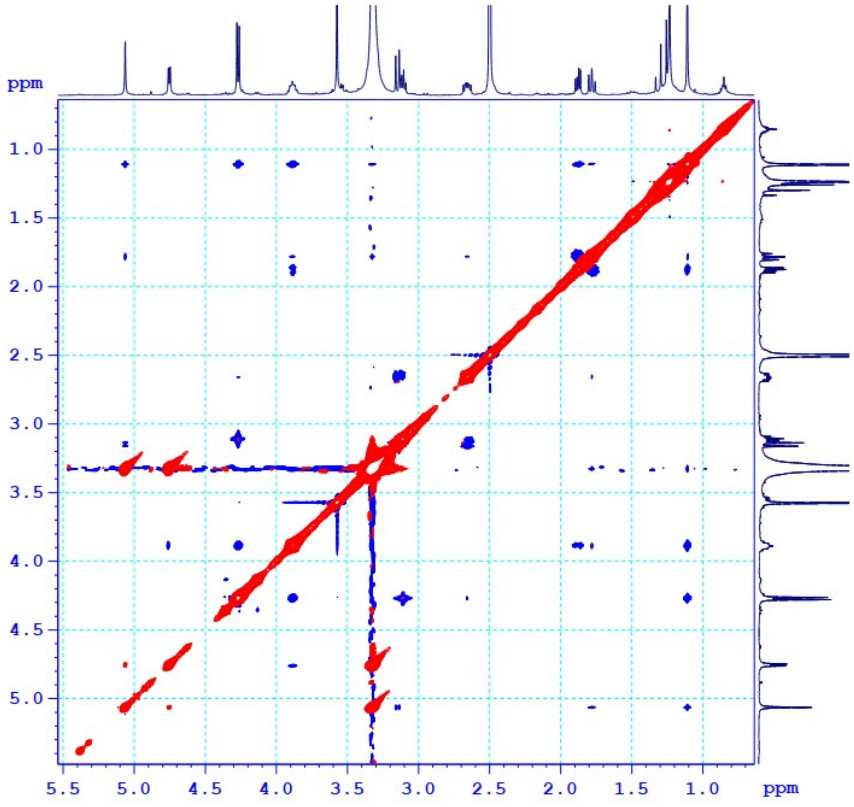


Figure S13.7. NOESY spectra of compound **1** (DMSO–d_6)

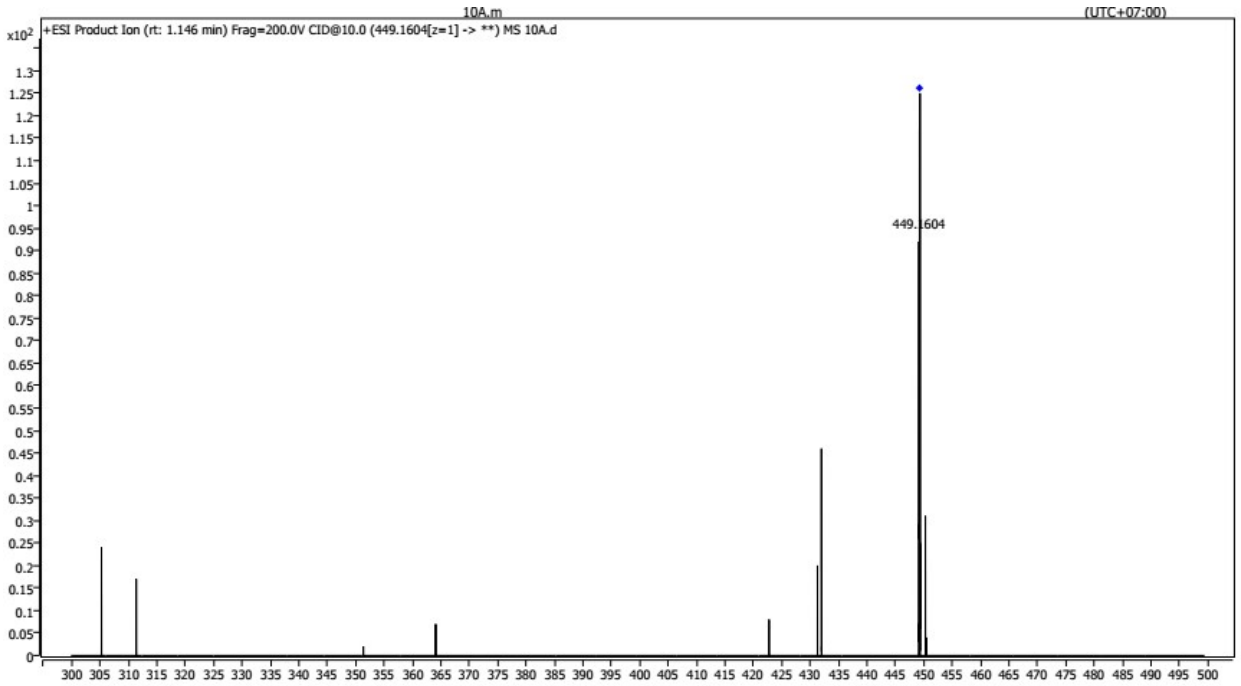


Figure S14.1. MS spectra of compound **2** (CD_3OD)

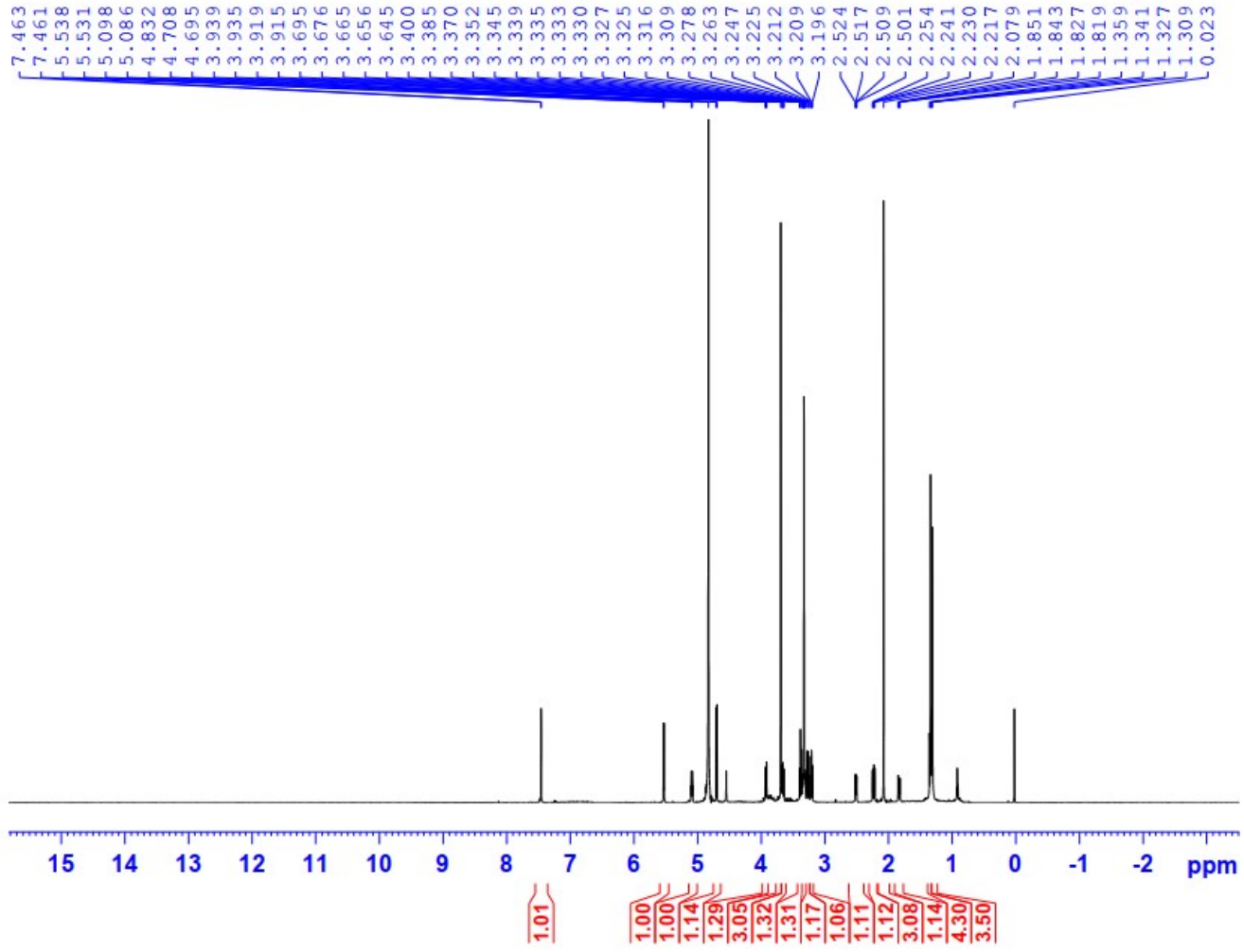


Figure S14.2. ^1H NMR spectra of compound **2** (CD_3OD)

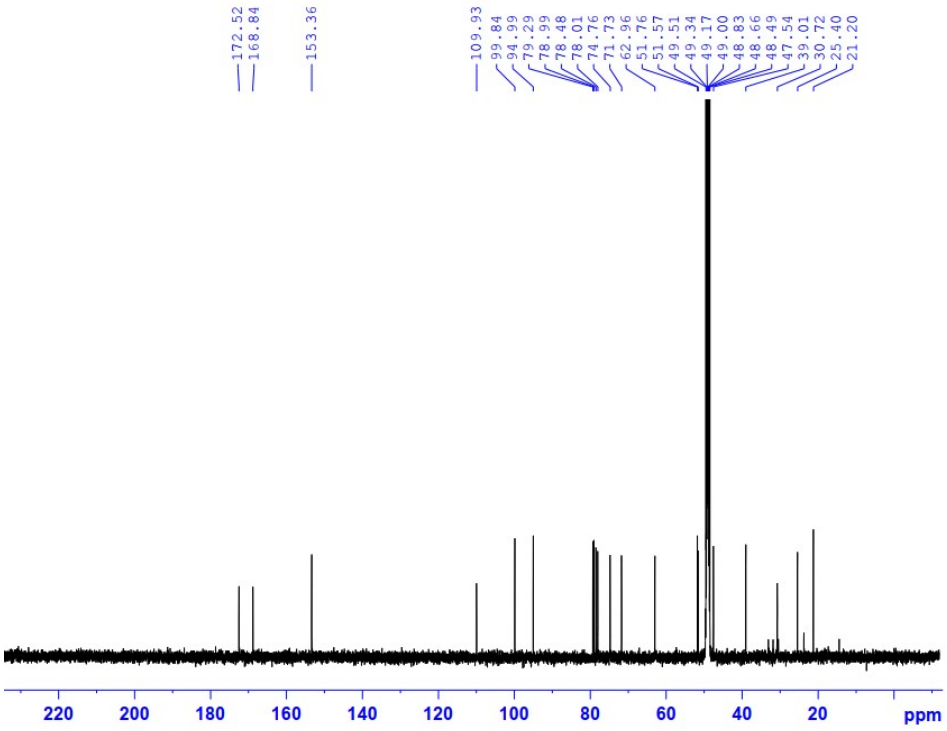


Figure S14.3. ^{13}C NMR spectra of compound **2** (CD_3OD)

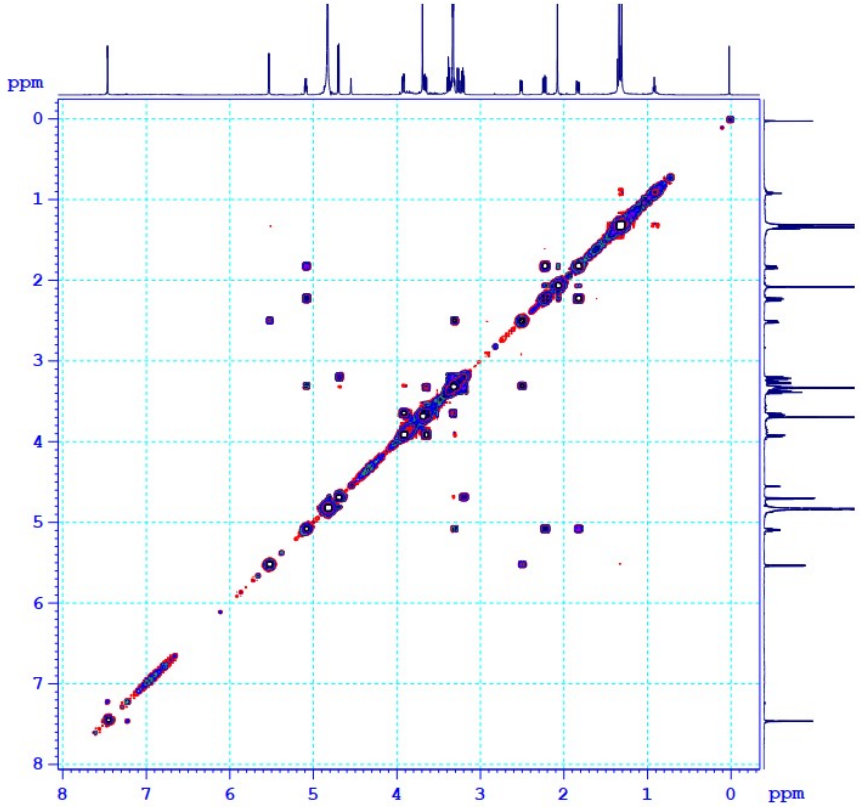


Figure S14.4. COSY spectra of compound **2** (CD_3OD)

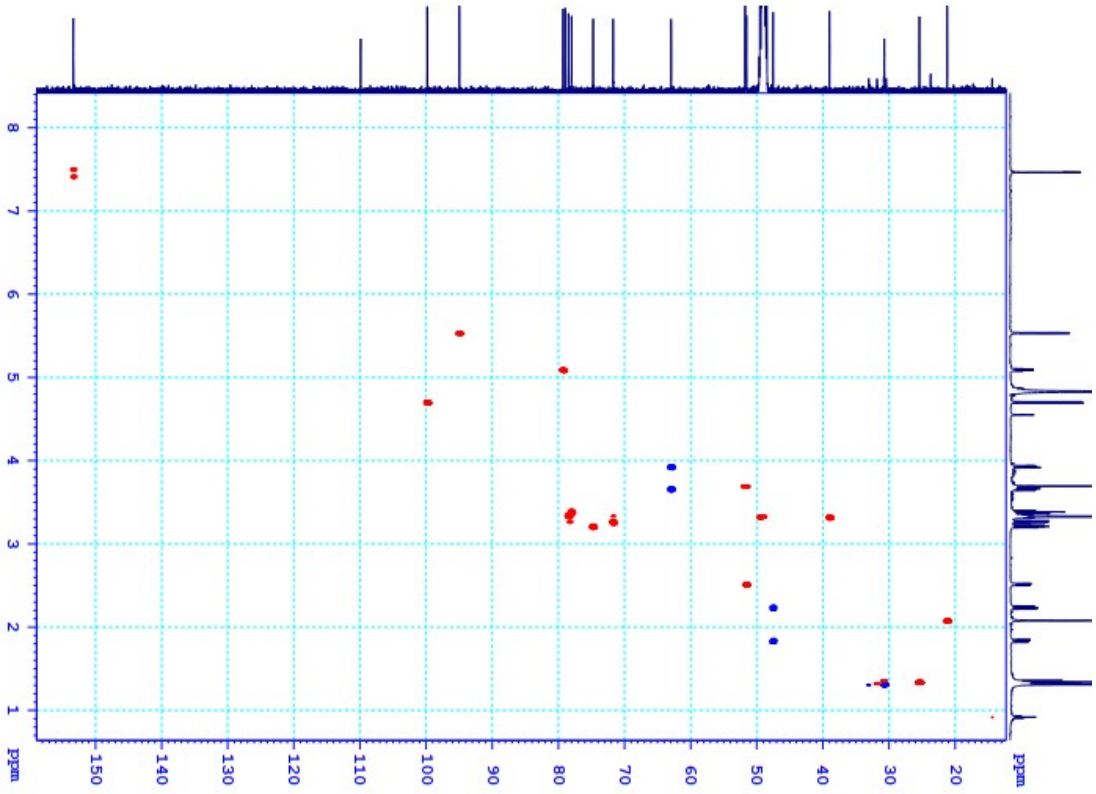


Figure S14.5. HSQC spectra of compound **2** (CD_3OD)

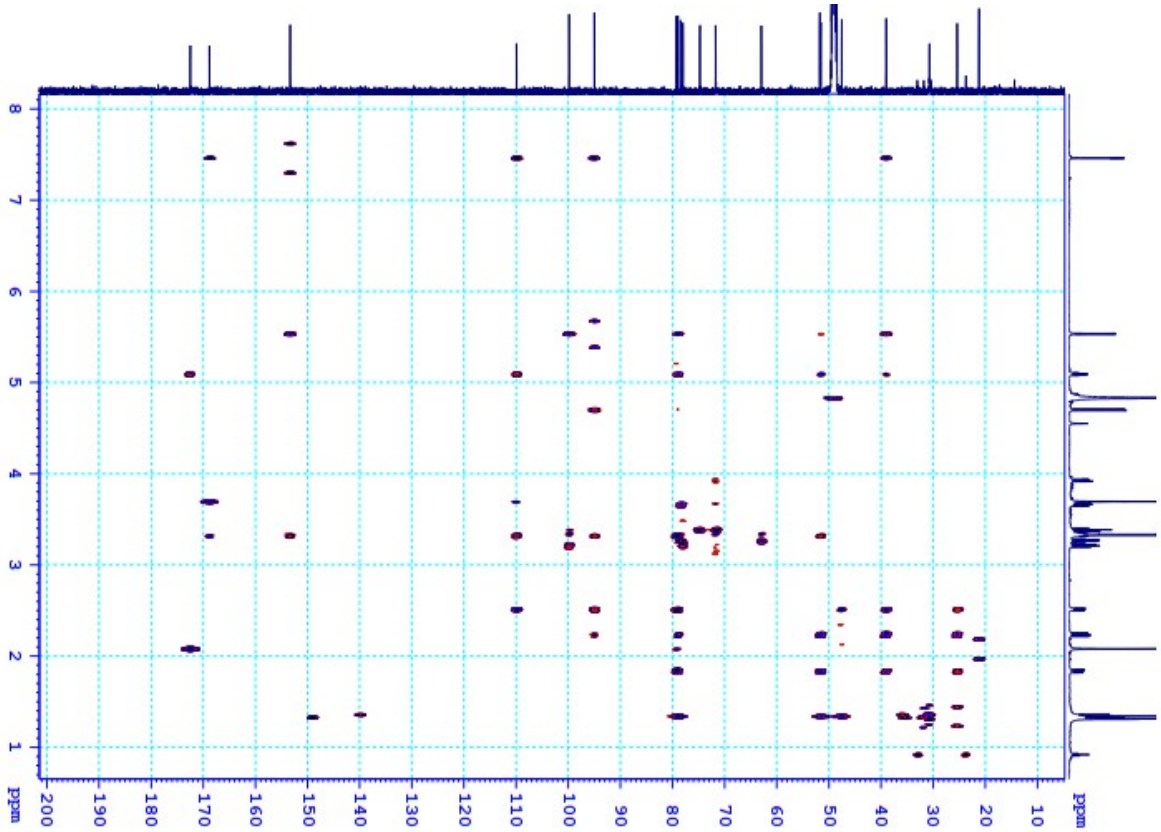


Figure S14.6. HMBC spectra of compound **2** (CD_3OD)

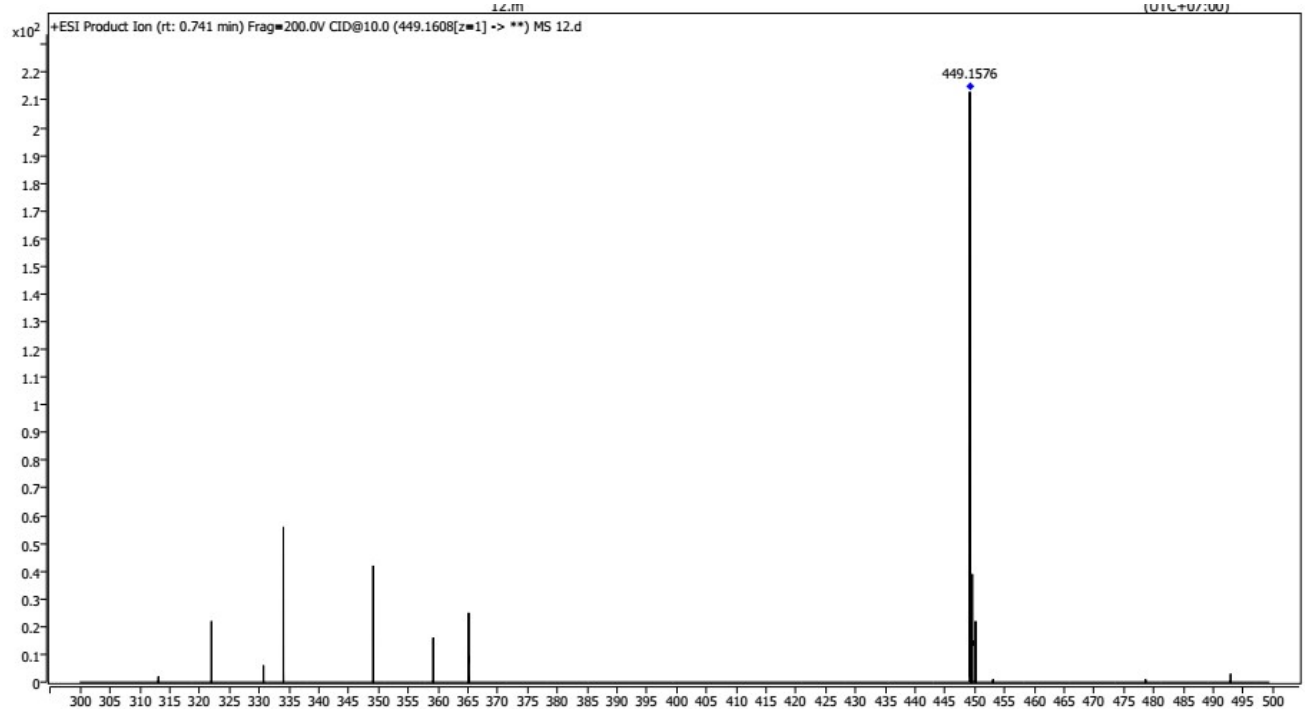


Figure S15.1. MS spectra of compound **3** (DMSO–d_6)

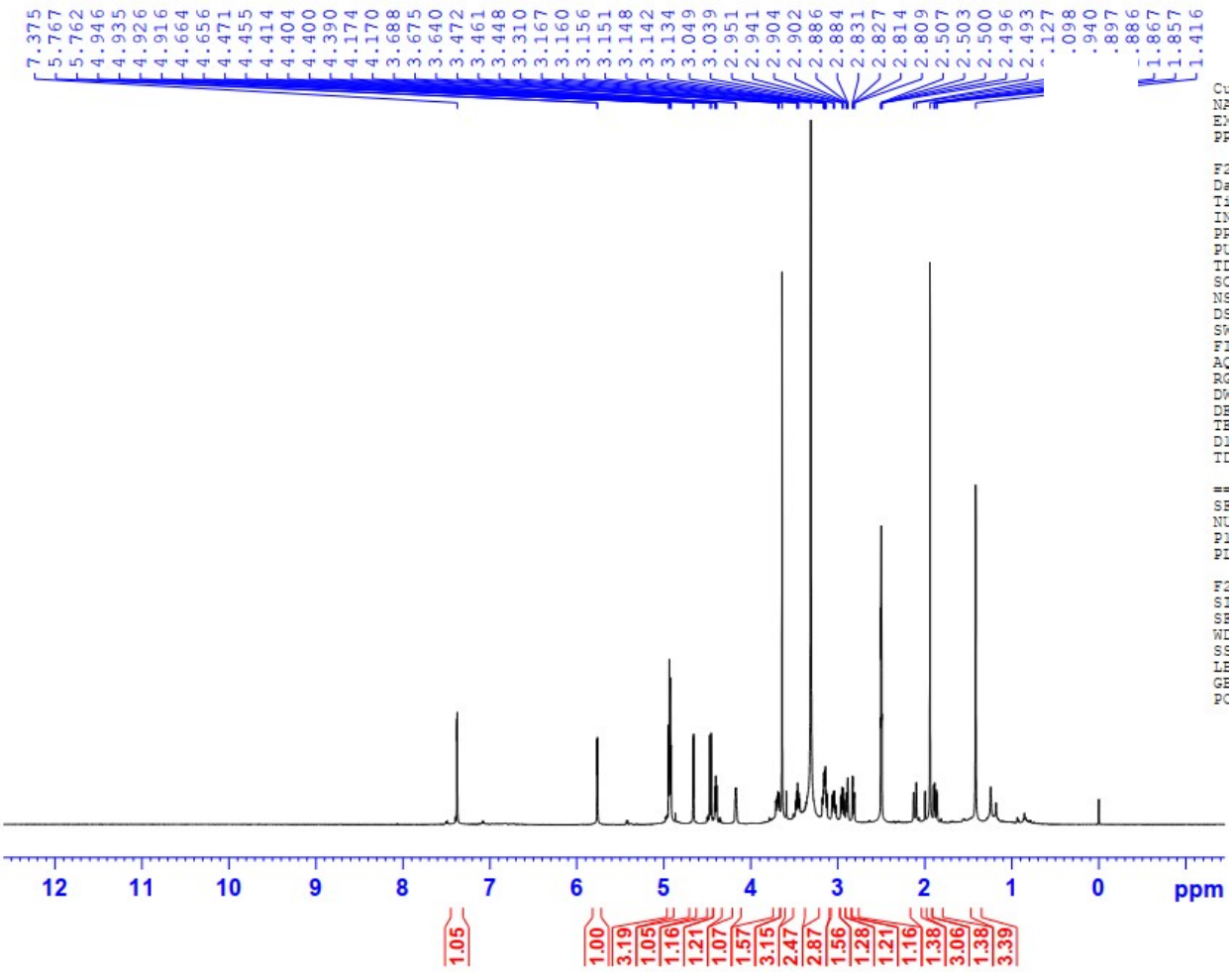


Figure S15.2. ^{1}H NMR spectra of compound **3** (DMSO–d_6)

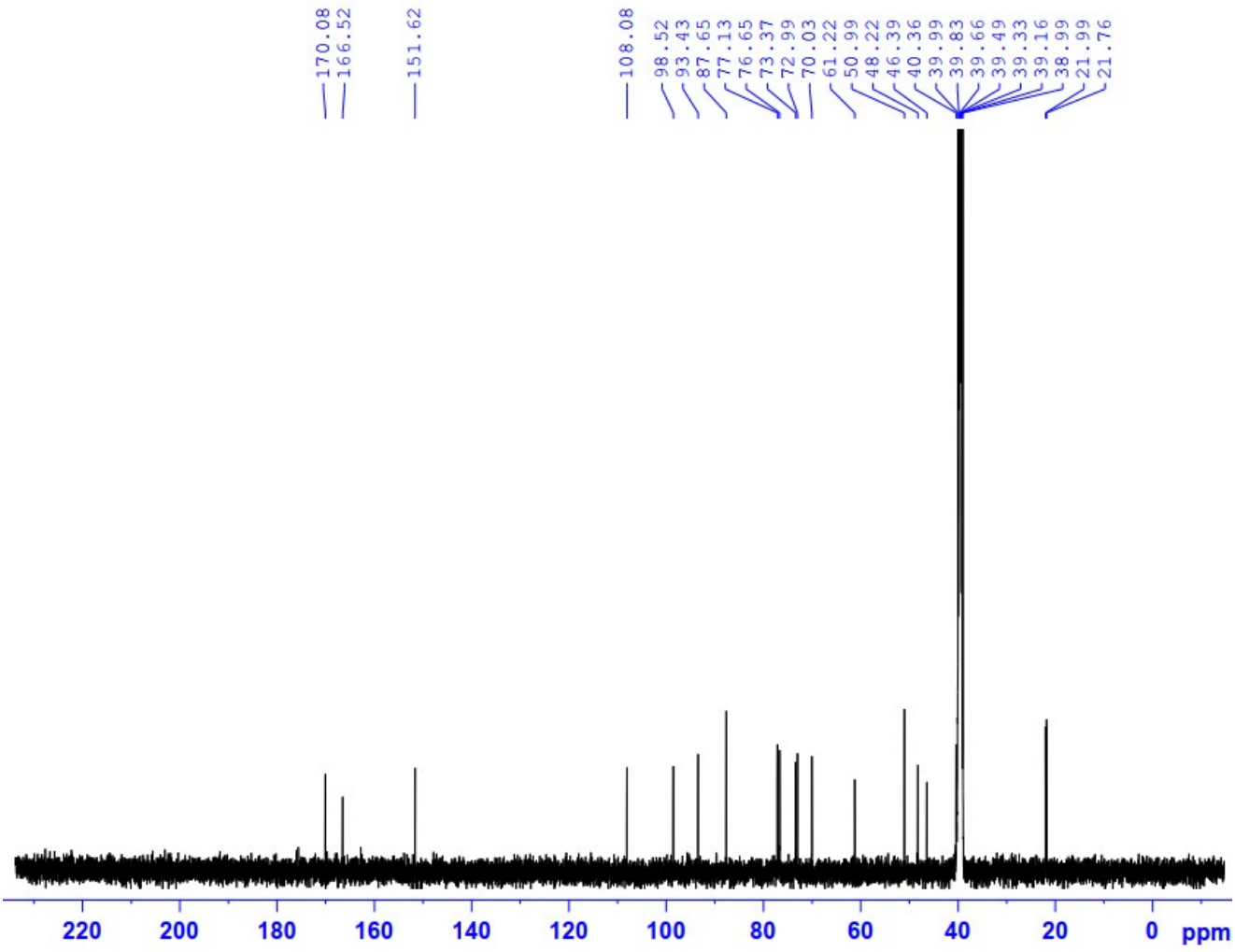


Figure S15.3. ^{13}C NMR spectra of compound **3** (DMSO–d_6)

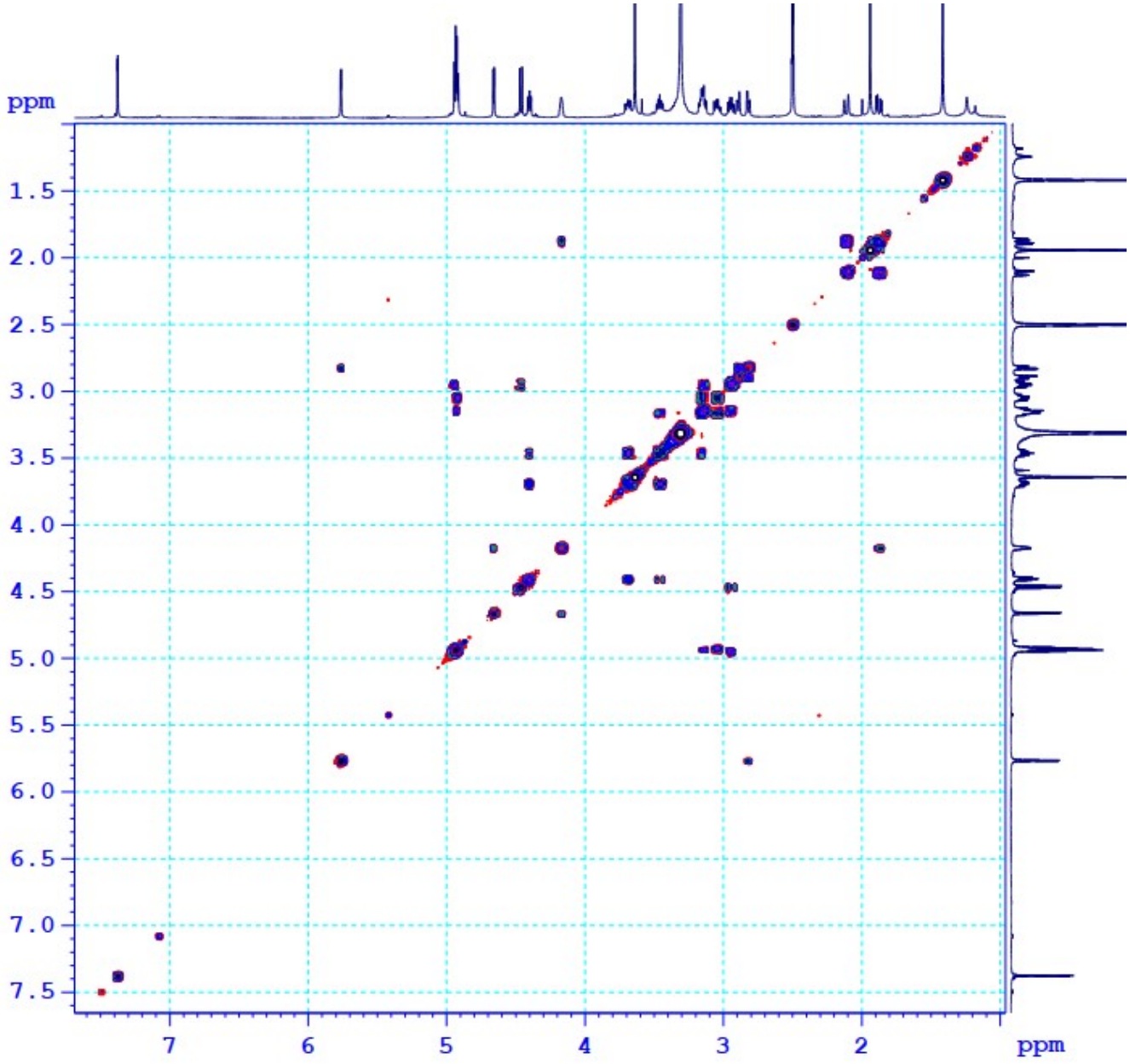


Figure S15.4. COSY spectra of compound **3** (DMSO–d_6)

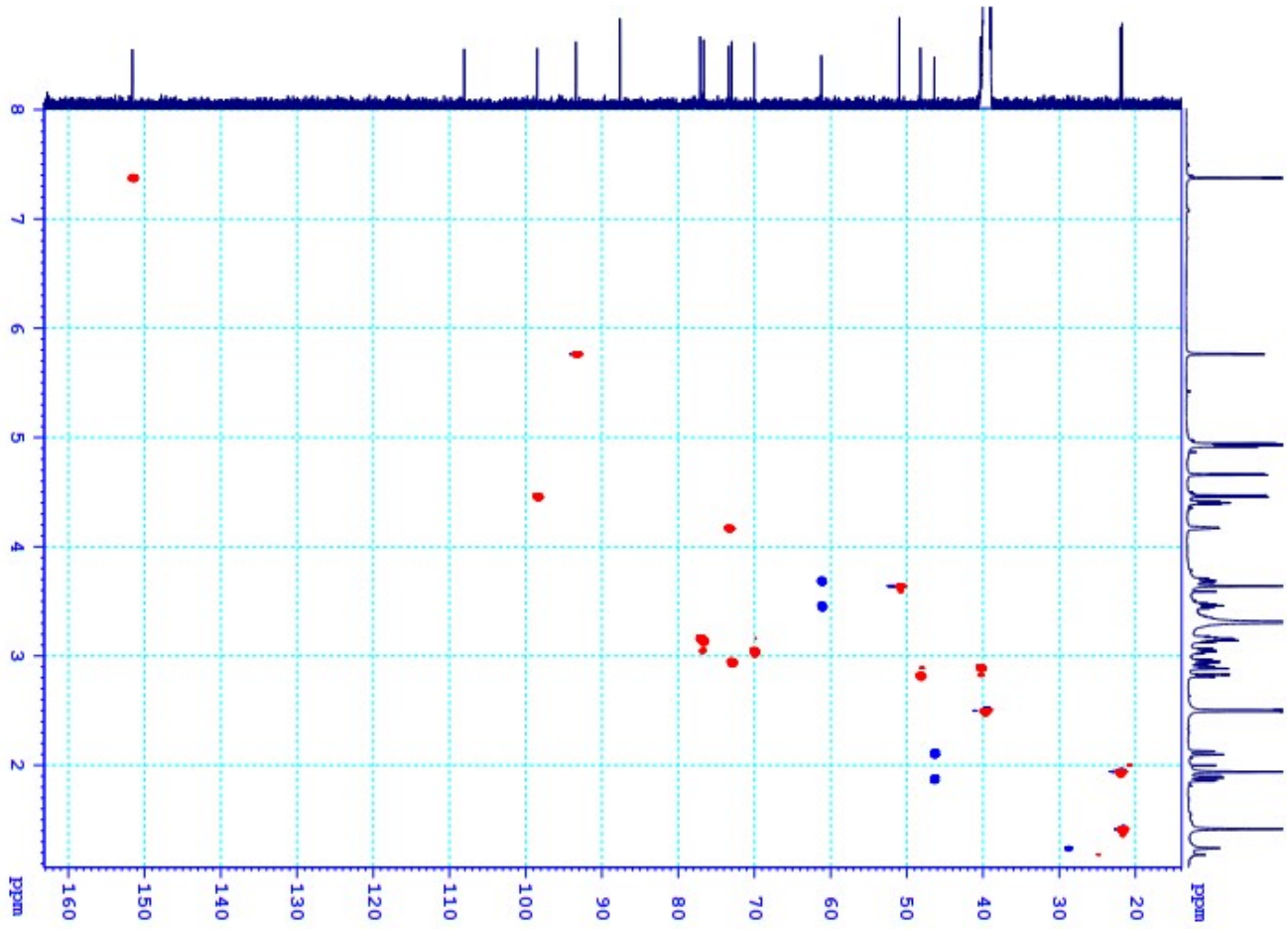


Figure S15.5. HSQC spectra of compound **3** (DMSO–d_6)

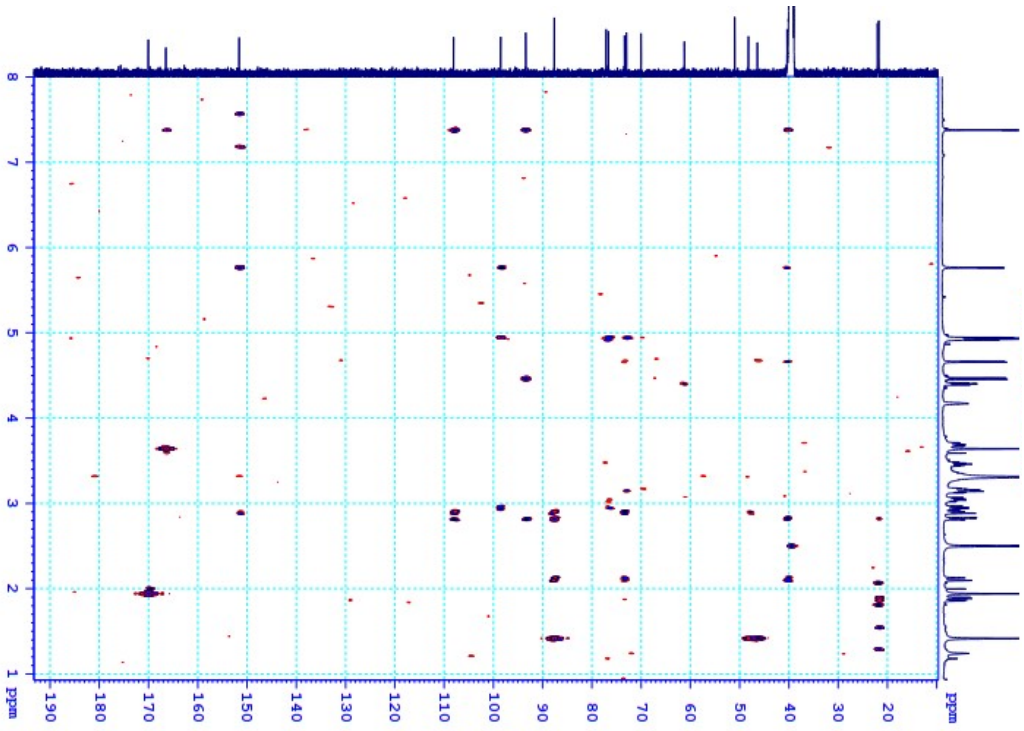


Figure S15.6. HMBC spectra of compound **3** (DMSO–d_6)

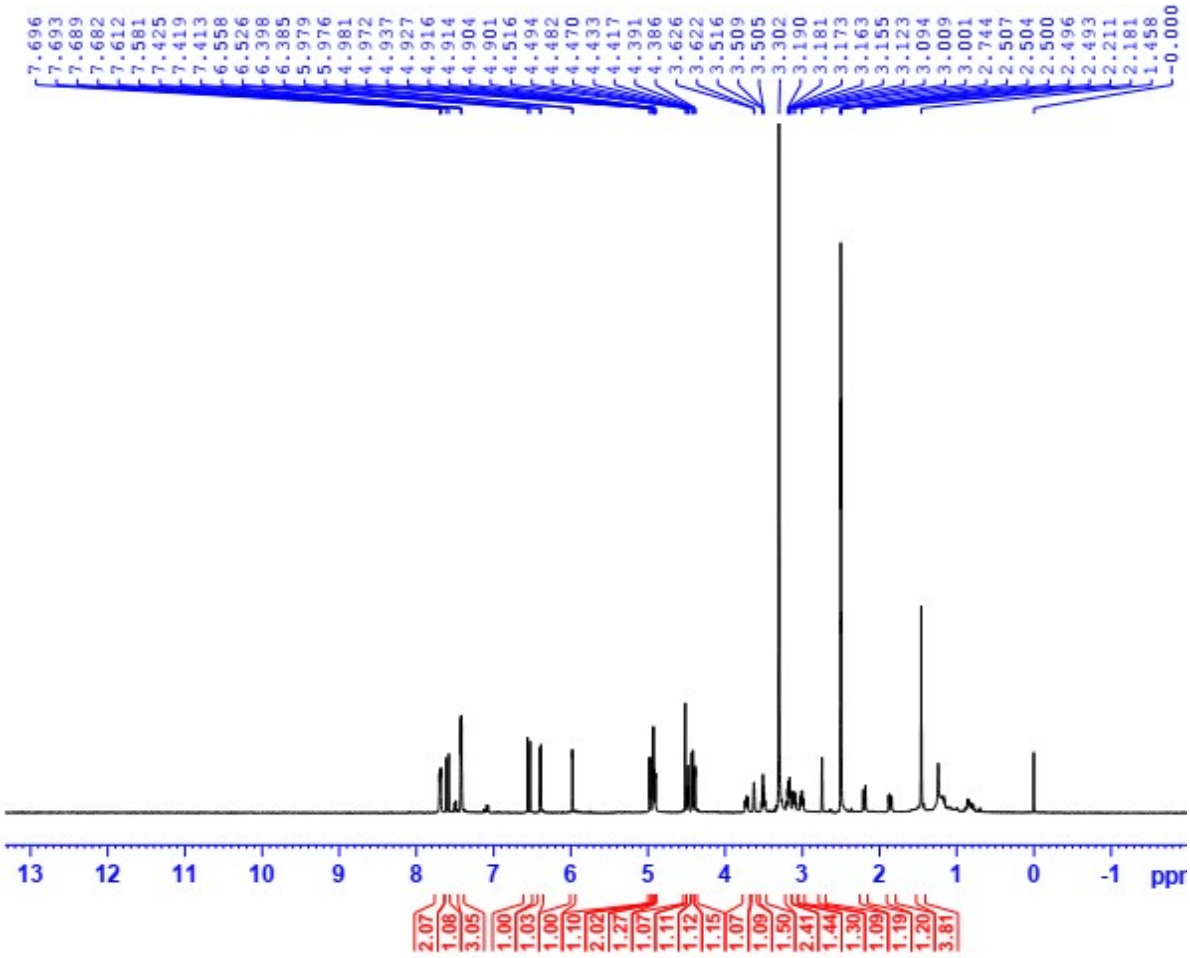


Figure S16.1. ^{1}H NMR spectra of compound **4** (DMSO–d_6)

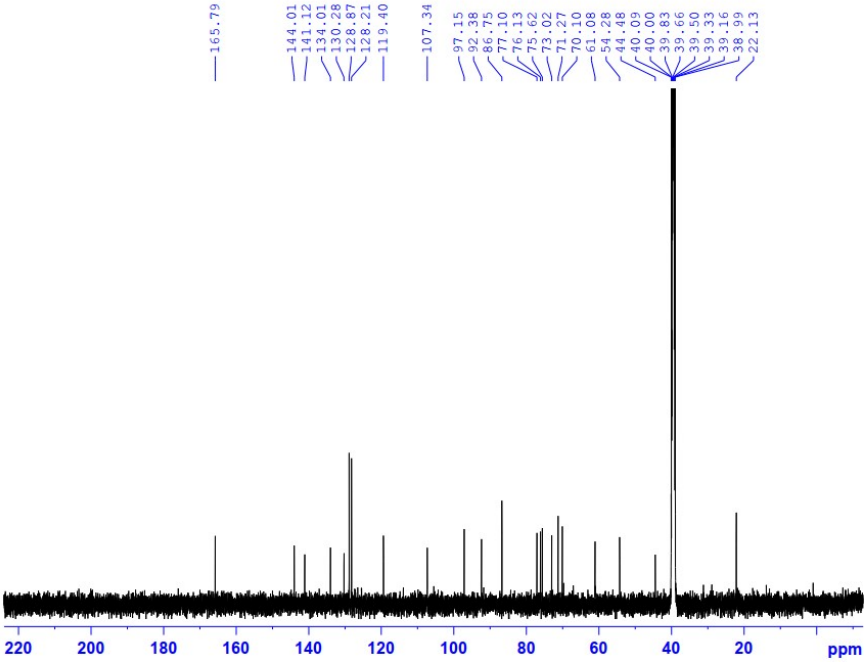


Figure S16.2. ^{13}C NMR spectra of compound **4** (DMSO–d_6)

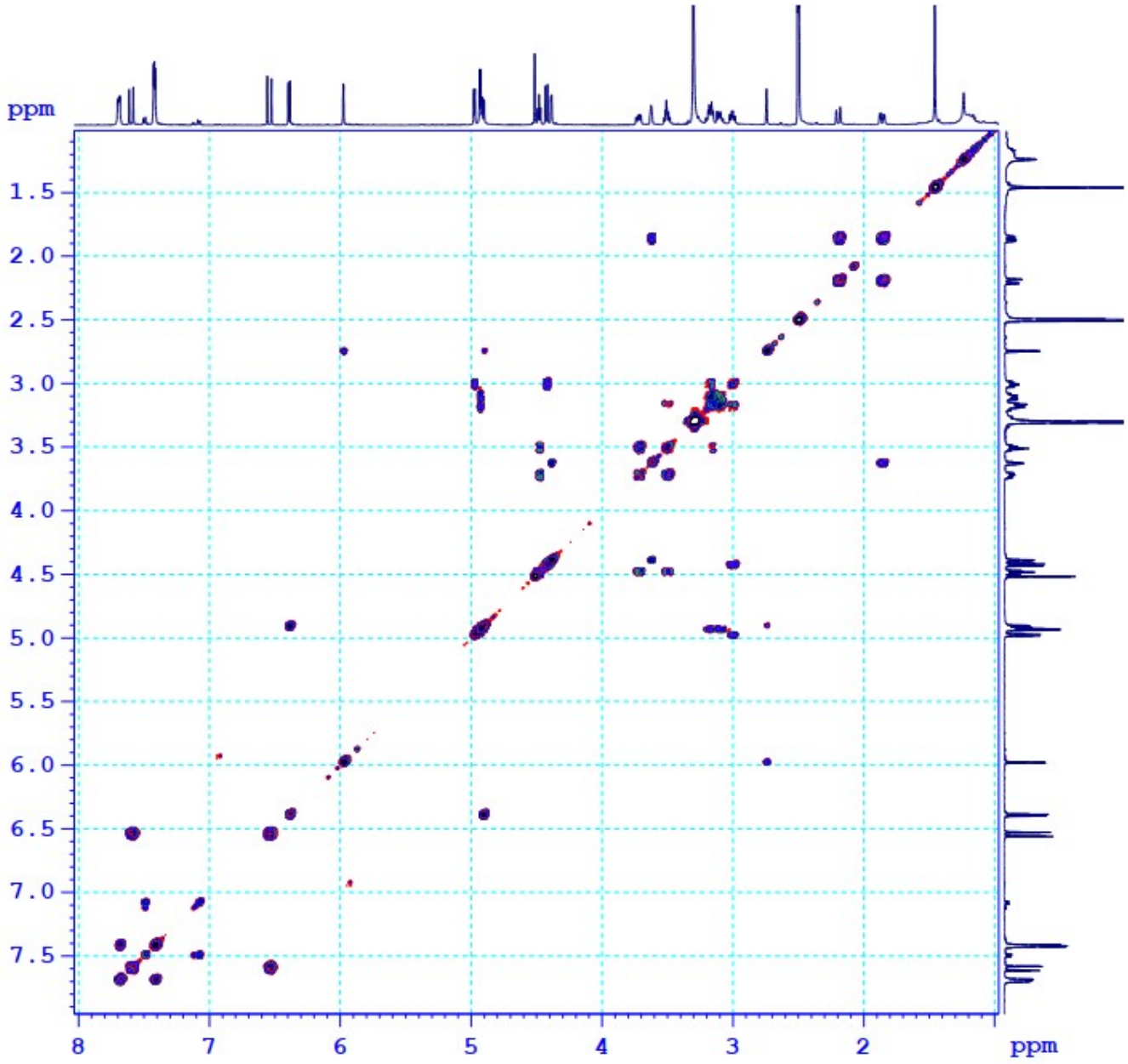


Figure S16.3. COSY spectra of compound **4** (DMSO–d_6)

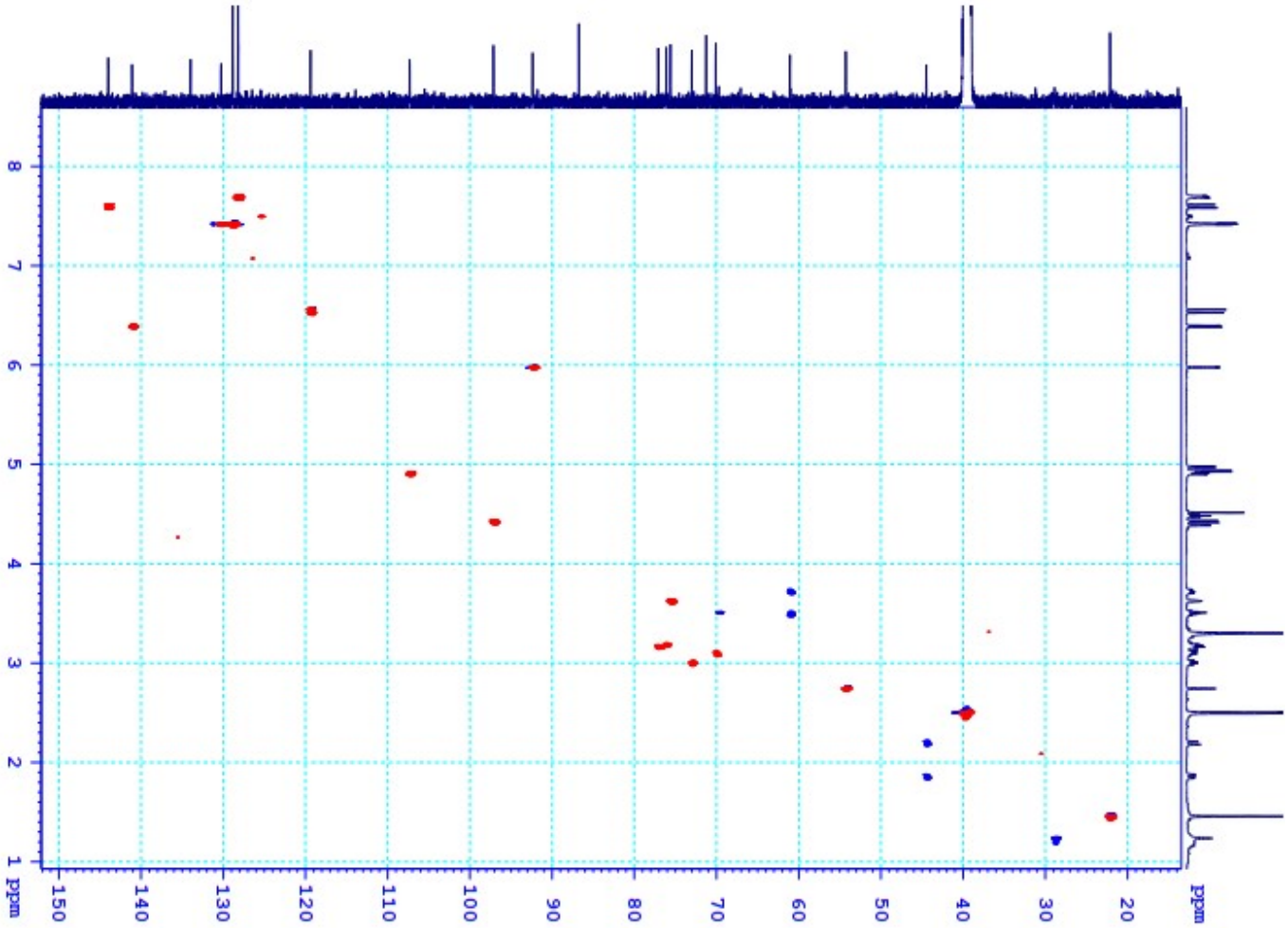


Figure S16.4. HSQC spectra of compound **4** (DMSO–d_6)

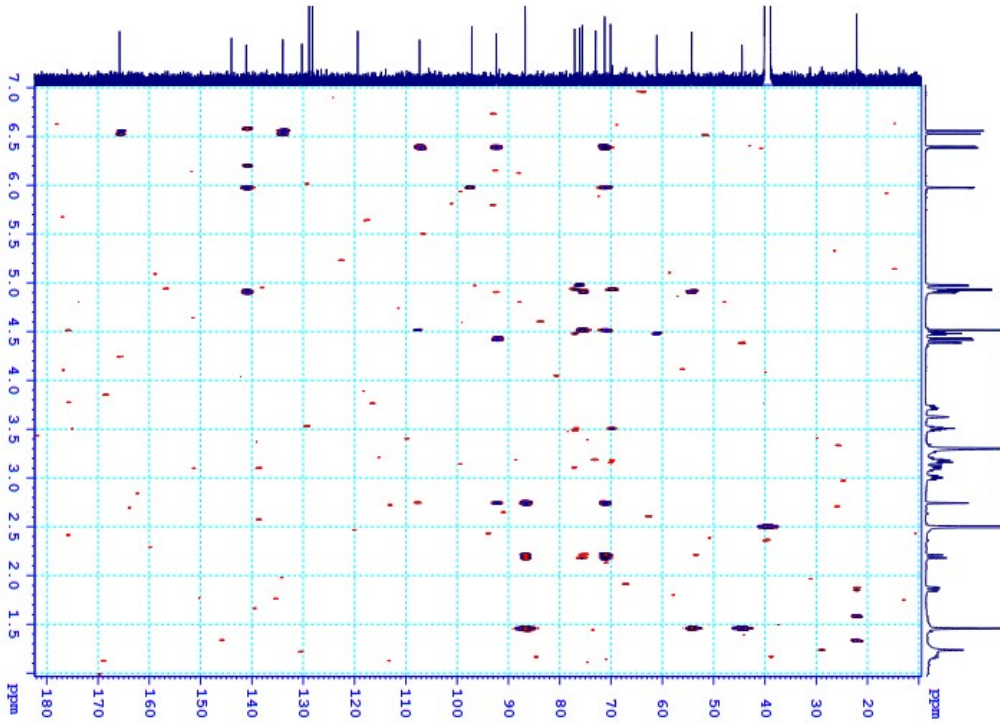


Figure S16.5. HMBC spectra of compound **4** (DMSO–d_6)

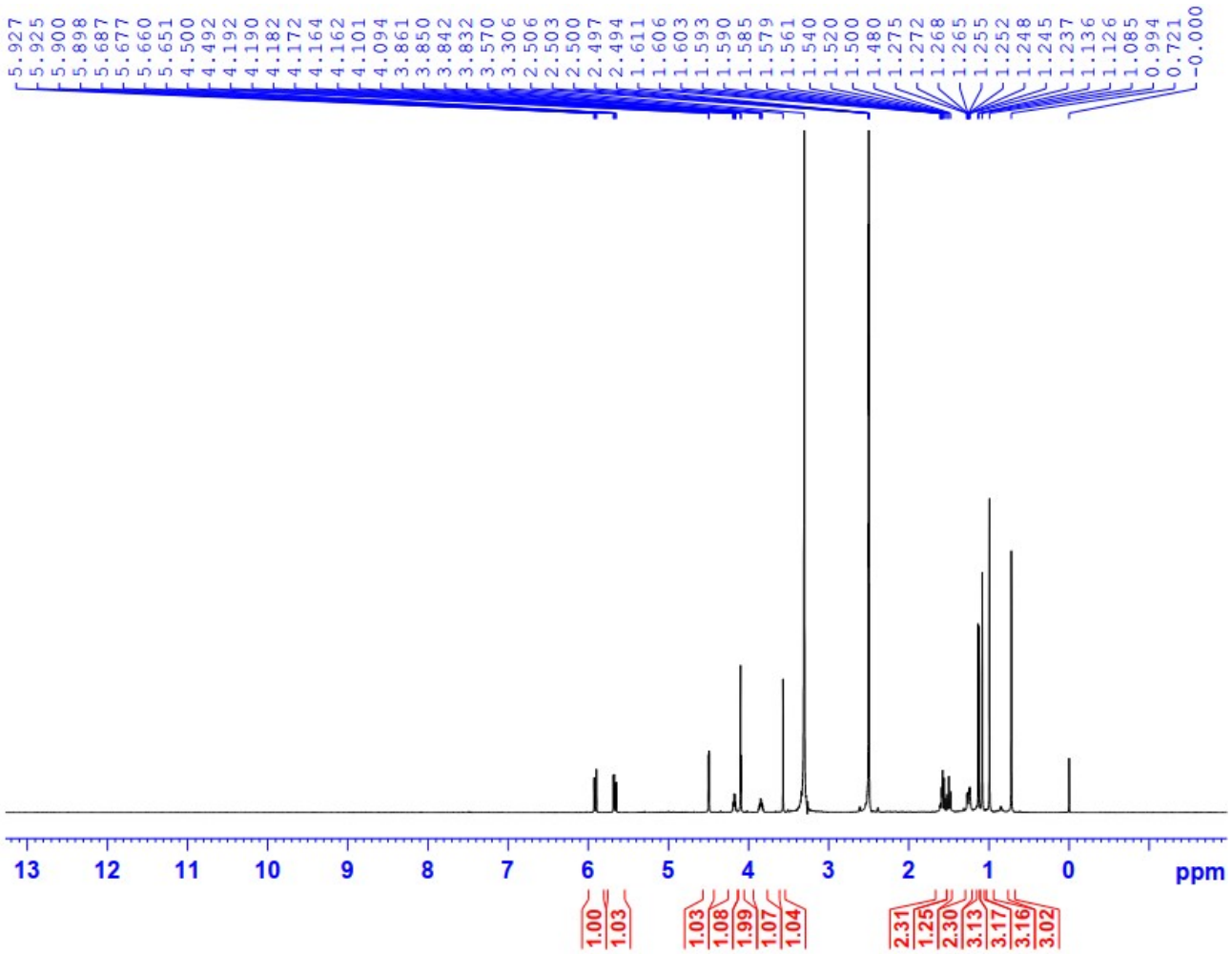


Figure S17.1. ^{1}H NMR spectra of compound **5** (DMSO–d_6)

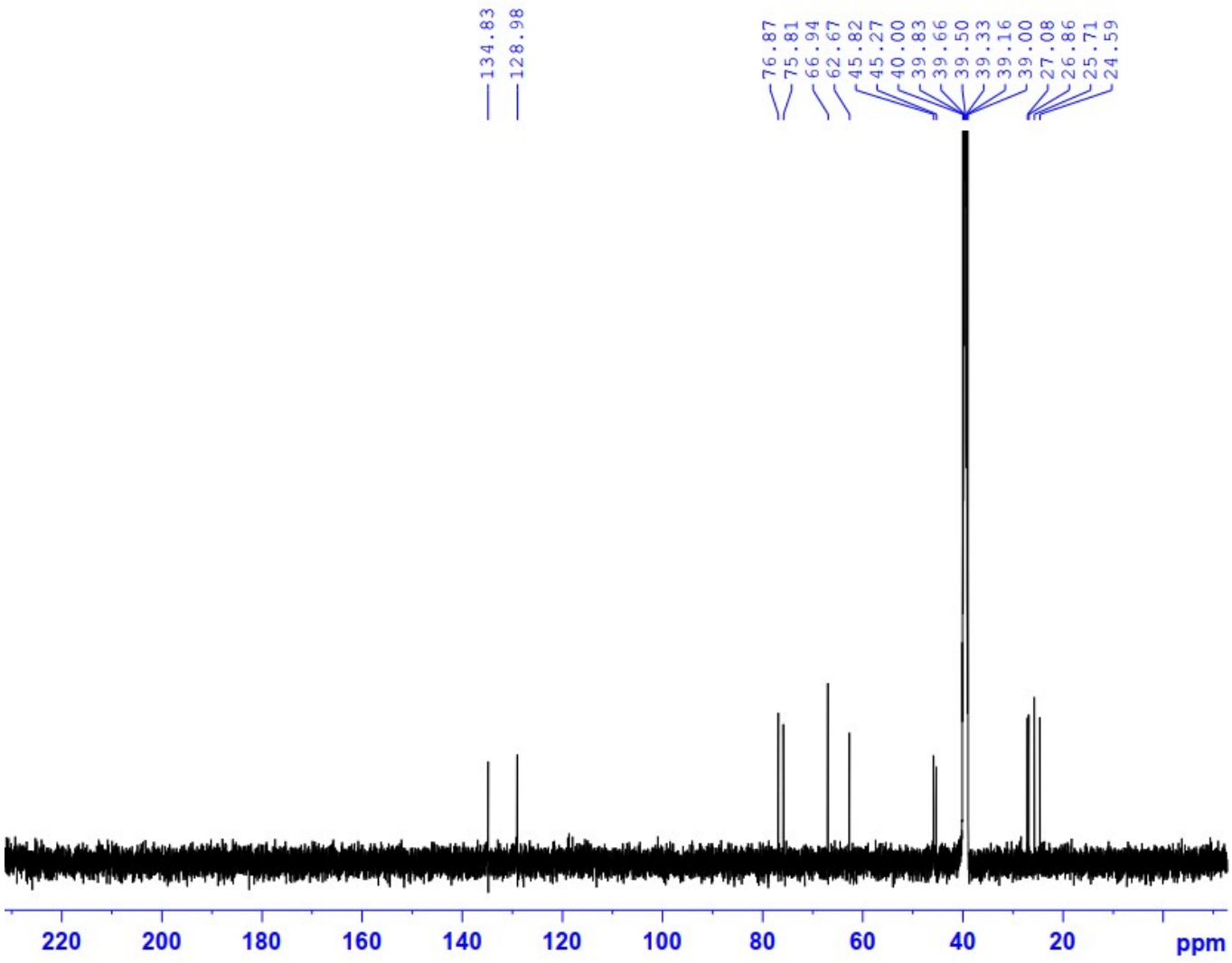


Figure S17.2. ^{13}C NMR spectra of compound **5** (DMSO–d_6)

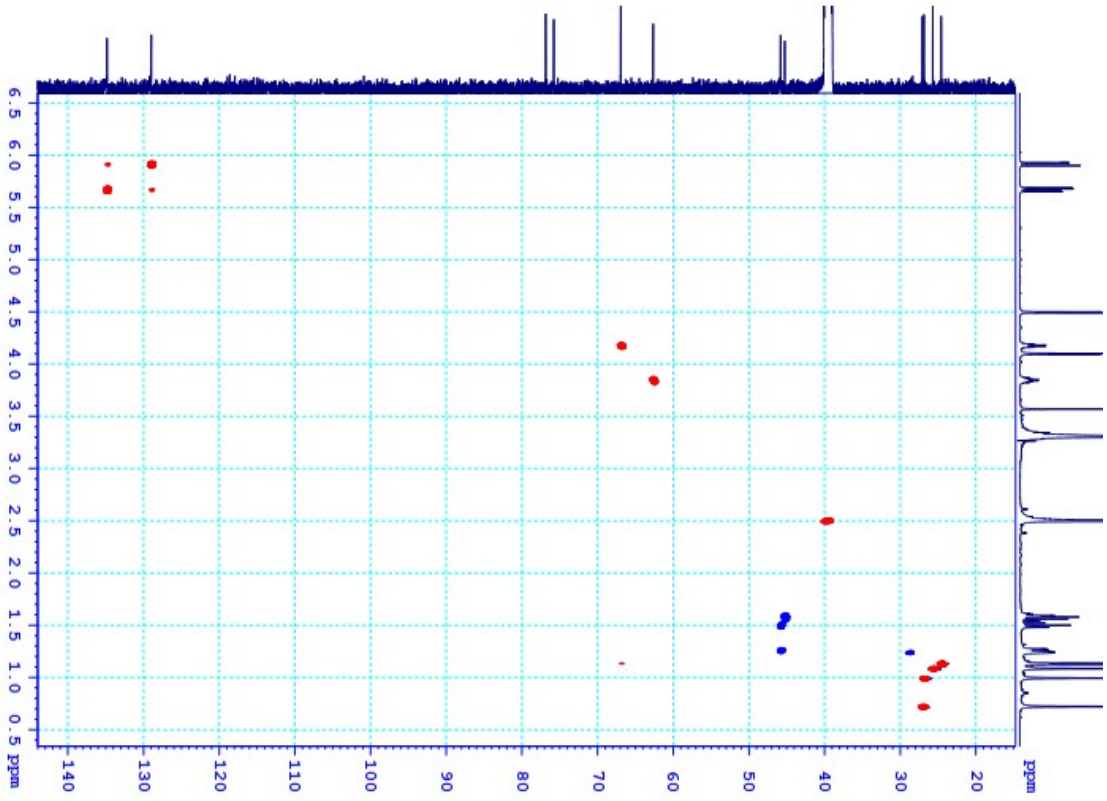


Figure S17.3. HSQC spectra of compound **5** (DMSO–d_6)

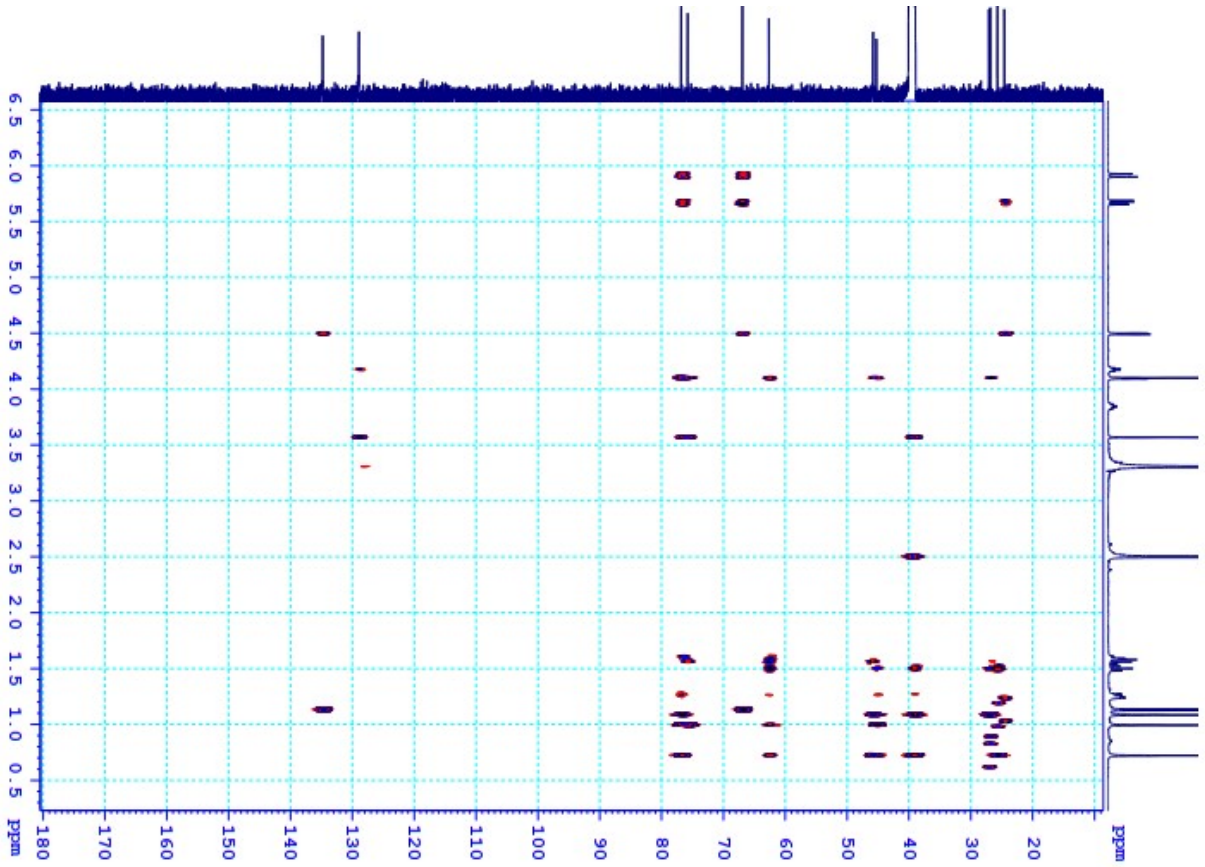


Figure S17.4. HMBC spectra of compound **5** (DMSO–d_6)

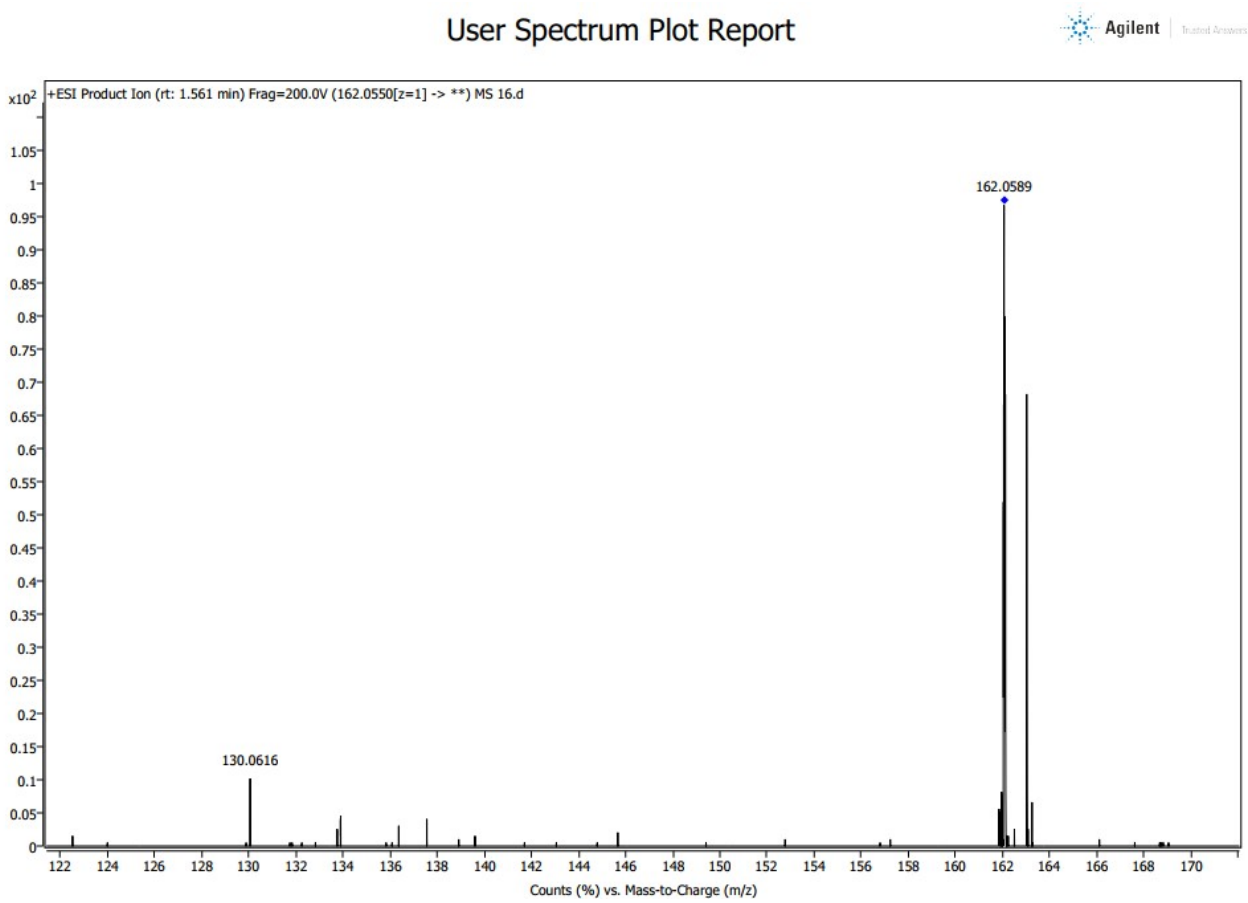


Figure S18.1. MS spectra of compound **6** (DMSO–d_6)

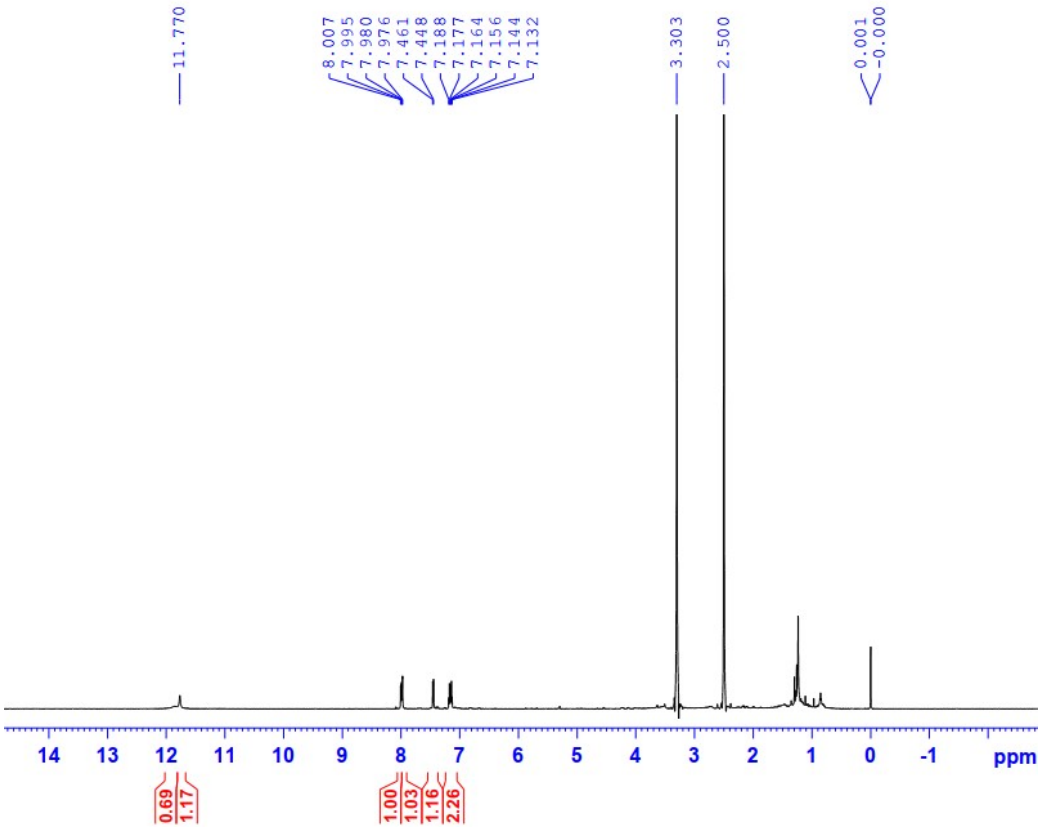


Figure S18.2. ^{1}H NMR spectra of compound **6** (DMSO–d_6)

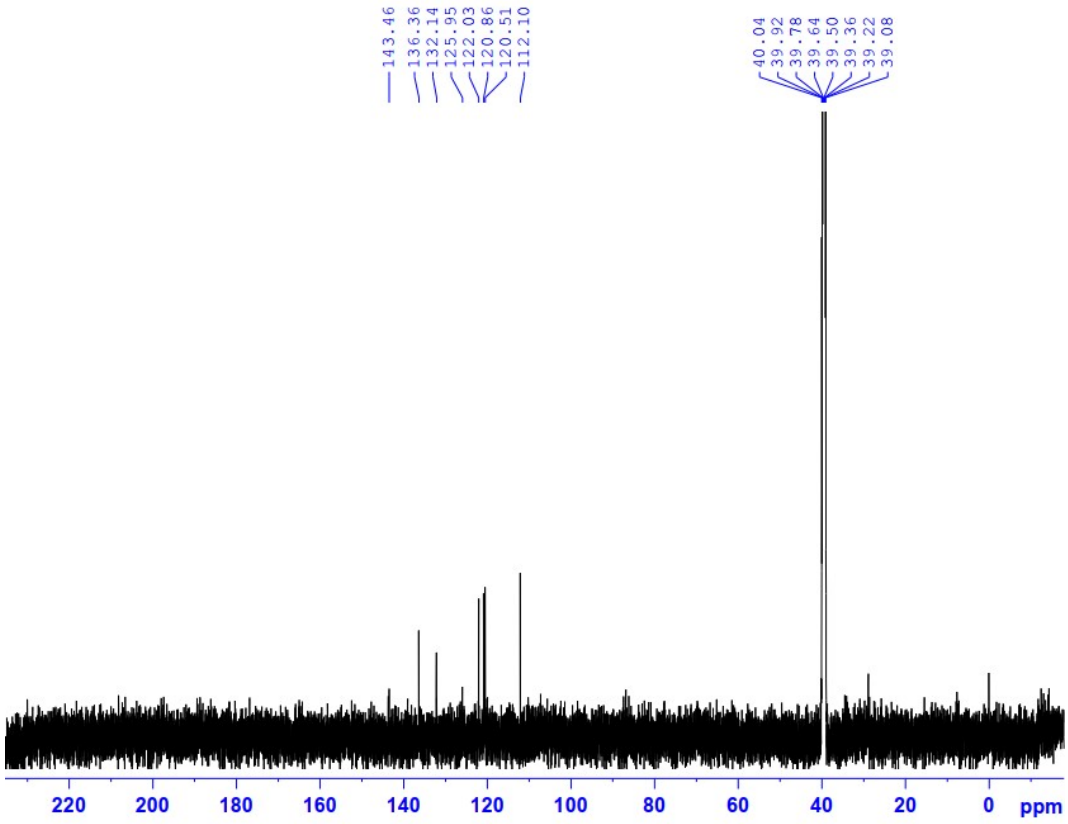


Figure S18.3. ^{13}C NMR spectra of compound **6** (DMSO–d_6)

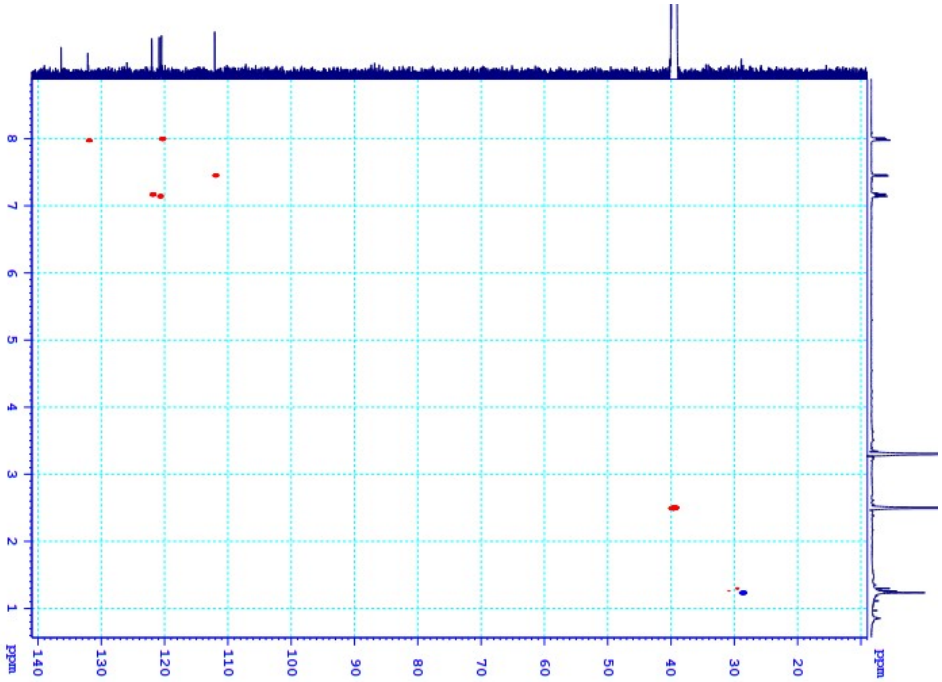


Figure S18.4. HSQC spectra of compound **6** (DMSO–d_6)

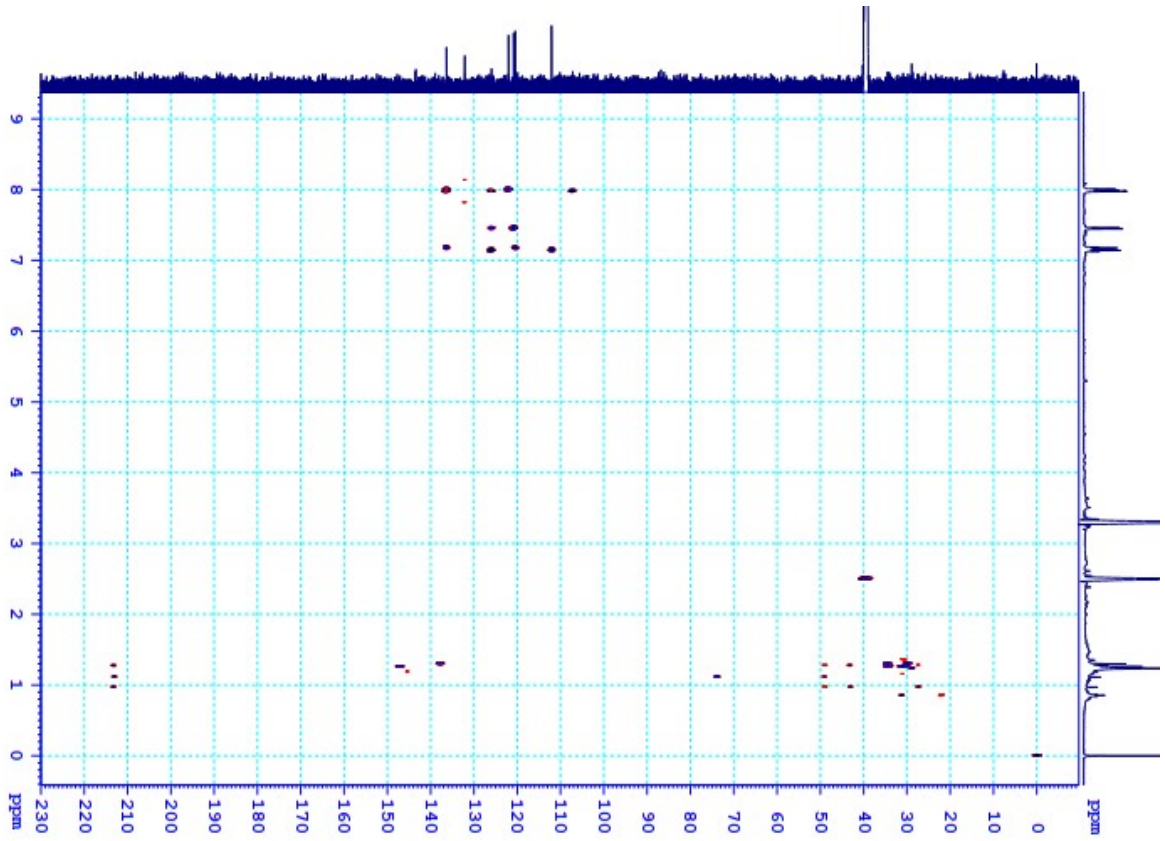


Figure S18.5. HMBC spectra of compound **6** (DMSO–d_6)

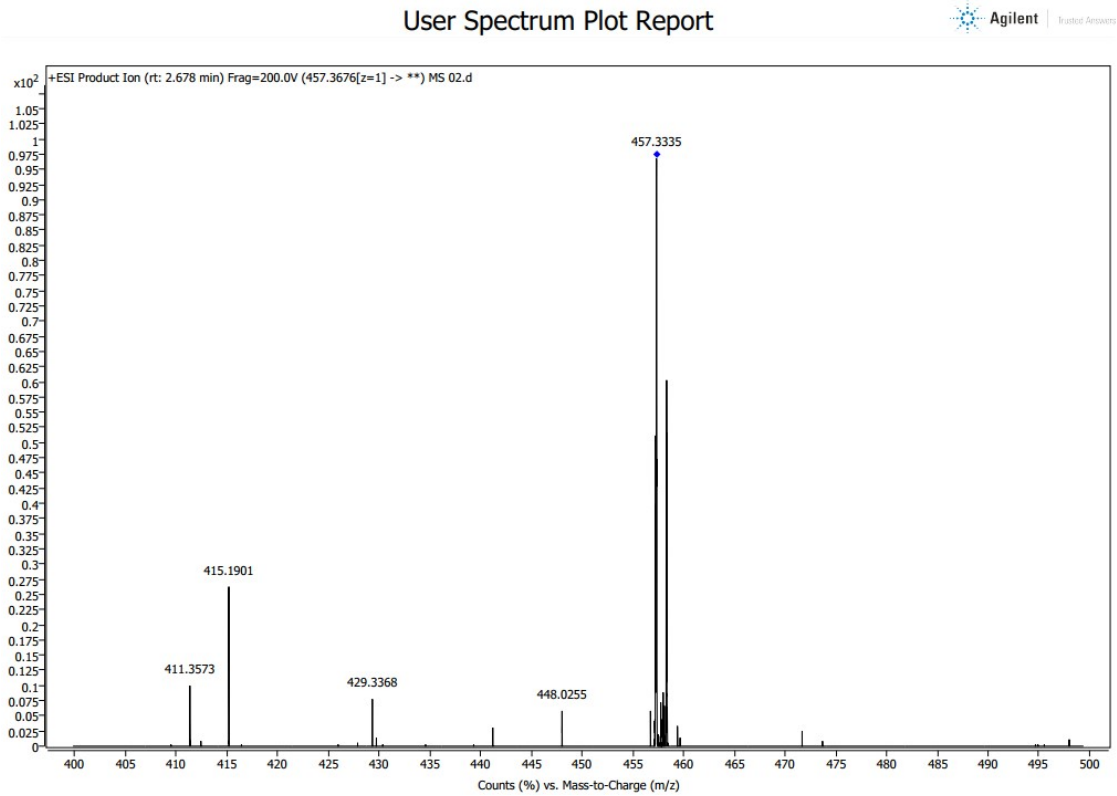


Figure S19.1. MS spectra of compound **7** ($CDCl_3$)

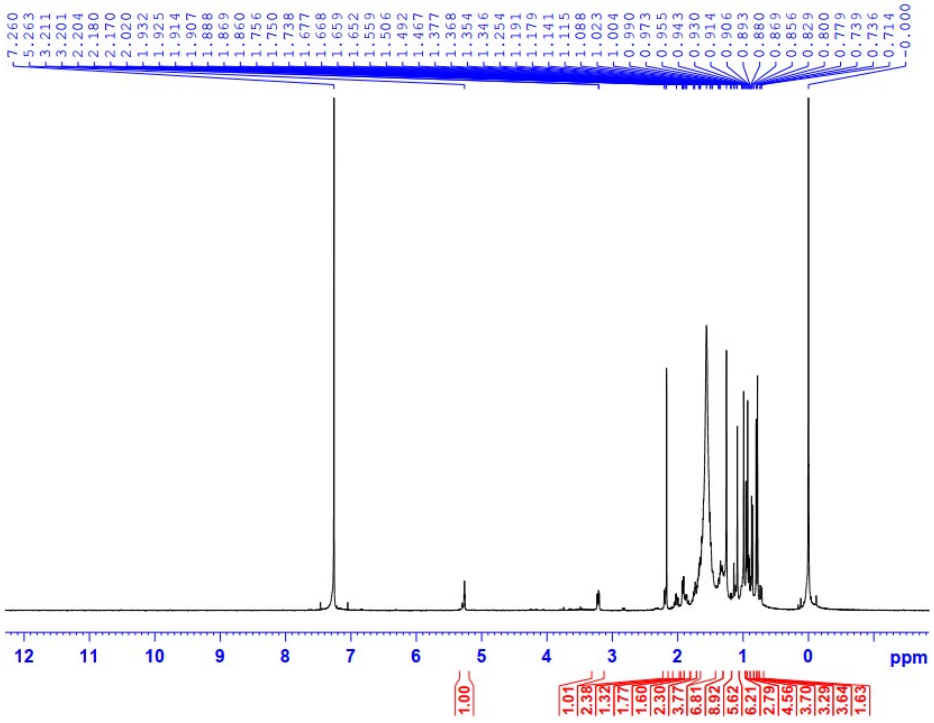


Figure S19.2. ^1H NMR spectra of compound **7** ($CDCl_3$)

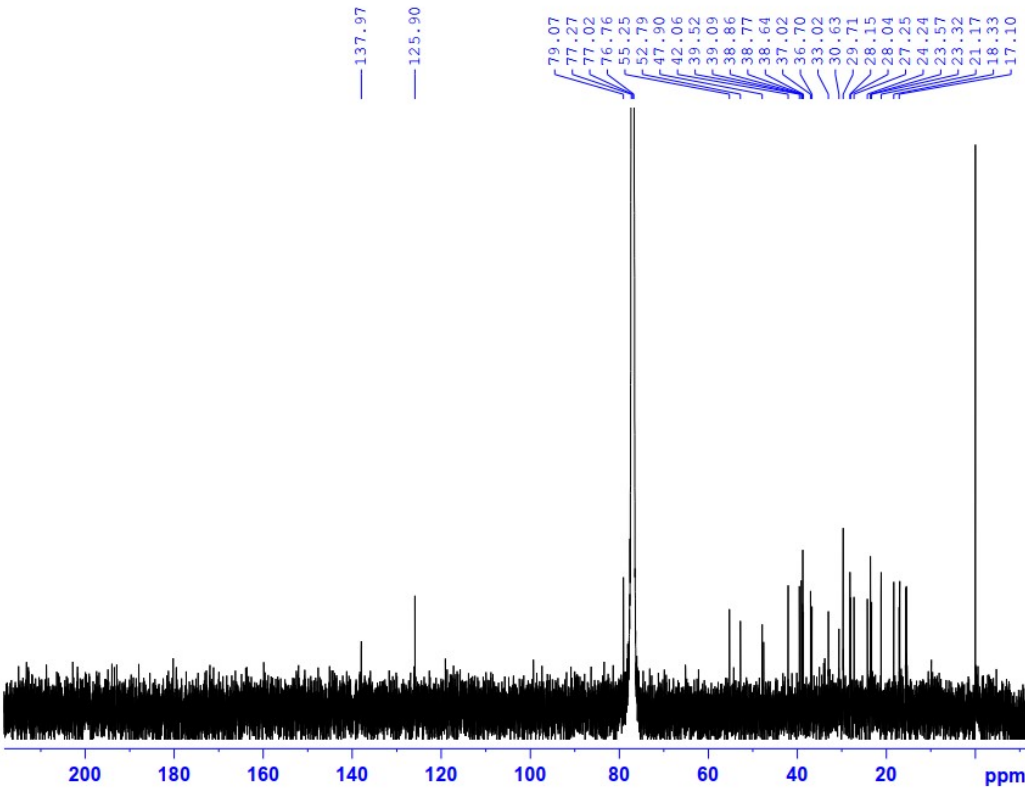


Figure S19.3. ^{13}C NMR spectra of compound **7** ($CDCl_3$)

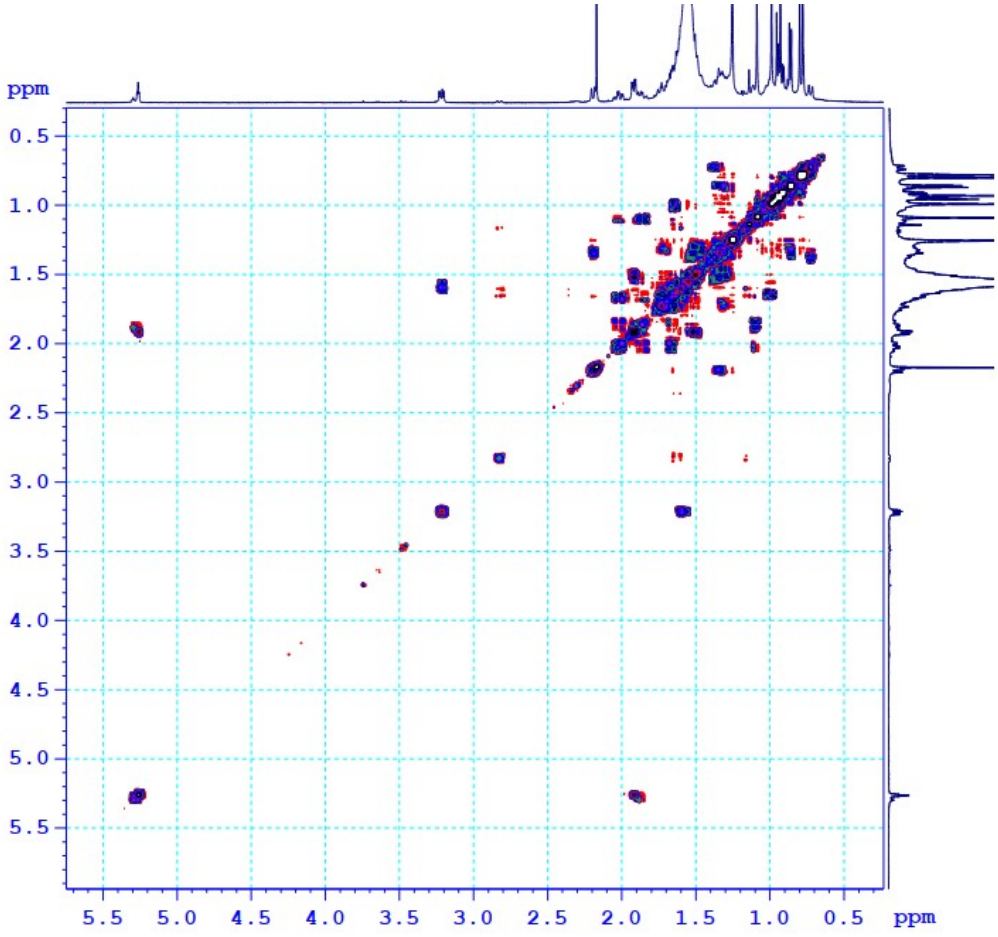


Figure S19.4. COSY spectra of compound **7** ($CDCl_3$)

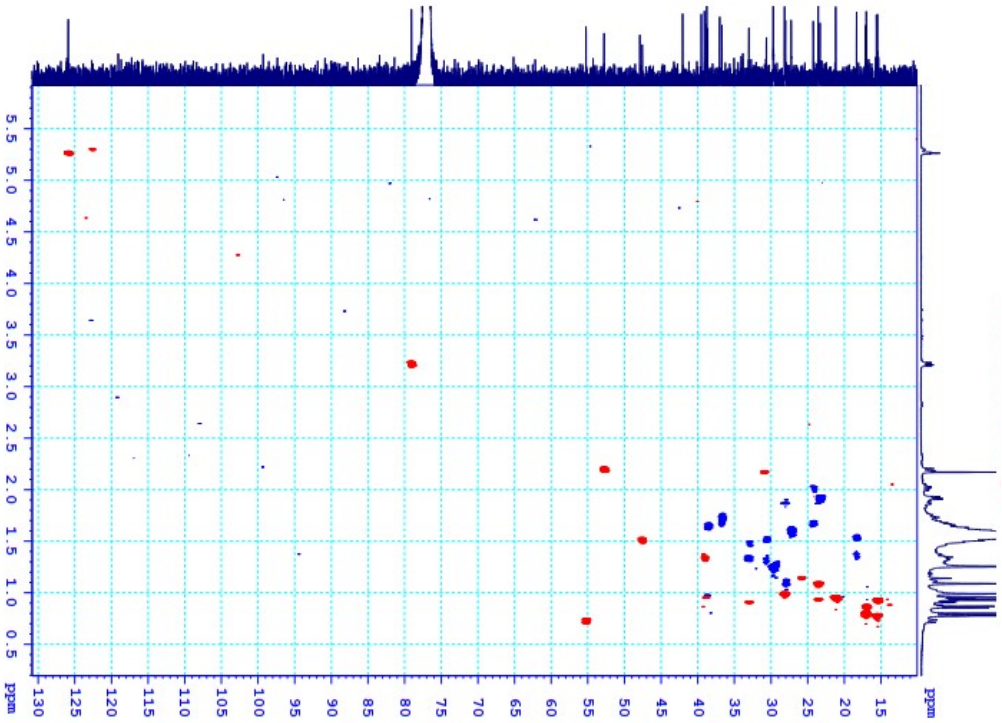


Figure S19.5. HSQC spectra of compound **7** ($CDCl_3$)

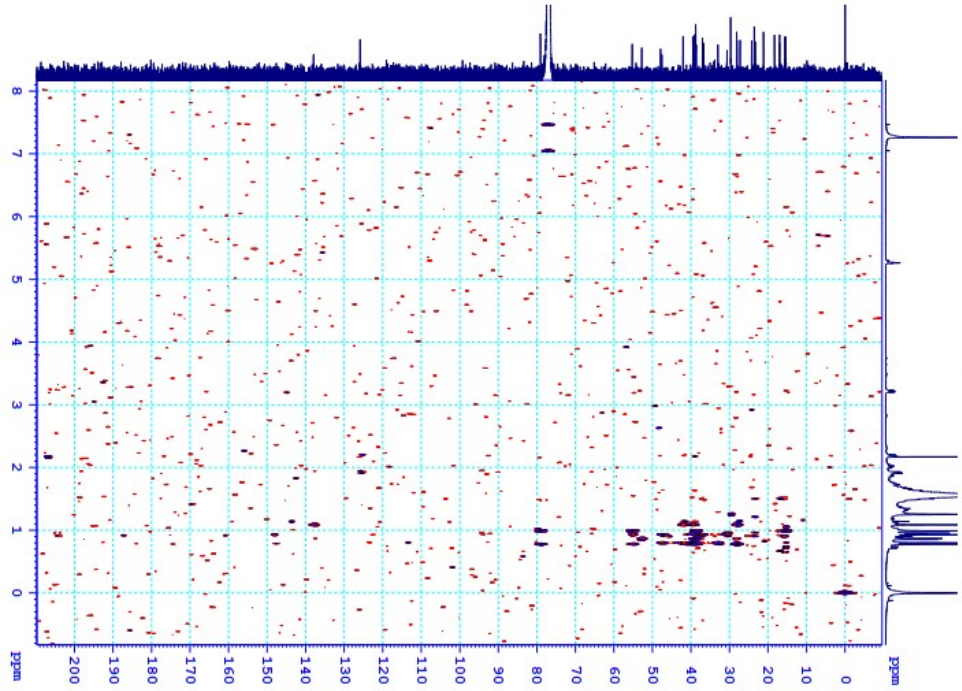


Figure S19.6. HMBC spectra of compound **7** ($CDCl_3$)

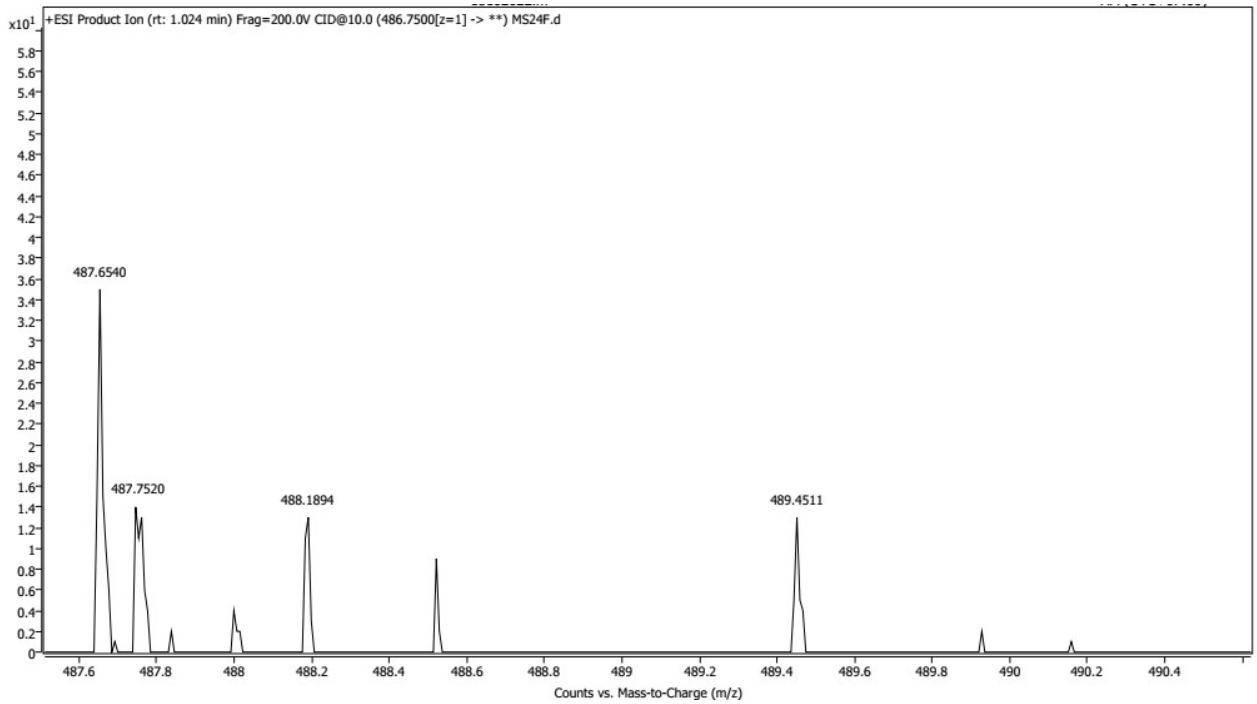


Figure S20.1. MS spectra of compound **8** (CD_3OD)

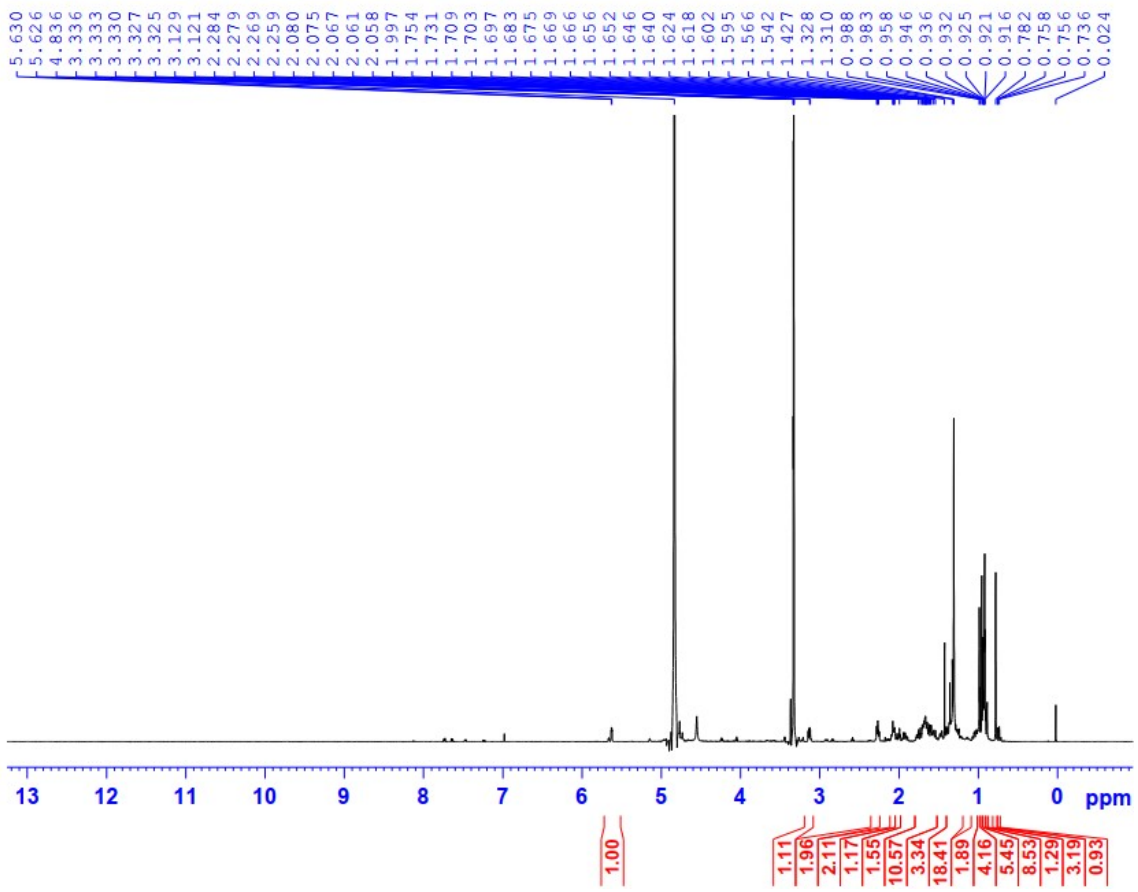


Figure S20.2. ^{1}H NMR spectra of compound **8** (CD_3OD)

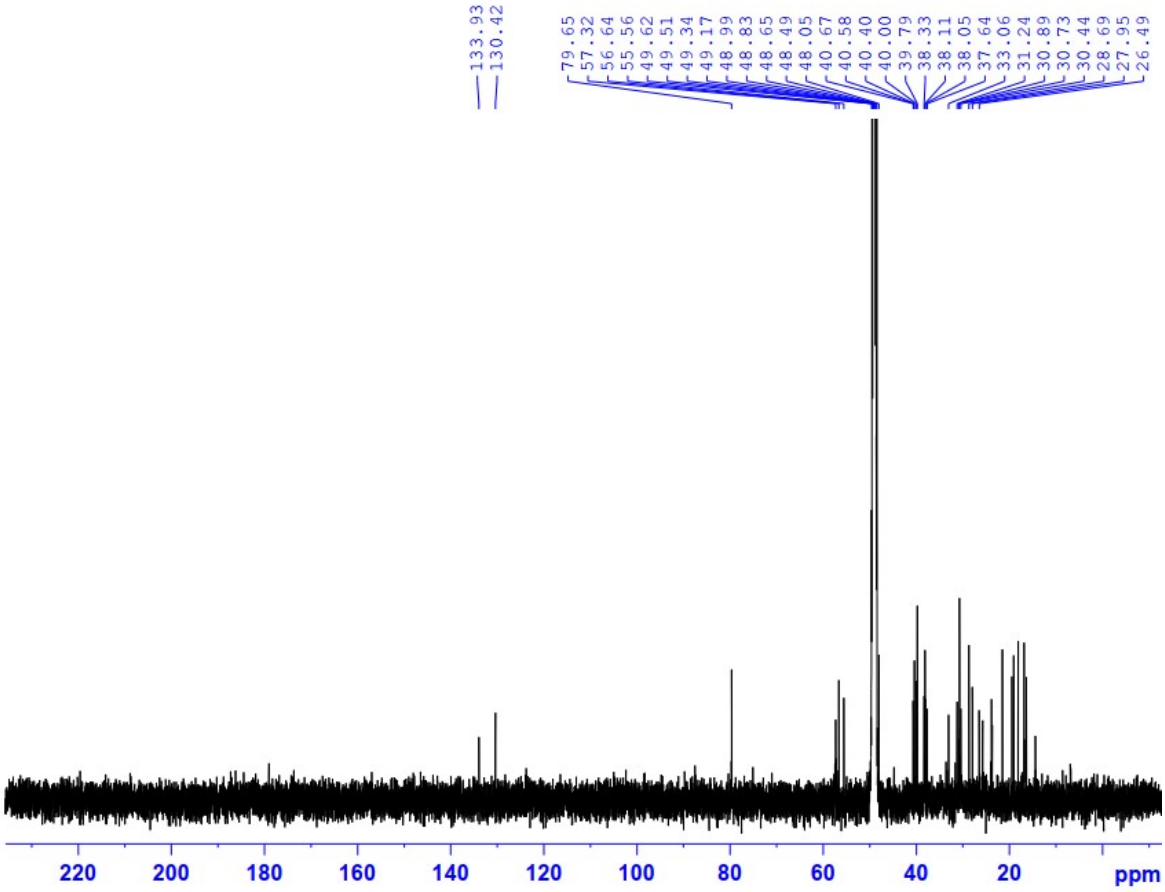


Figure S20.3. ^{13}C NMR spectra of compound **8** (CD_3OD)

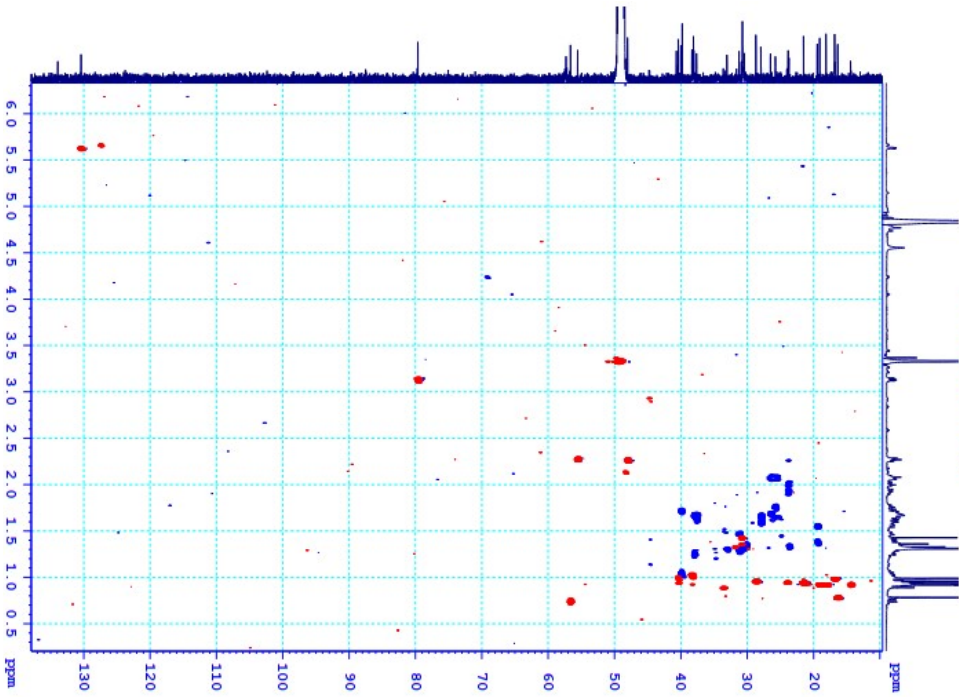


Figure S20.4. HSQC spectra of compound **8** (CD_3OD)

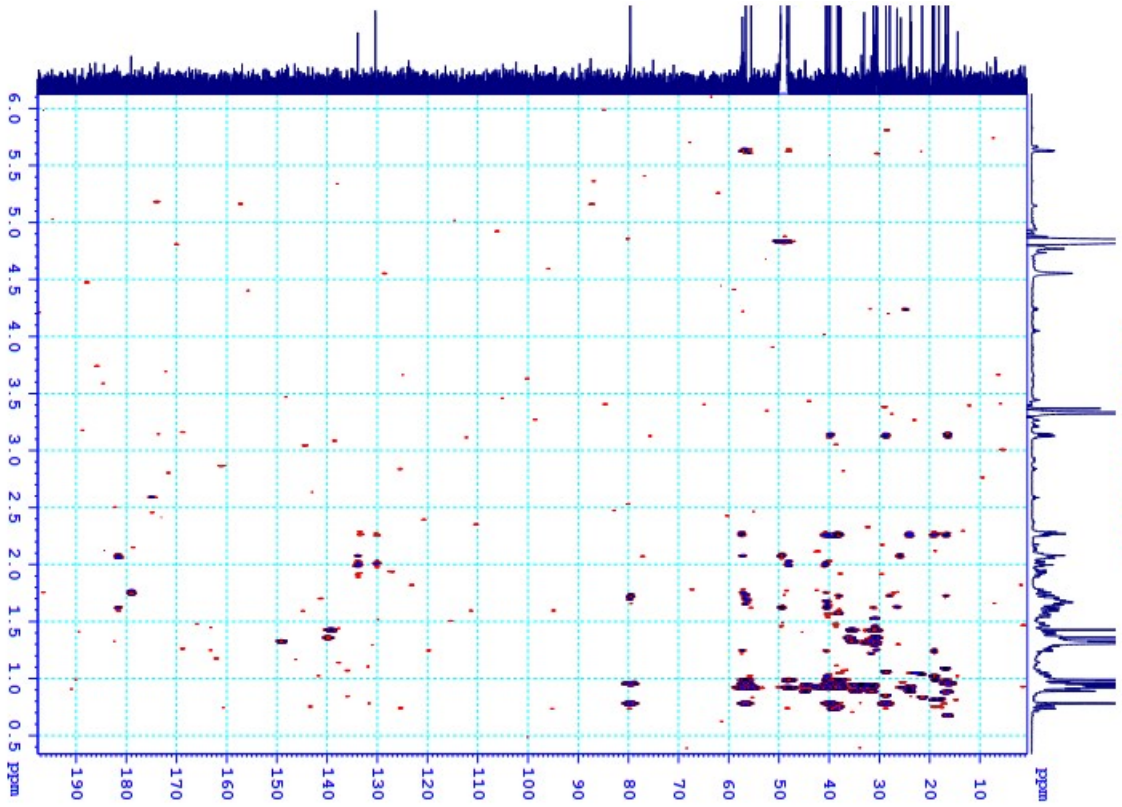


Figure S20.5. HMBC spectra of compound **8** (CD_3OD)

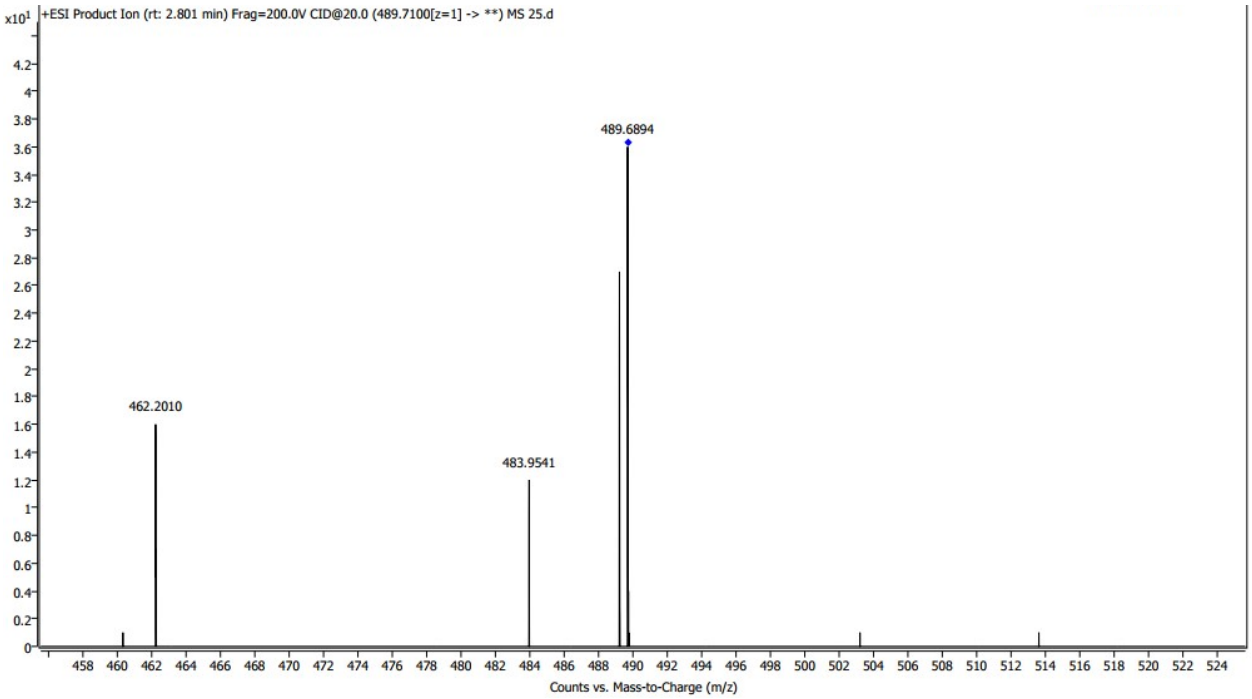


Figure S21.1. MS spectra of compound **9** (DMSO)

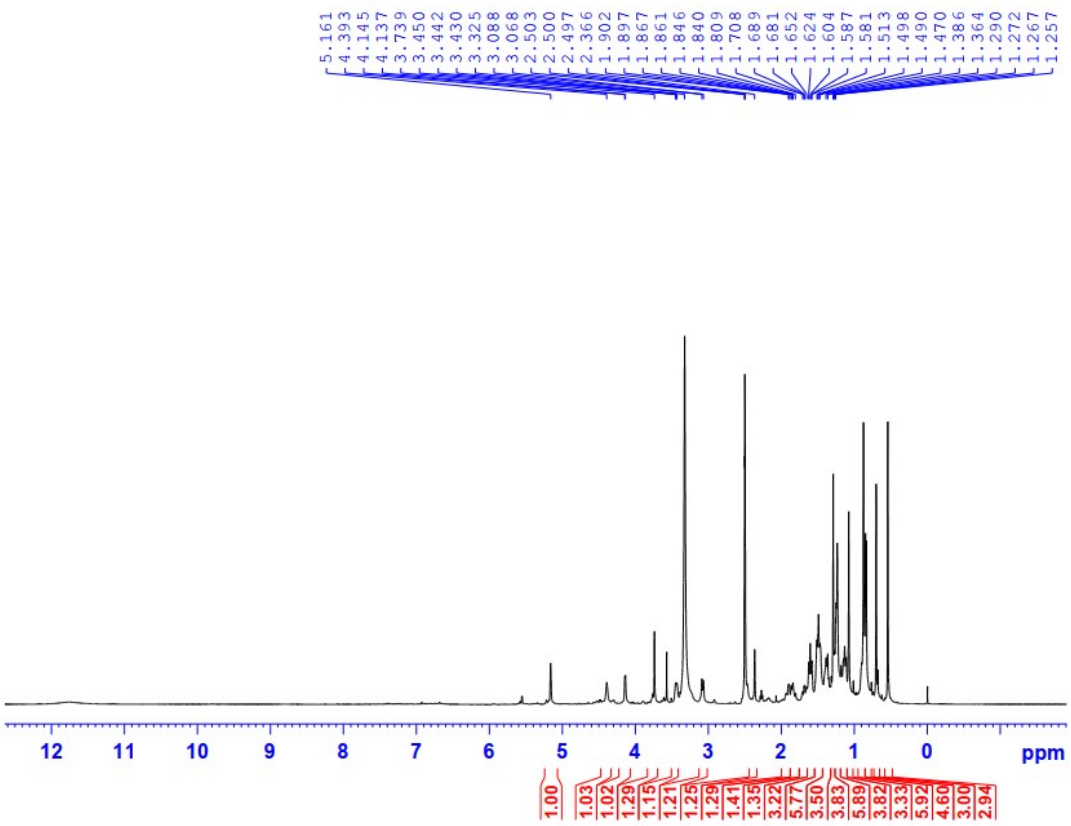


Figure S21.2. [1]H NMR spectra of compound **9** (DMSO)

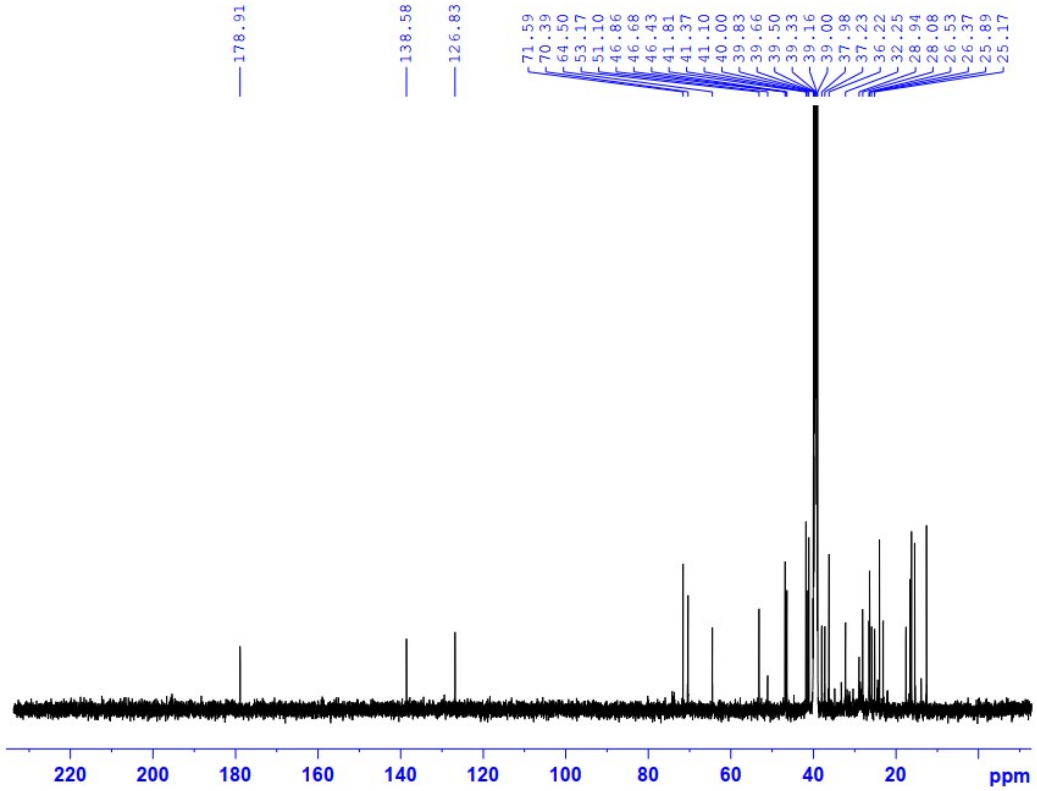


Figure S21.3. [13]C NMR spectra of compound **9** (DMSO)

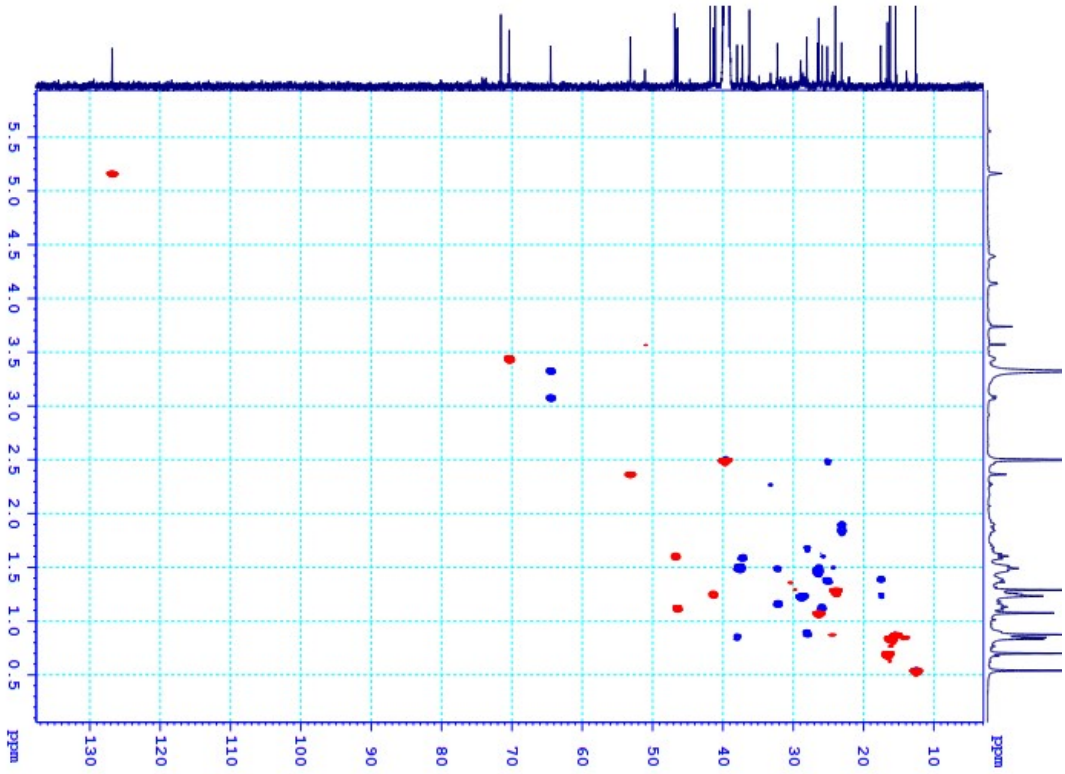


Figure S21.4. HSQC spectra of compound **9** (DMSO)

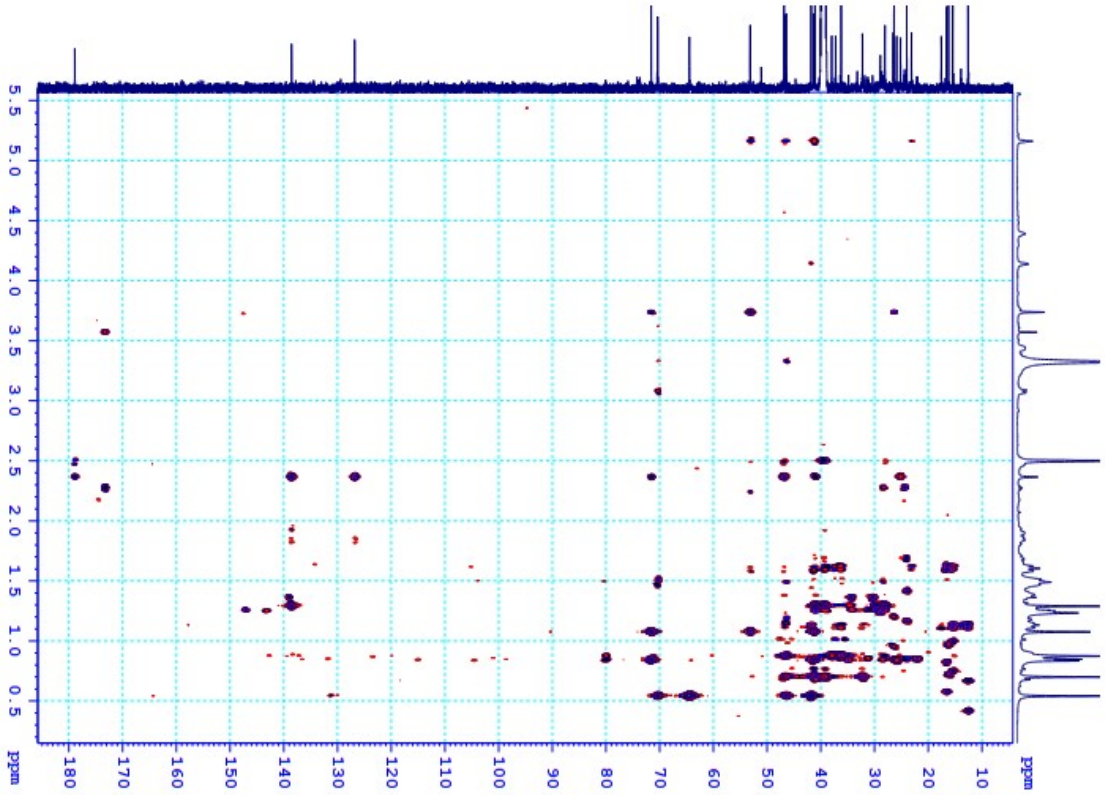


Figure S21.5. HMBC spectra of compound **9** (DMSO)

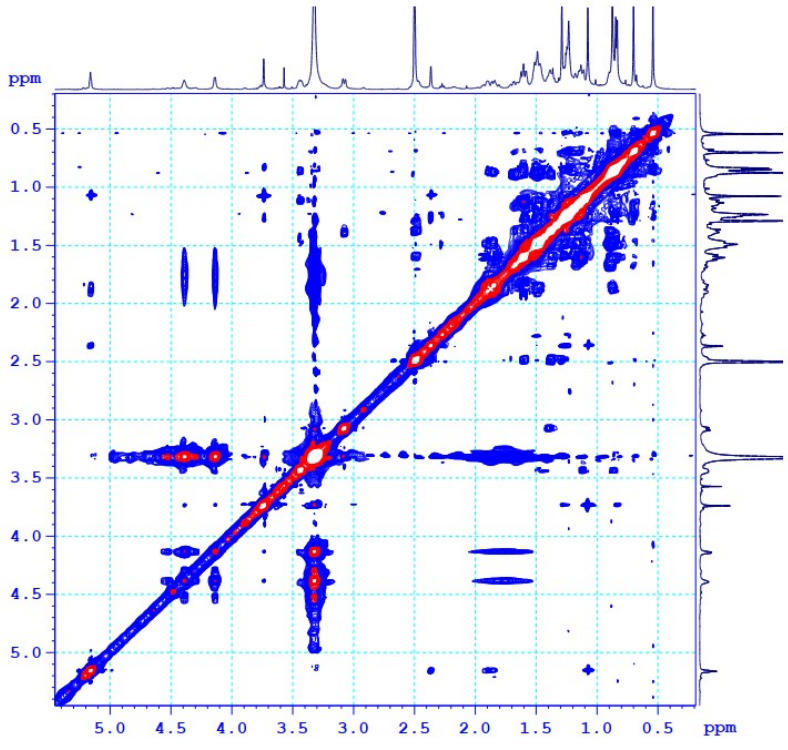


Figure S21.6. ROESY spectra of compound **9** (DMSO)

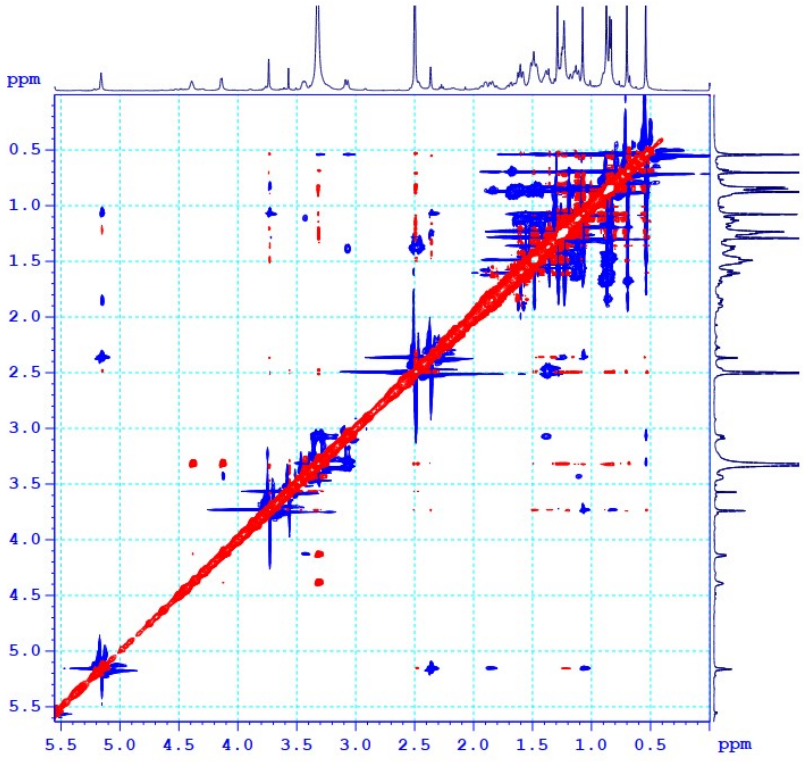


Figure S21.7. NOESY spectra of compound **9** (DMSO)

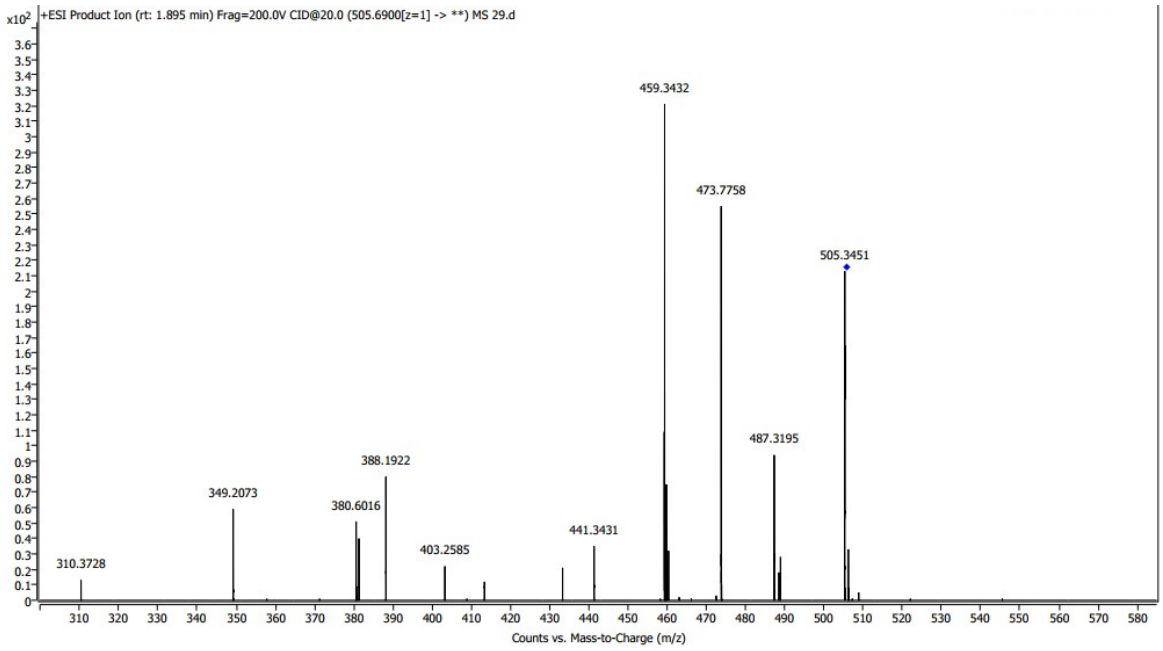


Figure S22.1. MS spectra of compound **10** (CD_3OD)

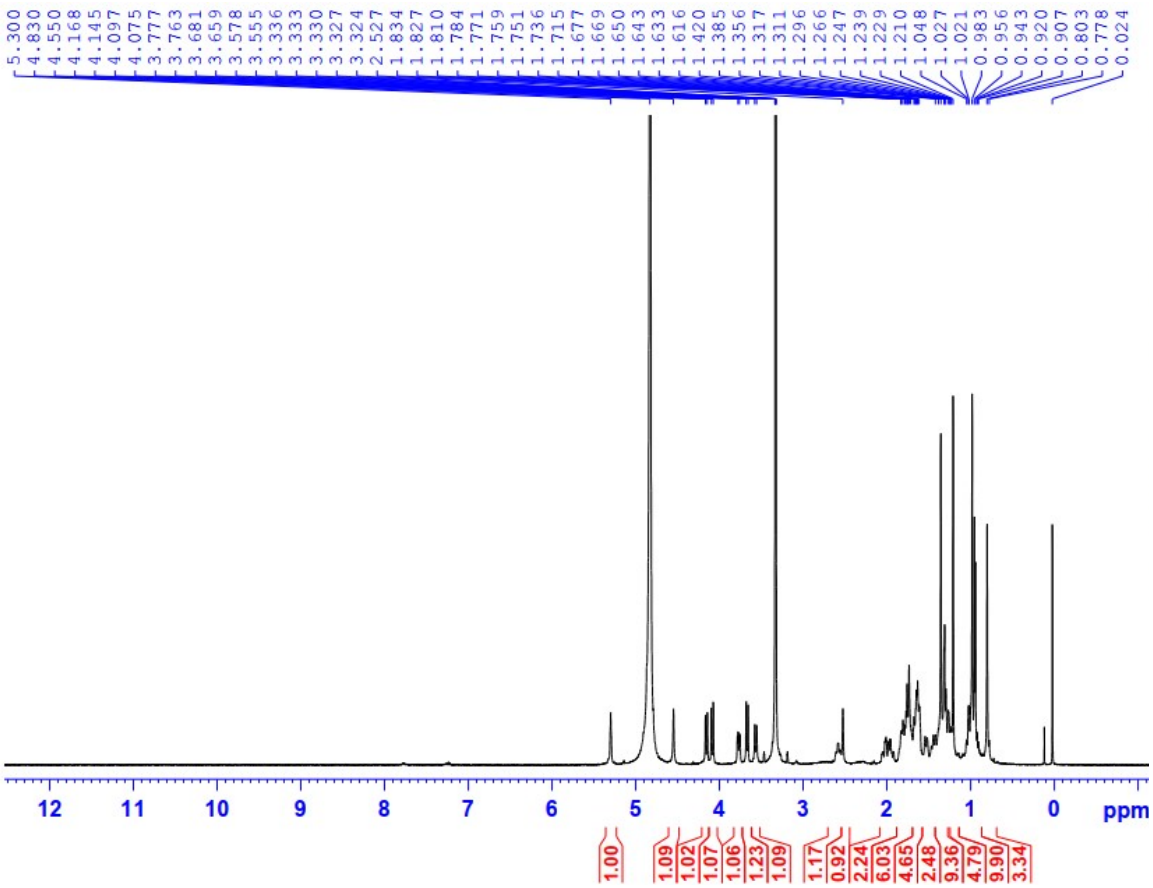


Figure S22.2. ^{1}H NMR spectra of compound **10** (CD_3OD)

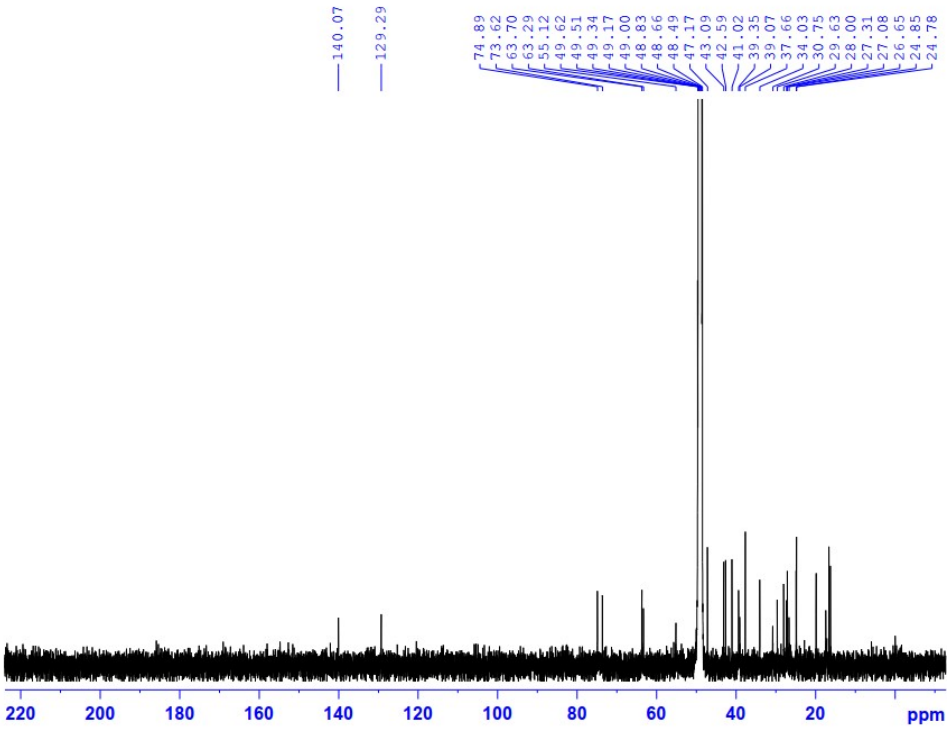


Figure S22.3. ^{13}C NMR spectra of compound **10** (CD_3OD)

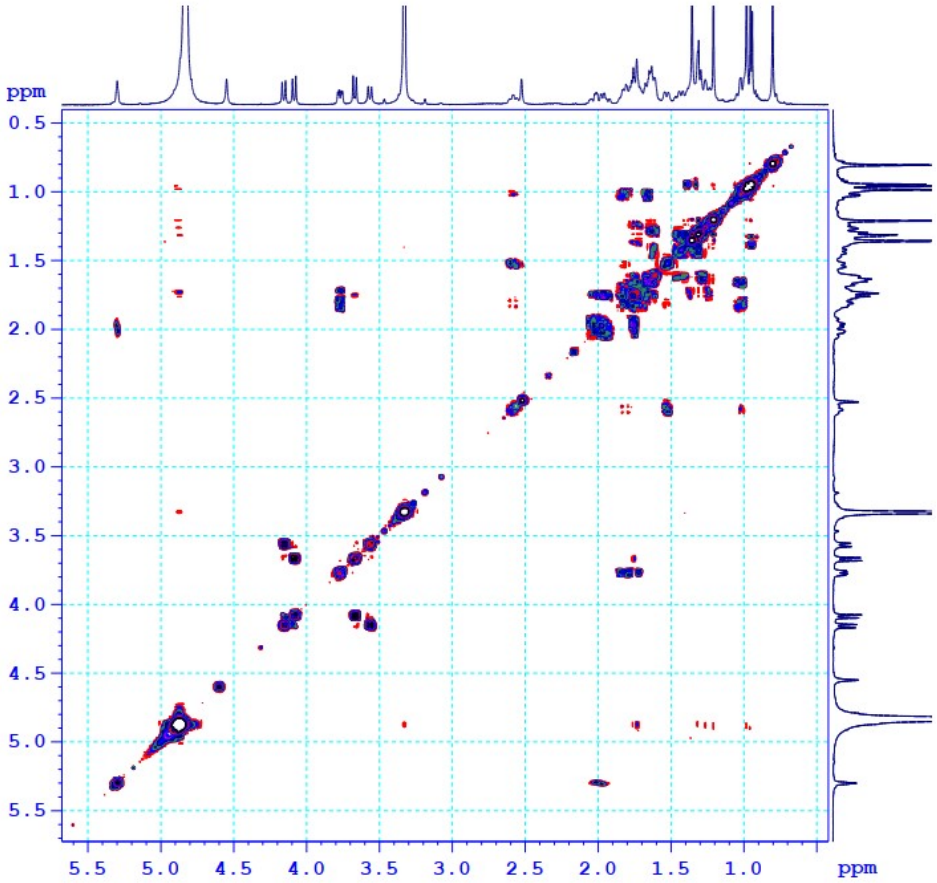


Figure S22.4. COSY spectra of compound **10** (CD_3OD)

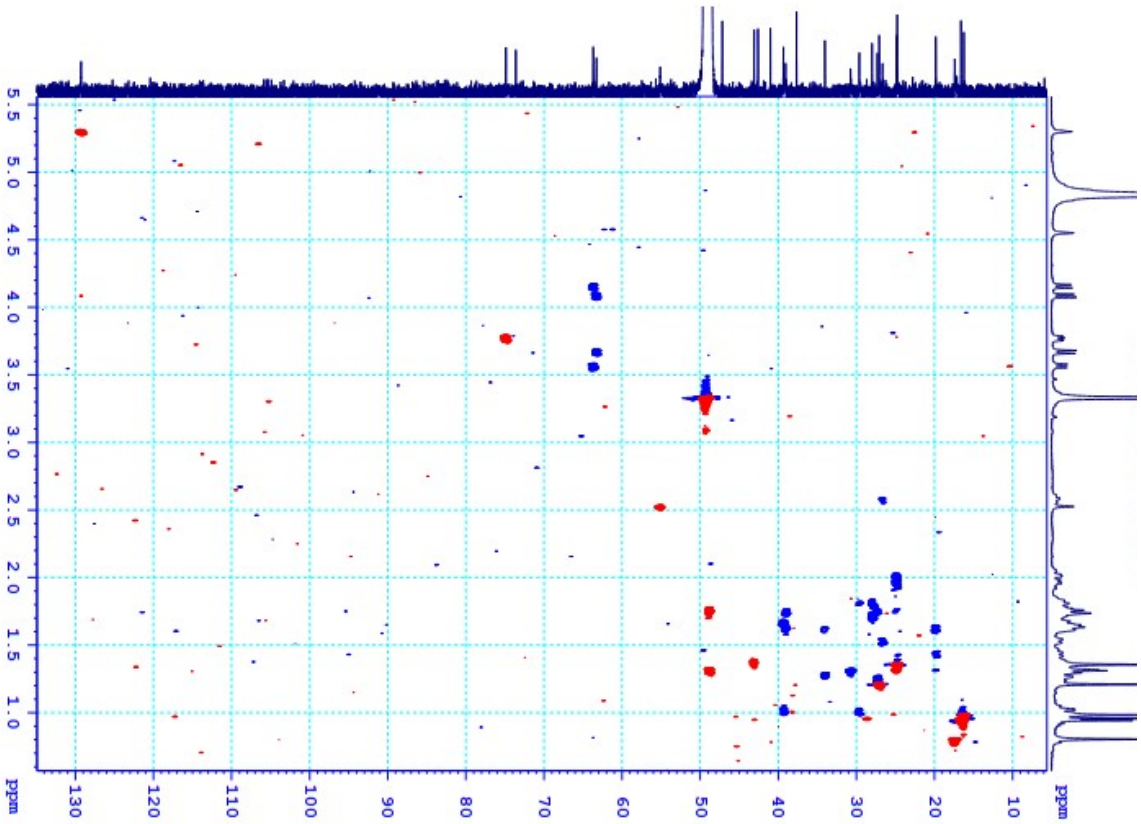


Figure S22.5. HSQC spectra of compound **10** (CD_3OD)

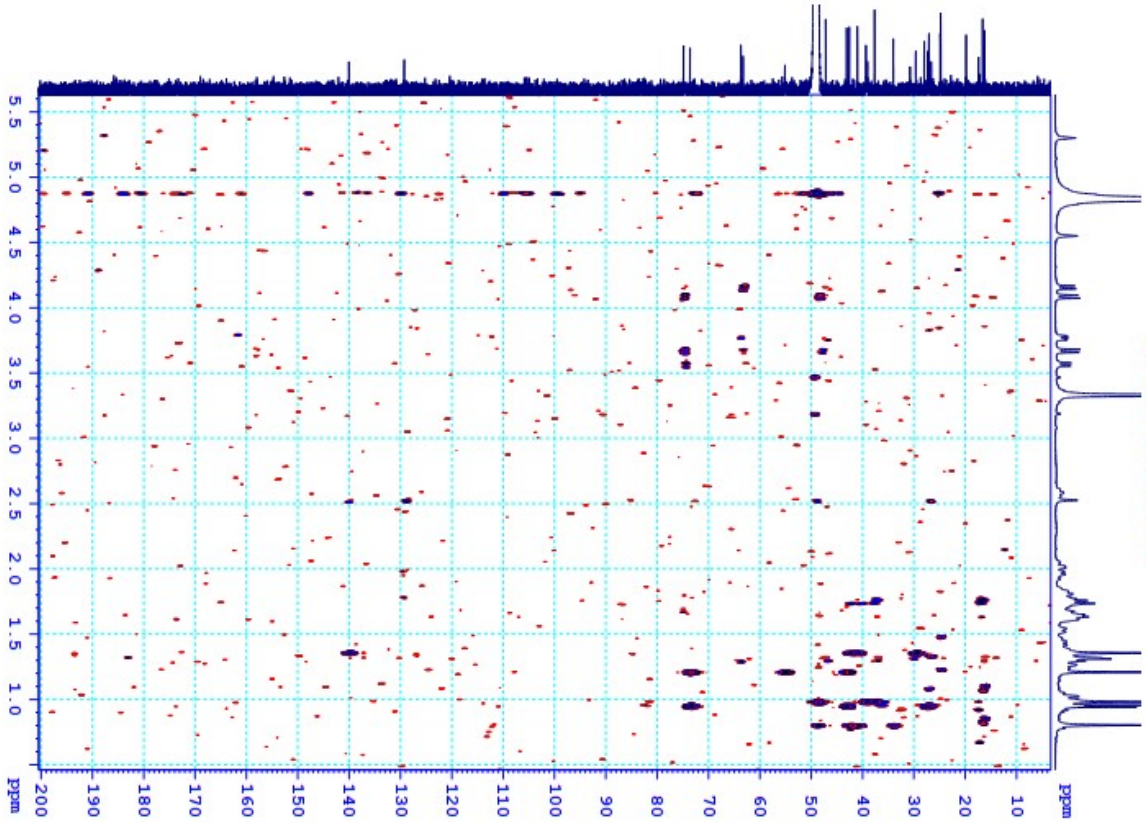


Figure S22.6. HMBC spectra of compound **10** (CD_3OD)

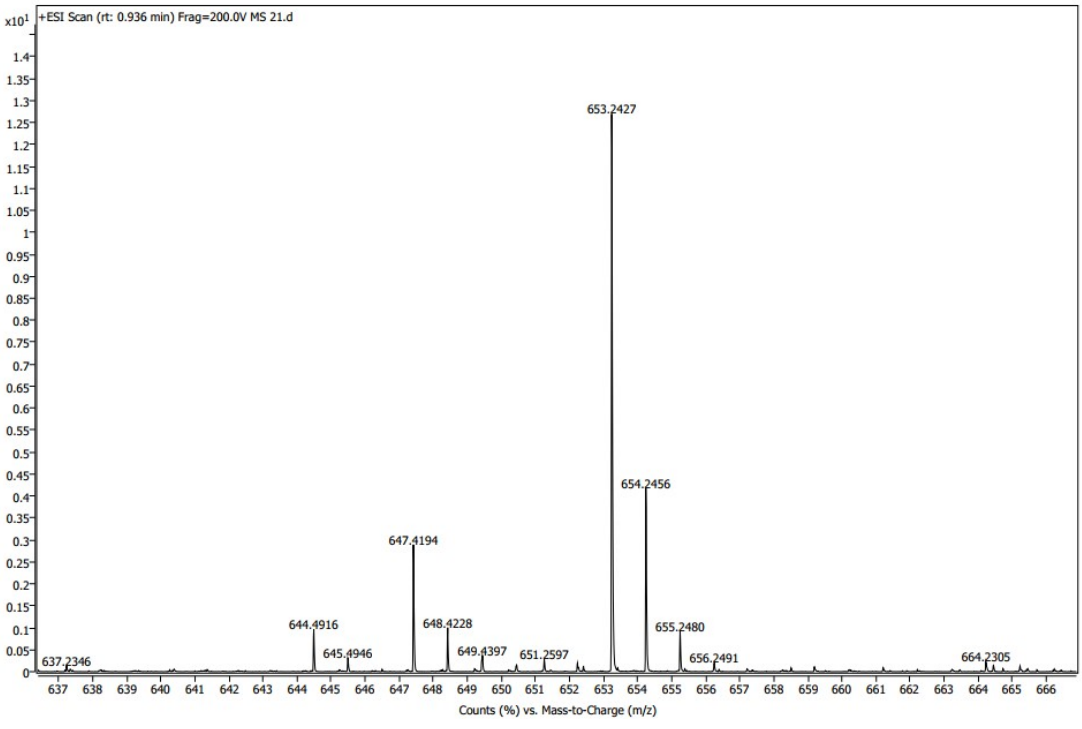


Figure S23.1. MS spectra of compound **11** (CD_3OD)

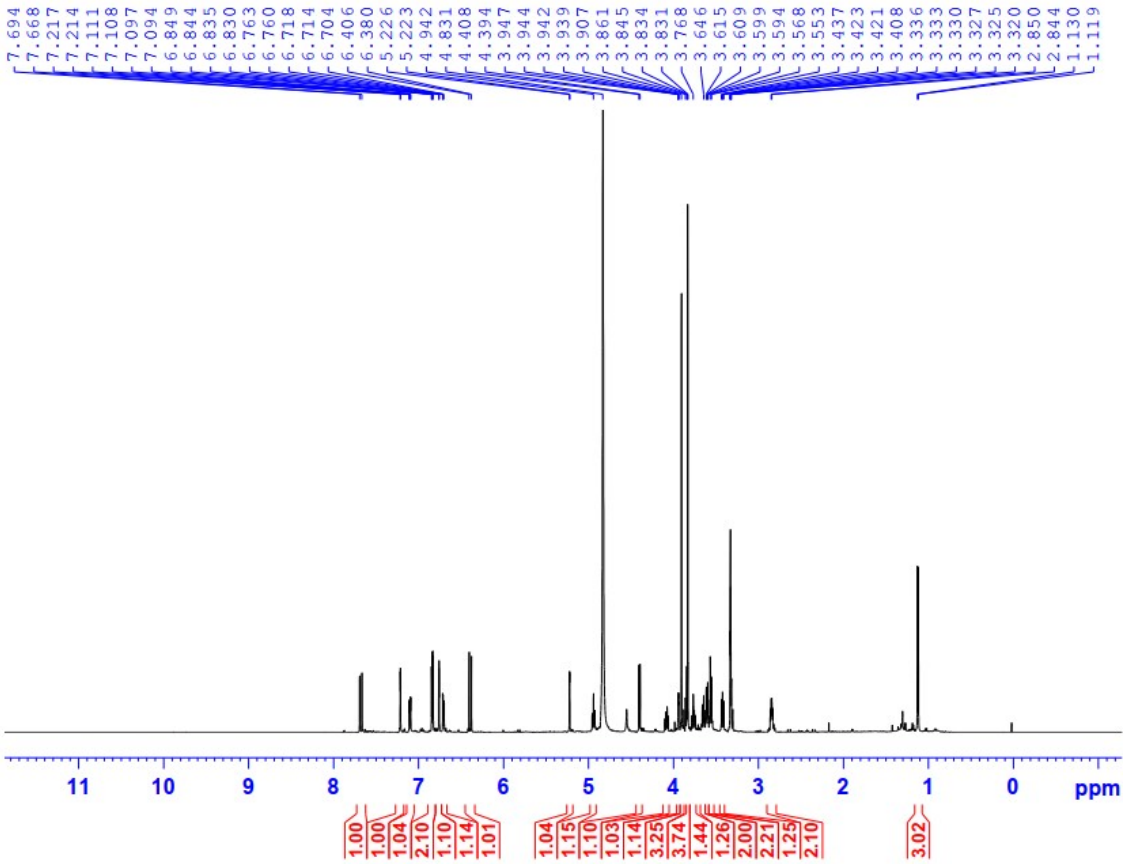


Figure S23.2. ^{1}H NMR spectra of compound **11** (CD_3OD)

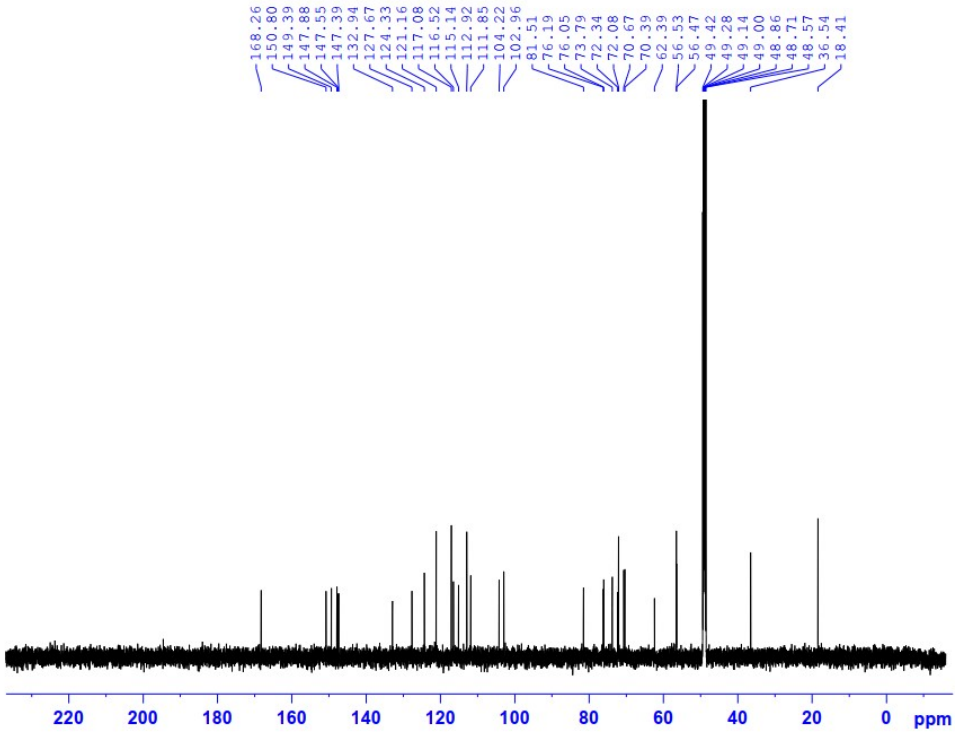


Figure S23.3. ^{13}C NMR spectra of compound **11** (CD_3OD)

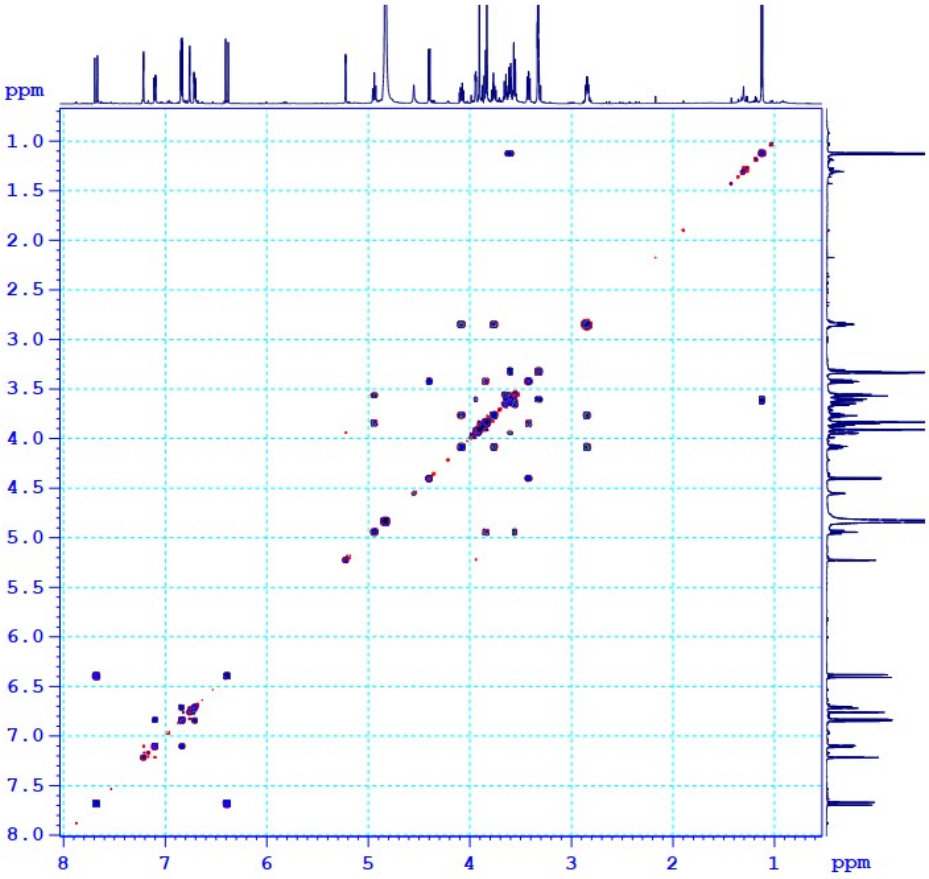


Figure S23.4. COSY spectra of compound **11** (CD_3OD)

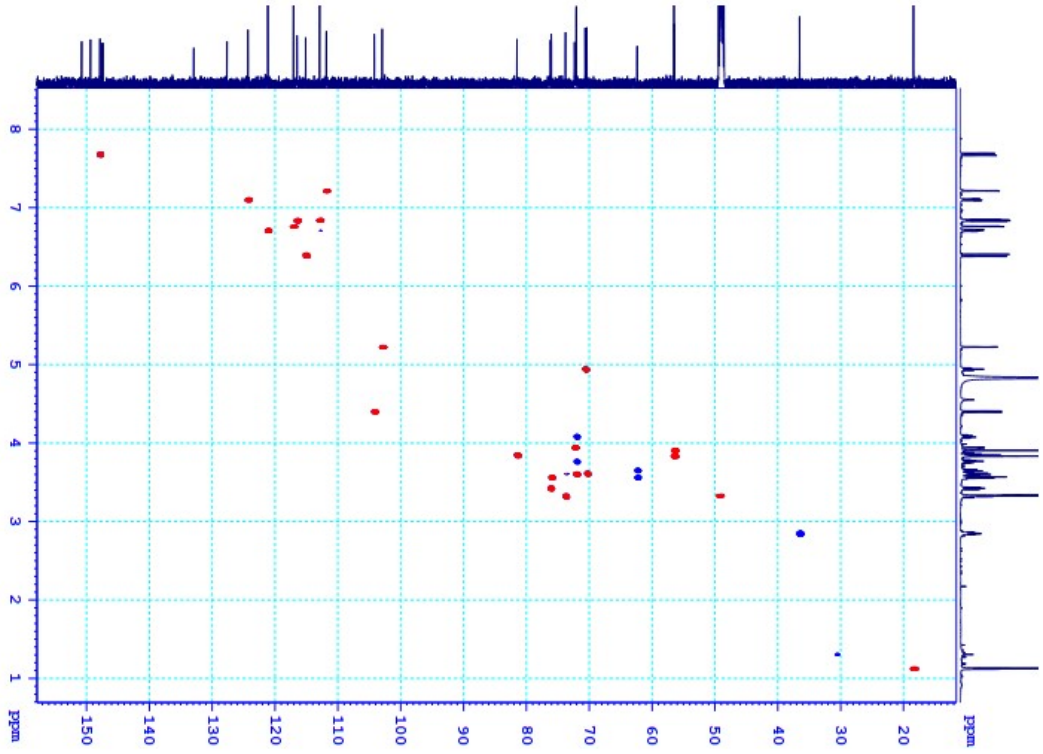


Figure S23.5. HSQC spectra of compound **11** (CD_3OD)

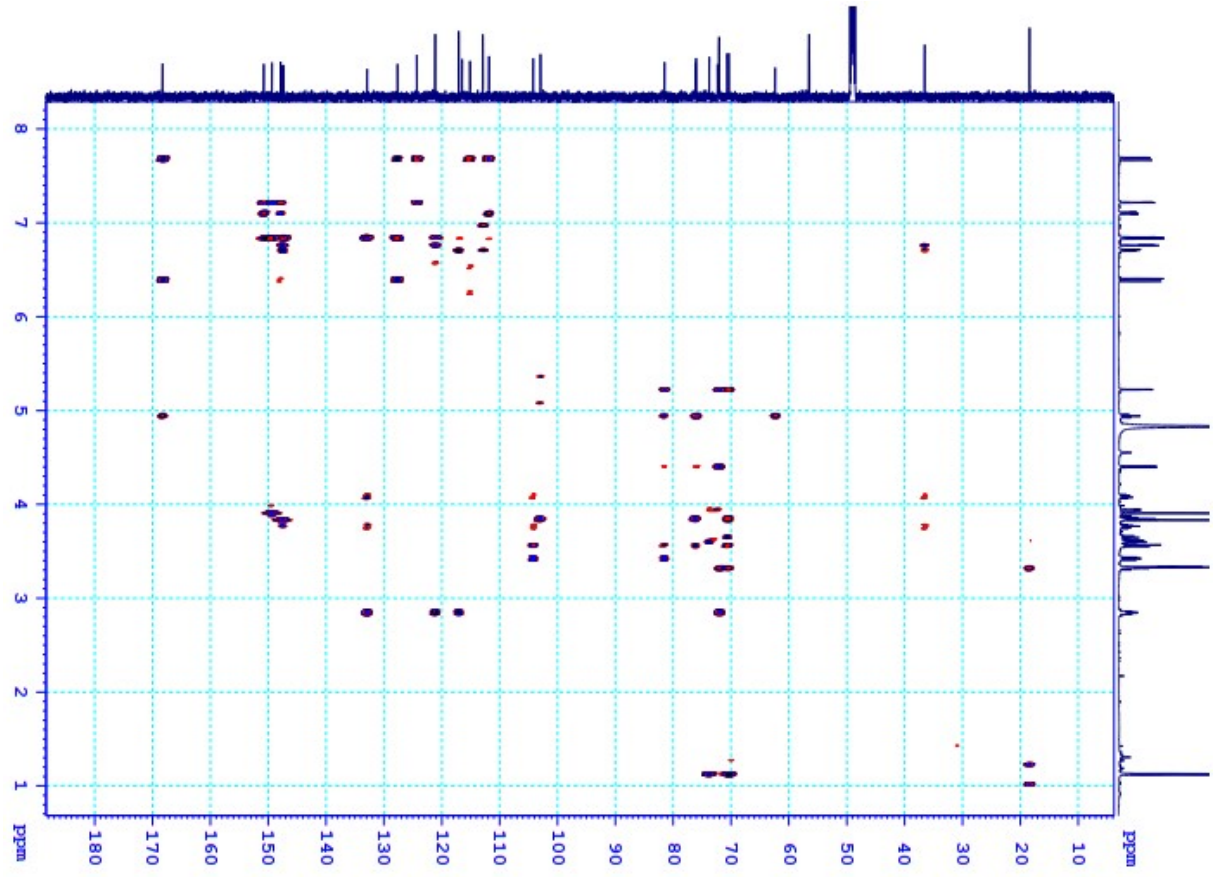


Figure S23.6. HMBC spectra of compound **11** (CD_3OD)

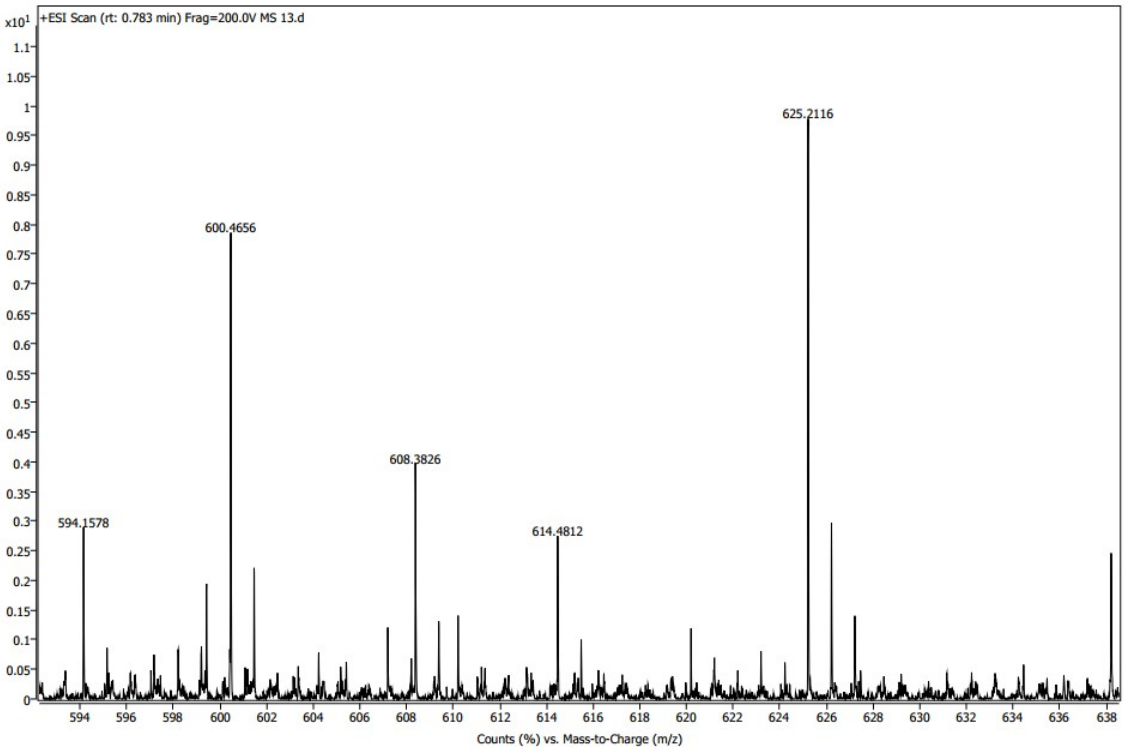


Figure S24.1. MS spectra of compound **12** (DMSO)

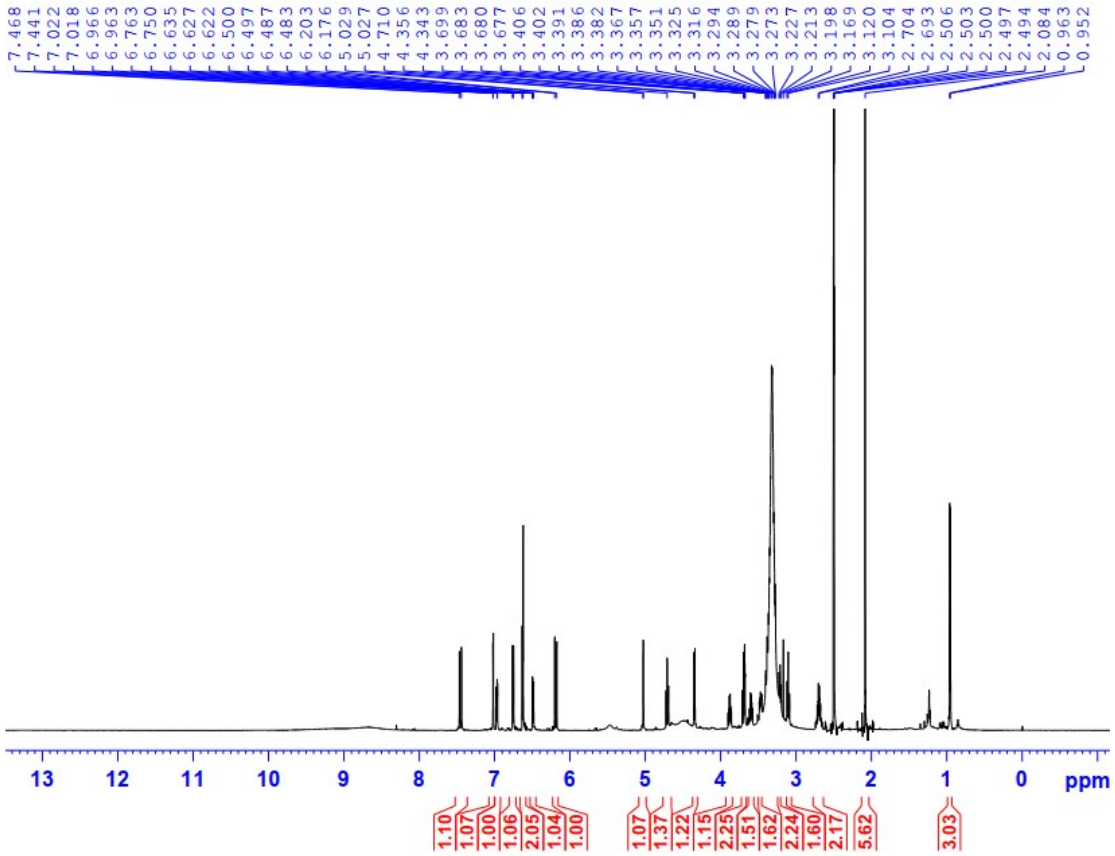


Figure S24.2. ^{1}H NMR spectra of compound **12** (DMSO)

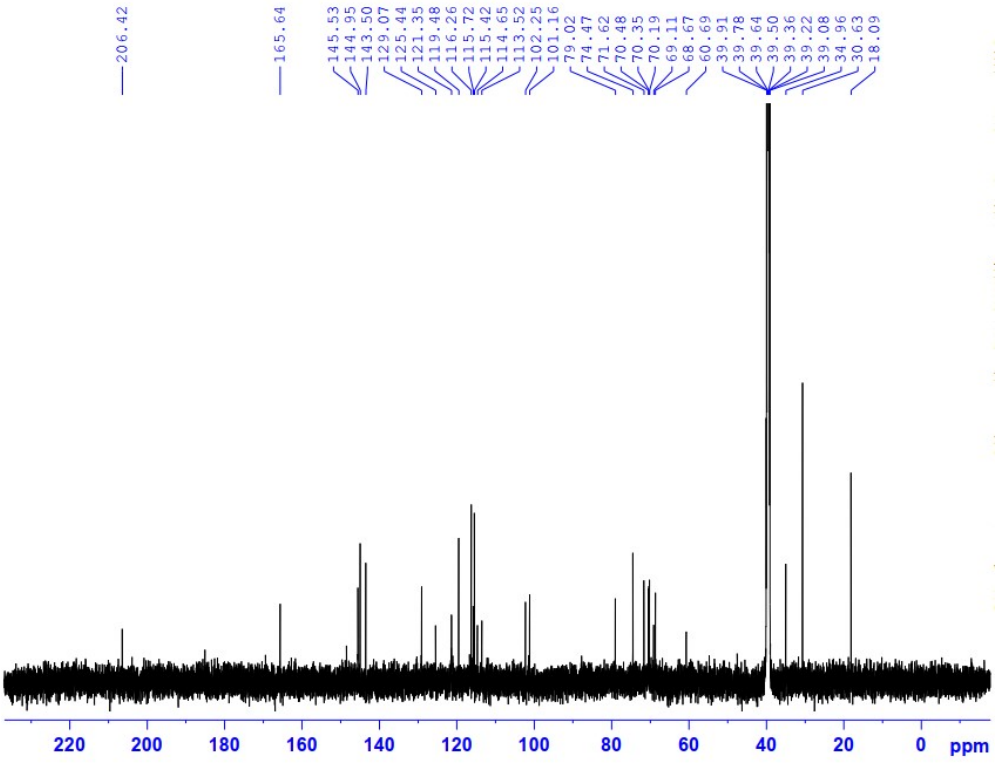


Figure S24.3. ^{13}C NMR spectra of compound **12** (DMSO)

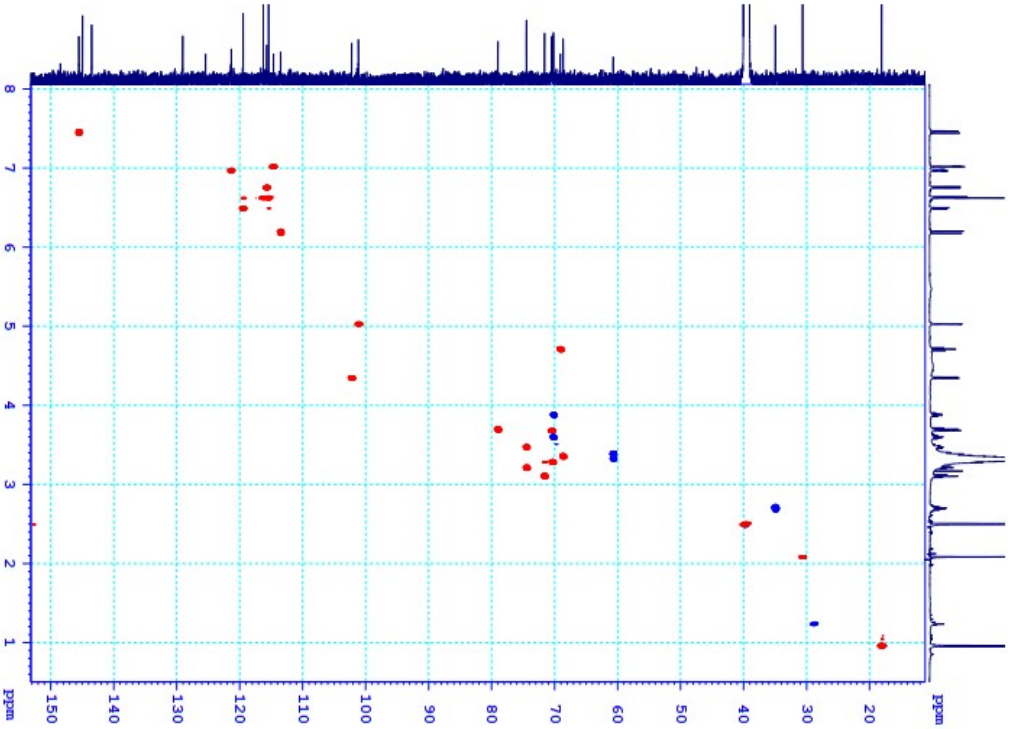


Figure S24.4. HSQC spectra of compound **12** (DMSO)

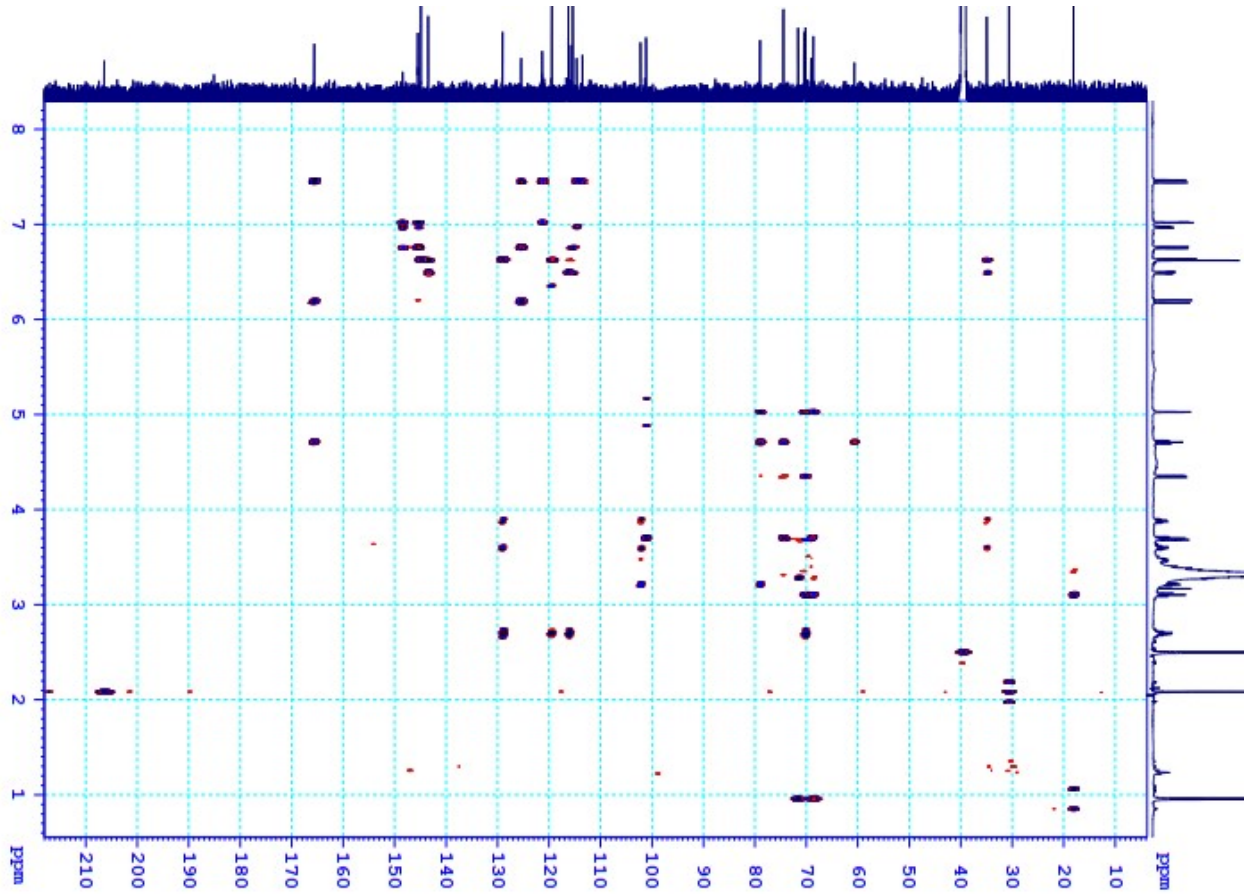


Figure S24.5. HMBC spectra of compound **12** (DMSO)

2. In silico docking and MD simulation

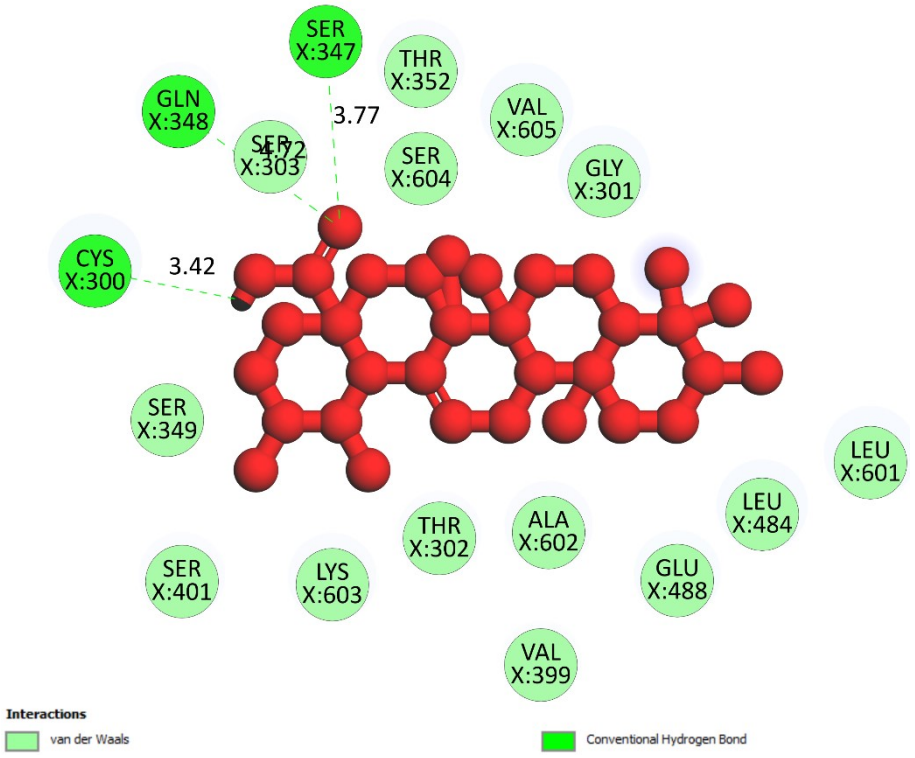


Figure S25. one 2D diagram exposed the significant ligand interactions between **pose 395 and 2VF5**: not full interactions in ligand interaction model

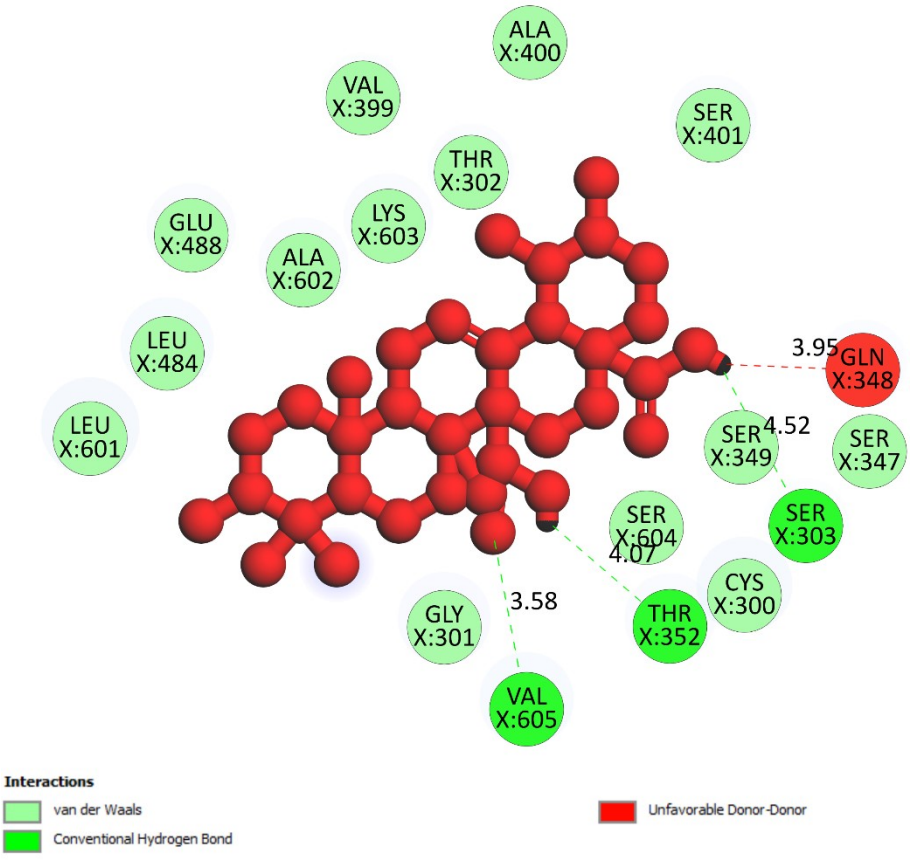


Figure S26. one 2D diagram exposed the significant ligand interactions between **pose 43 and 2VF5**: one forming unfavorable interaction between Gln 348 and 2VF5 in ligand interaction model

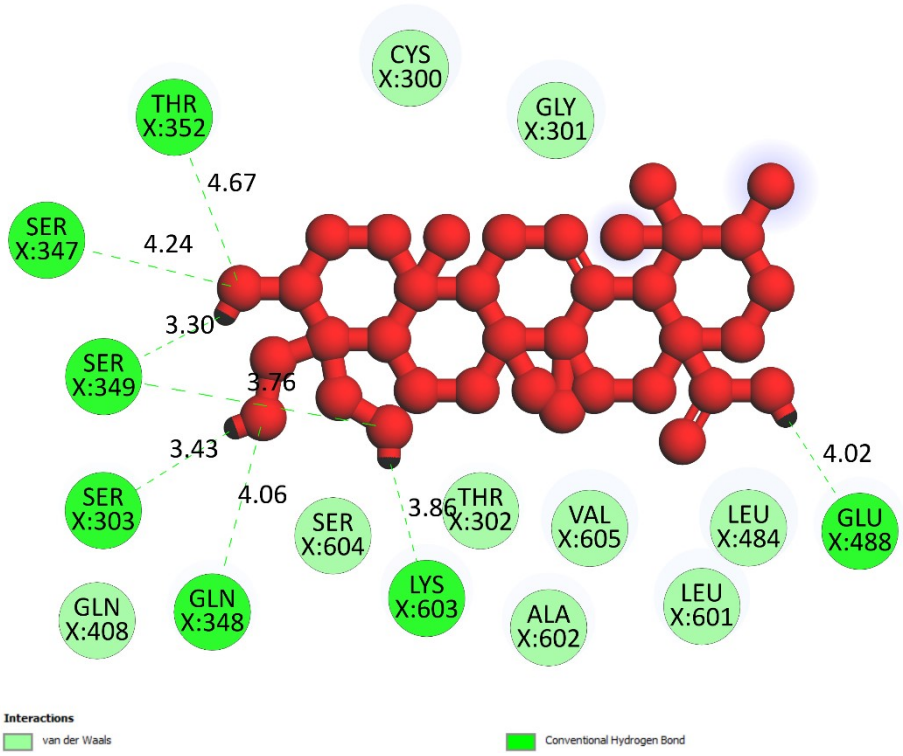


Figure S27. one 2D diagram exposed the significant ligand interactions baqqetween **pose 70 and 2VF5**: in ligand interaction model: not full interactions

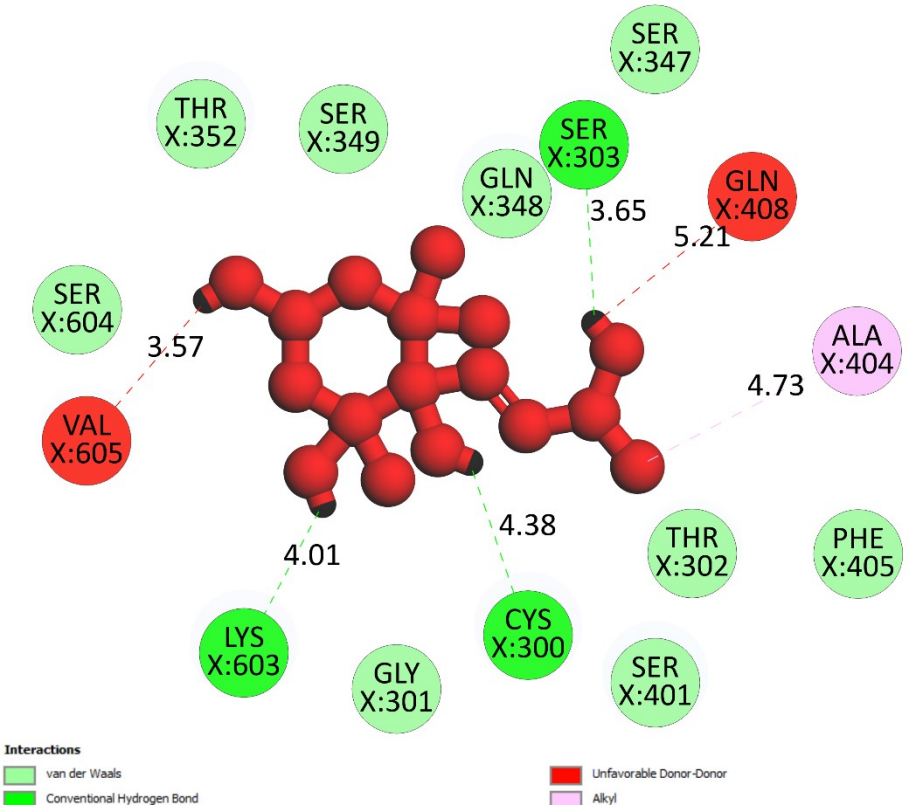


Figure S28. one 2D diagram exposed the significant ligand interactions baqqetween **pose 30 and 2VF5**: in ligand interaction model: unfavorable interactions

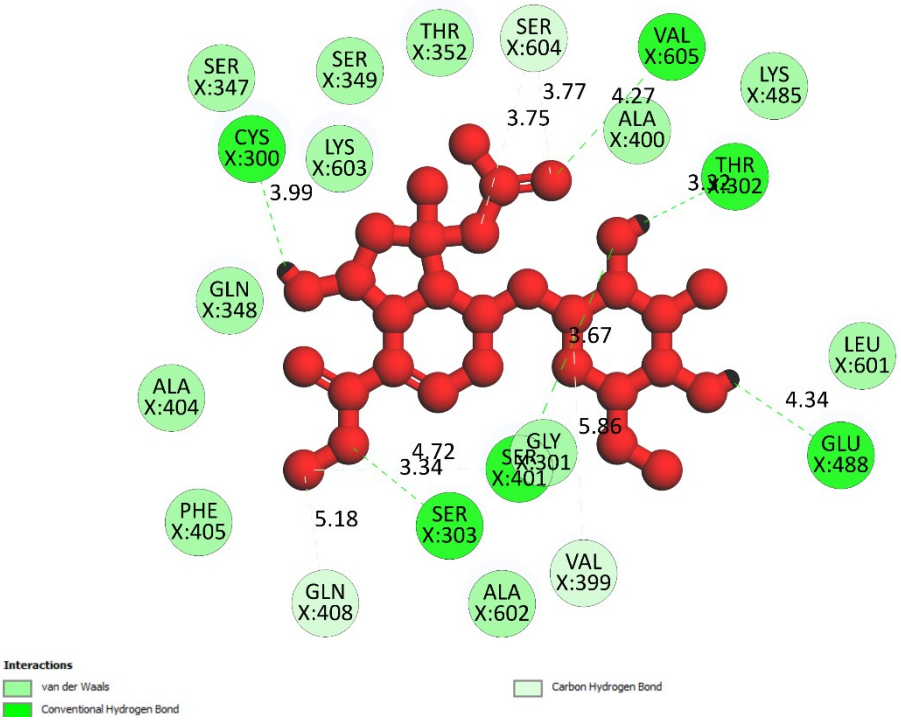


Figure S29. one 2D diagram exposed the significant ligand interactions bettween **pose 213 and 2VF5**: full interaction in ligand interaction model.

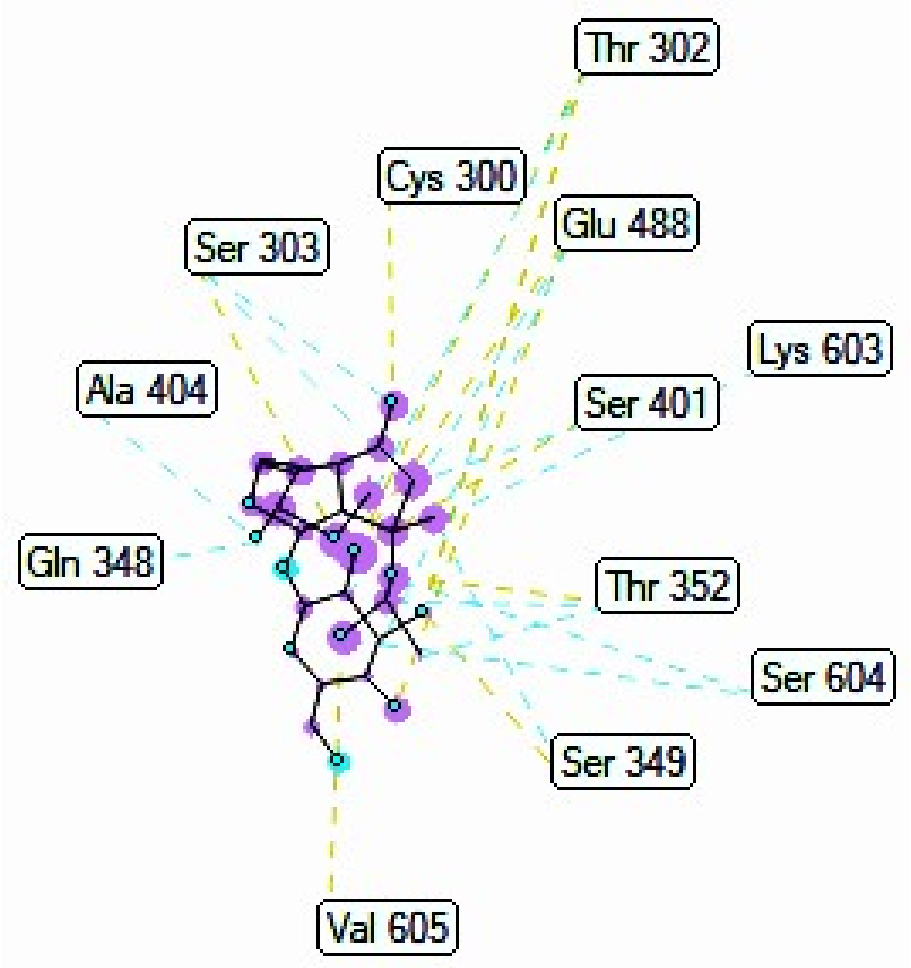


Figure S30. Ligand map shown the secondary interactions between pose 213/ Barlerin (**3**) and 2VF5

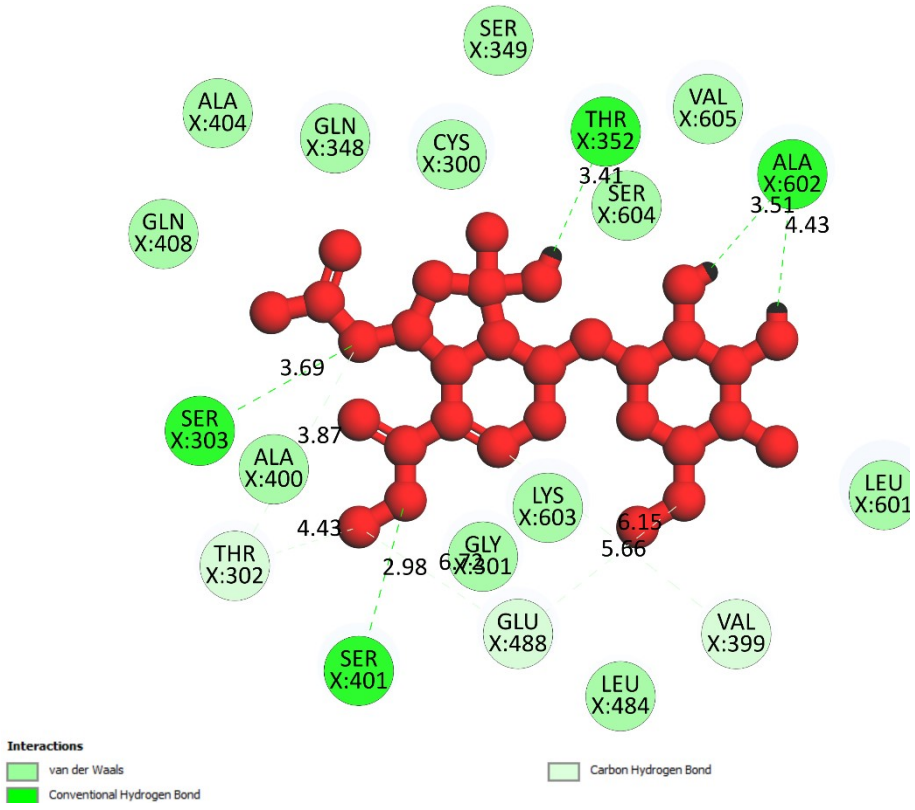


Figure S31. One 2D diagram exposed the significant ligand interactions bettween **pose 18 and 2VF5**: full interaction in ligand interaction model

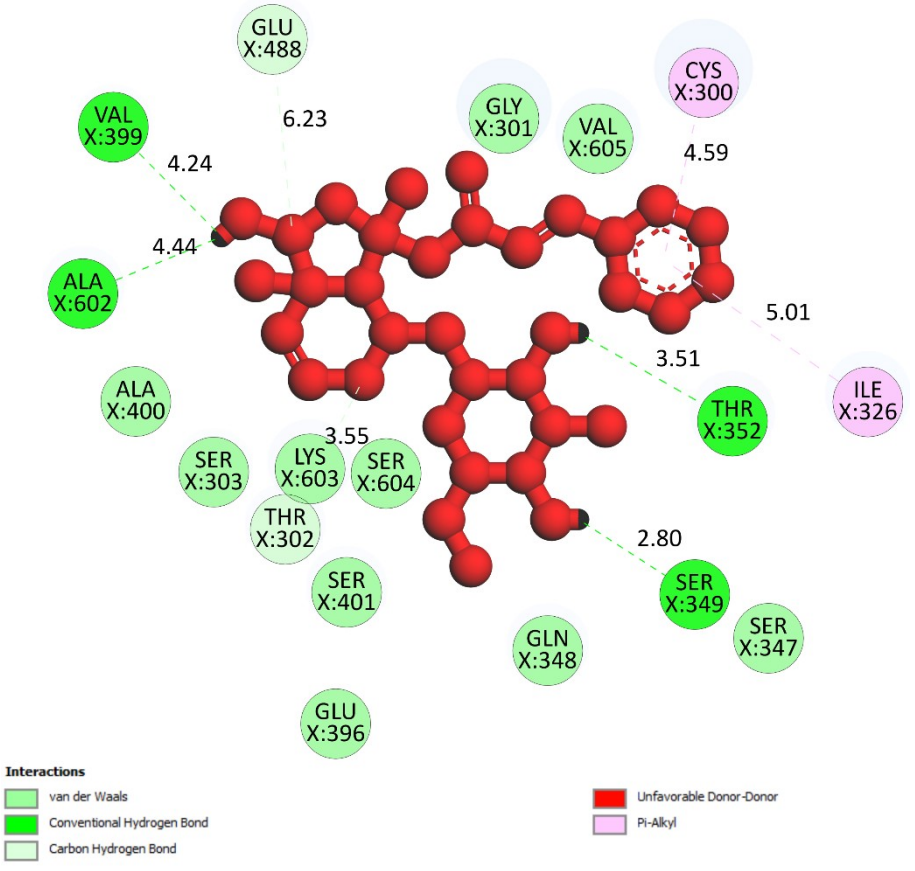


Figure S32. One 2D diagram exposed the significant ligand interactions bettween **pose 227 and 2VF5**: full interaction in ligand interaction model

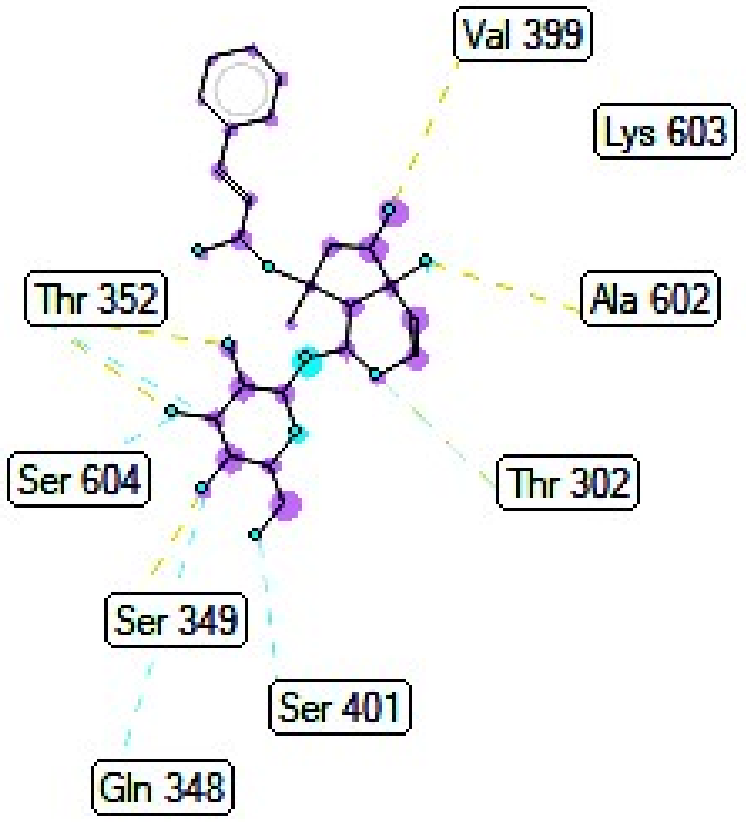


Figure S33. Ligand map shown the secondary interactions between pose 227 and 2VF5

Table S13. The significant docking results of the best docking pose of entries **1-11** to **2VF5** enzyme: PDB

Entry	Pose[a]	Free Gibbs energy [b]	K_i[c]	The number of Hydrogen [d]	The character and bond length[e]	Describes[f]
Martynoside(**11**)	90	-4.92	248	7	X:Tyr 304:O – Pose 90: O (2.78 Å); X:Tyr 304:O – Pose 90:O (2.85 Å); X:Tyr 312:O – Pose 90: O (2.87 Å); Pose 90 – X:Val 324:O (2.16 Å); Pose 90:H – X:Glu 325:O (1.86 Å); Pose 90:H – X:Glu 325:O (2.26 Å); Pose 90:H – X:Tyr 304:O (2.18); Pose 90:H – X:Tyr312:O (2.32 Å);	Full interactions at 3 part of pose 90 are identified including capping group, linker part, and functional group
Harpagoside (**4**)	227	-6.14	31.57	7	X:Ser 349:N – Pose 227:O (2.74 Å); X:Ser 349:O – Pose 227:O (2.69 Å); X:Thr 52:O –	Functional group:

Entry	Pose[a]	Free Gibbs energy [b]	K_i[c]	The number of Hydrogen [d]	The character and bond length[e]	Describes[f]
					Pose 227:O (2.78 Å); X:Thr 352:O – Pose 227:O (3.05 Å); Pose 227:H – X:Ala 602:O (2.36 Å); Pose 227:H – X:Thr 352:O (2.11 Å); Pose 227:H – X:Ser 349:O (2.17 Å)	Val 399, Ala 602 to H of OH; Thr 352 to H of OH and Ser 349 to H of OH on pose 227; Capping group: pi alkyl from Cys 300 and Ile 326 to pi elecctron system of phenyl ring; Linker part: Carbon hydrogen bonds from Glu 488 to carbon atom and Lys 603 to oxygen atom on pose: weak interactions
6-Acetyl shanzhisi de methyl ester (**2**)	18	-6.41	20.17	8	X:Ser 303:N – Pose 18:O (3.17 Å); X:Ser 303:O – Pose 18:O (2.84 Å); X:Thr 352:O – Pose 18 :O (2.91 Å); X:Ser 401:N – Pose 18:O (2.78 Å); X:Ser 401:O – Pose 18:O (3.02 Å); X:Ser 401:O – Pose 18:O (2.97 Å); Pose 18:H - X:Ala 602:O (1.95 Å); Pose 18:H - X:Thr 352:O (1.99 Å)	Weak interactions at capping group
Rotundic acid (**9**)	395	-9.41	0.127	3	X:Ser 347:O – Pose 395:O (3.17 Å); X:Gln 348:N – Pose 395:O (3.09 Å); Pose 395:H - X:Cys300:O (2.16 Å): strongest bonding	Functional group: Cys 300 to hydrogen atom of hydroxyl of COOH; Ser 307 and Gln 348 to oxygen atom of carbonyl group; Capping group: No; Linker part: No
Quinovic acid (**8**)	43	-8.38	0.719	4	X:Ser 303:O – Pose 43:O (3.03 Å); X:Gln 348:N - Pose 43:O (2.63 Å); X:Val 605:N - Pose 43:O (2.85 Å); Pose 43:H -	One forming unfavorable interaction between Gln 348 and 2VF5

Entry	Pose[a]	Free Gibbs energy [b]	K_i[c]	The number of Hydrogen [d]	The character and bond length[e]	Describes[f]
					X:Thr 352:O (2.37 Å): strongest bonding	
3β,19α 23, 24-tetrahydroxyolean-12-en-28-oic acid (**10**)	70	-8.21	0. 958	9	X:Ser 303:O – Pose 70:O (2.94 Å); X:Ser 347:O – Pose 70:O (3.17 Å); X:Ser 349:O – :Pose 70 :O (2.72 Å); X:Ser 349:O – Pose 70: O (3.02 Å);X:Thr 352:O – Pose 70: O 3.00 Å); :Pose 70:H – X:Ser 349:O (2.24 Å); Pose 70:H – X:Lys 603:O (1.98 Å); Pose 70:H – X:Ser 303:O (2.01 Å); Pose 70:H – X:Glu 488:O (1.79 Å)	Fuctional groups: Thr 352, Ser 347, and Ser 349 to oxyen and hydrogen atoms of hydroxyl; Ser 303 and Gln 348 to hydrogen and oxygen atoms of hydroxyl methylen; Lys 603 and Ser 349 to hydrogen and oxygen atoms of hydroxyl methylen; Capping group and linker part: no bonding
(3S,5R,6R,7E,9S)-megastiman-7-ene-3,5,6,9-tetraol (**5**)	30	-7.35	4.07	6	X:Ser 303:O – Pose30:O (2.98 Å); X:Gln 408:N – Pose30:O (2.69 Å); X:Val 605:N – Pose30:O (3.09 Å); Pose30:H – X:Cys 300:O (2.14 Å); Pose30:H – X:Ser 303:O (2.08 Å); Pose30:H – X:Lys 603:O (1.93 Å)	forming two unfavorable interactions between Gln 408, Val 605 and 2VF5
Barlerin (**3**)	213	-7.01	7.28	10	X:Thr 302:O – Pose 213:O (2.84 Å); X:Thr 302:O – Pose 213:O (3.16 Å); X:Ser 303:O – Pose 213:O (2.43 Å); X:Ser 303:O – Pose 213:O (2.78 Å); X:Thr 352:O – Pose 213:O (2.90 Å); X:Ser 401:N – Pose 213:O (2.93 Å); Pose 213: H – X:Cys 300:O (2.20 Å); Pose 213:H – X:Thr 302:O (1.96 Å); Pose 213:H - X:Glu 488:O (2.16 Å);	Functinal group: Cys 300 to hydrogen atom of hydroxyl, Val 605 to oxygen atom of acetyl group, Ser 303 to oxygen atom of methoxy group, Thr 302 to hydrogen atom of hydroxyl, Ser 401 to oxygen atom og hydroxyl, and Glu 488 to hydrogen atom of hydroxyl group;

Entry	Pose[a]	Free Gibbs energy [b]	K_i[c]	The number of Hydrogen [d]	The character and bond length[e]	Describes[f]
						Connecting unit: vander Waals from Gln 408 to methoxy; Capping group: Val 399 to carbon atom of carbohydrate part, Ser 604 to oxygen atoms of acetyl group
Shanzilactone (**1**)	253	-5.96	42.73	6	X:Thr 302:N – Pose 253:O (2.82 Å); X:Ser 303:N – Pose 253:O (2.85 Å); X:Ser 303:O – Pose 253:O (3.02 Å); X:Gln 348:N – Pose 253:O (2.91 Å); X:Ser 349:O – Pose 253:O (2.62 Å); Pose 253:H - X:Cys 300:O (2.07 Å)	Functional groups: Ser 349, Gln 348, Cys 300, and Thr 302 to oxyen atoms of ether, ketone, alcohol group on pose 253; Linker part: carbon hydrogen bond from Thr 352, Ser 401, and Leu 346 to methyl, carbon, oxygen atoms of ether, ketone groups, and oxygen atom of OH group on pose 253; Capping group: no bonding;
Verbacoside (**12**)	425	-5.38	113	5	X:ASN305:N – Pose 425:O (2.85 Å) Arg 599:N - X:Tyr 491:O (3.12 Å); Pose 425:H - X:Arg 599:O (1.95 Å); Pose 425:H - X:Asn 305:O (1.97 Å); Pose 425:H - X:Ala 602:O (2.26 Å)	Functional group: Asn 305 to H atoms of OH groups, Arg 599 to H atoms of phenolic hydroxyl, and Ala 602 to hydrogen atoms of phenolic hydroxyl; Capping group: Lys 487 and Leu 601 to pi electron system of phenyl group; Linker part: cabon hydrogen bond from Glu 488 to carbon atom on pose: weak

Entry	Pose[a]	Free Gibbs energy [b]	K_i[c]	The number of Hydrogen [d]	The character and bond length[e]	Describes[f]
						interaction.
Indole-3-carboxylic acid (**6**)	296	-4.65	390.50			Functional group: Glu 488 to hydrogen atom of N-H indole, Arg 599 and Asn 600 to hydrogen atom of carboxylic group, and Arg 599 to oxygen atom of carbonyl group; Capping group: Lys 487 and Leu 601 to pi electron system of phenyl group, and Leu 601 and Arg 599 to pi electron system of indole heterocylic; Linker part: carbon hydrogen bond: from Arg 599 to carbon atom of indole heterocylic: week interaction

[a], [b], [c]: The calculation Results from AutoDockTools-1.5.7 (ATD); [d], [e]: building from Discovery Studio 2021 Client, and [f]: To explain why the best conformation of compound showed active or inactive in silico based on article.