Bromopyrrole Alkaloids with the Inhibitory Effects against the Biofilm Formation of Gram Negative Bacteria

Supporting Information

Table S1 Yield of each alkaloid isolated from the sponge

compounds	Amount (mg)	Yield (%)
1	21.1	0.60
2	2.4	0.08
3	2.5	0.08
4	2.0	0.06
5	1.8	0.05
6	4.7	0.13
7	6.0	0.17
8	3.1	0.09
9	39.1	1.12
10	99.2	2.83
11	26	0.74
12	7.2	0.21
13	8.6	0.25
14	17.5	0.50
15	9.6	0.27
16	29.3	0.84
17	11.3	0.32
18	3.3	0.10
19	6.7	0.19
20	13.5	0.39
21	7.6	0.22
22	2.9	0.08
23	17.5	0.50
24	9.9	0.28
25	11.7	0.33
26	117.5	3.36
27	30.8	0.88
28	1.2	0.03
29	11.9	0.34
30	39.7	1.13
31	2.0	0.06
32	3.6	0.10

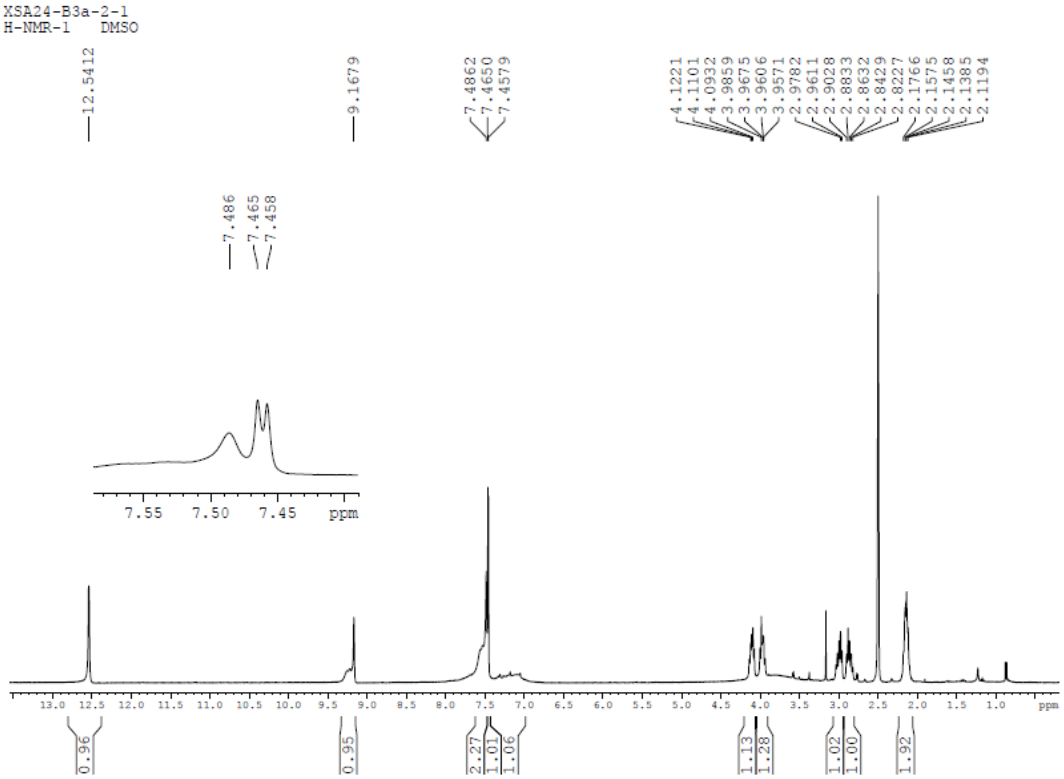


Figure S1. ^{1}H-NMR spectrum of **1** (DMSO-d_6, 400MHz)

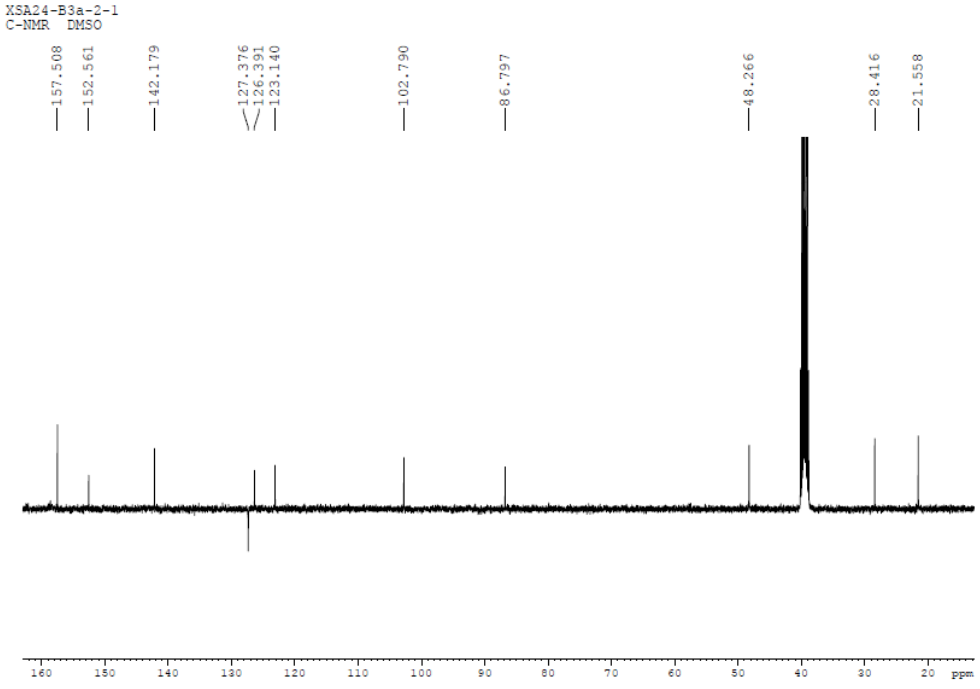


Figure S2. ^{13}C-NMR spectrum of **1** (DMSO-d_6, 100MHz)

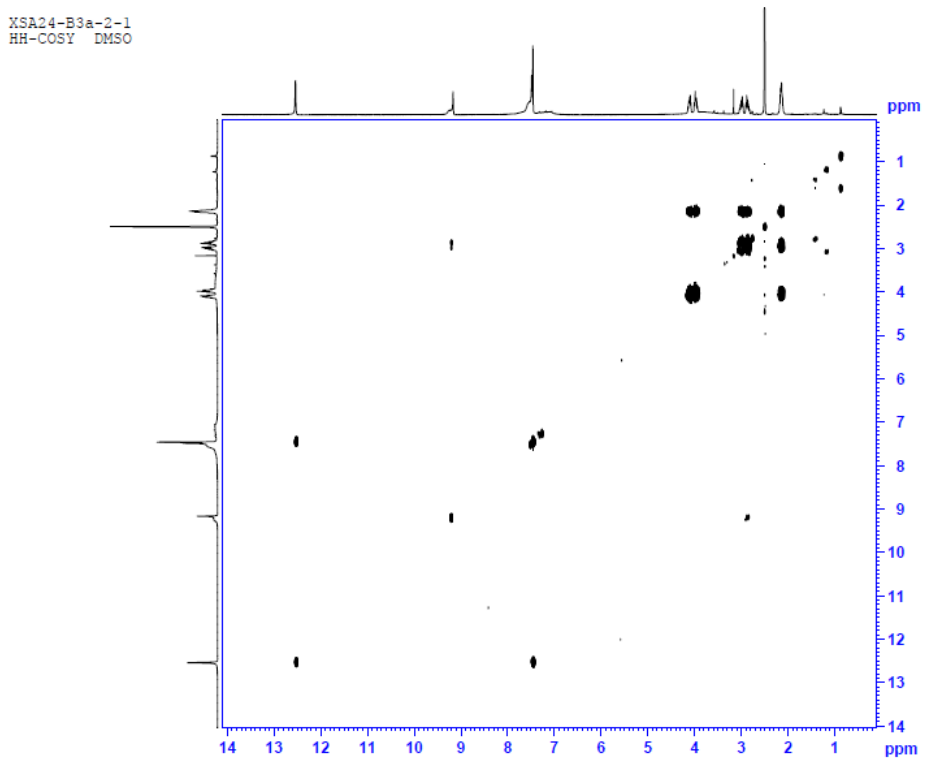


Figure S3. ^{1}H-^{1}H COSY spectrum of **1** (DMSO-d_6, 400MHz)

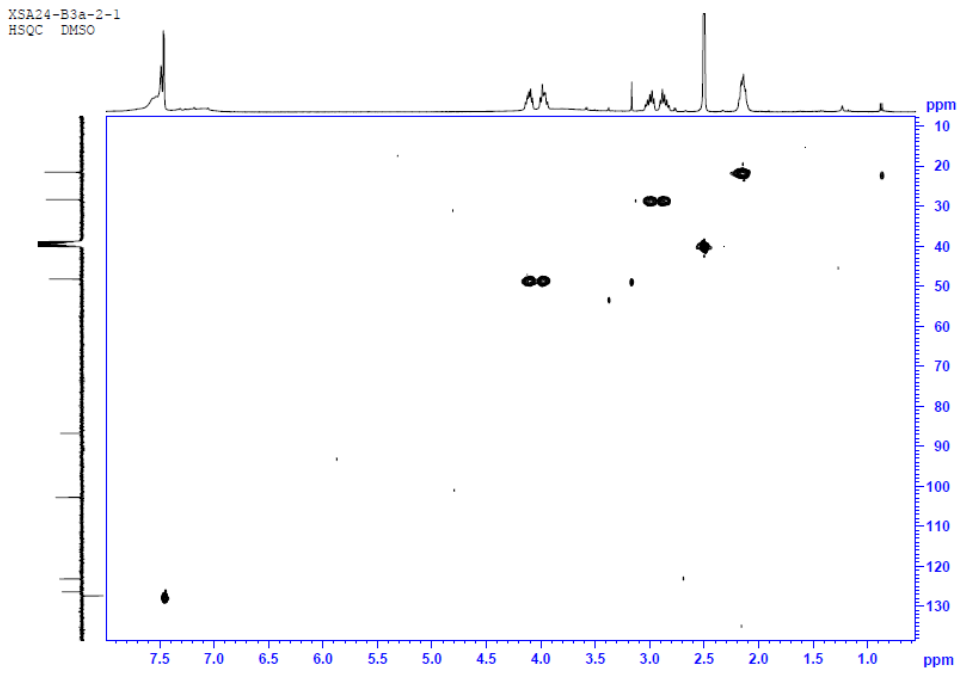


Figure S4. HSQC spectrum of **1** (DMSO-d_6, 400MHz)

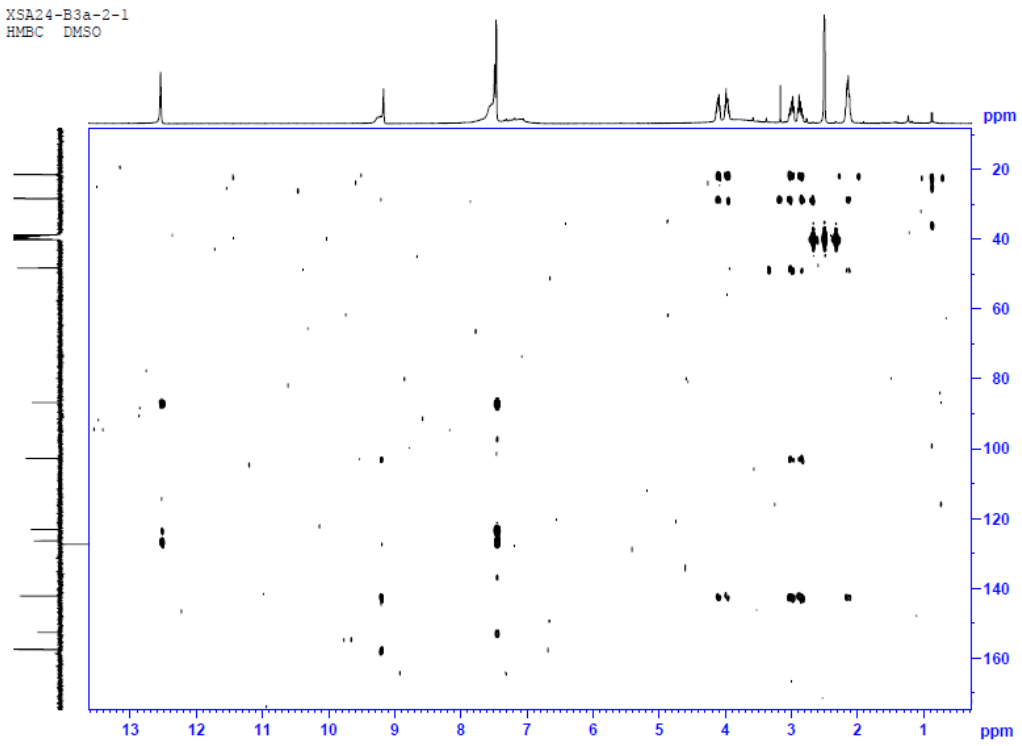


Figure S5. HMBC spectrum of **1** (DMSO-d_6, 400MHz)

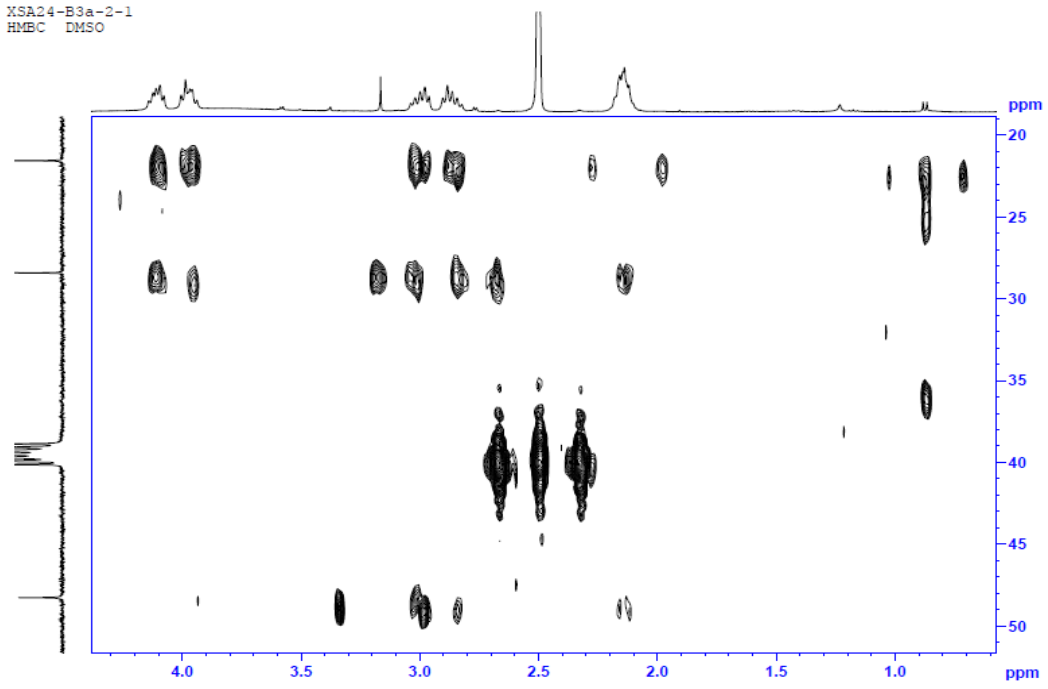


Figure S6. Enlarged HMBC spectrum of **1** (DMSO-d_6, 400MHz)

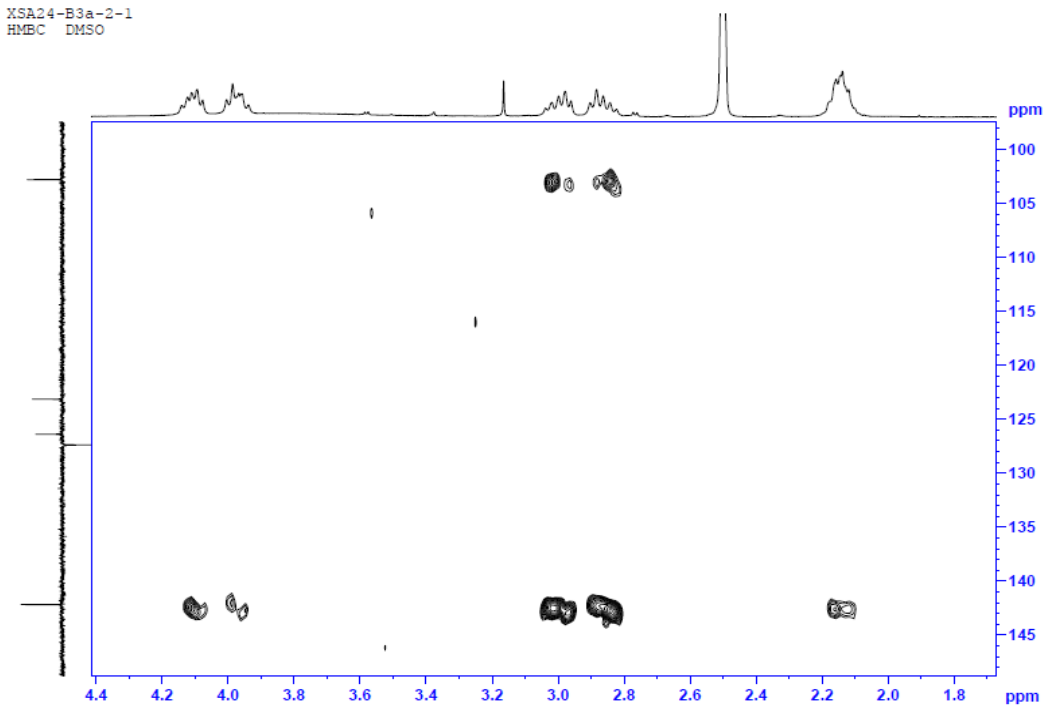


Figure S7. Enlarged HMBC spectrum of **1** (DMSO-d_6, 400MHz)

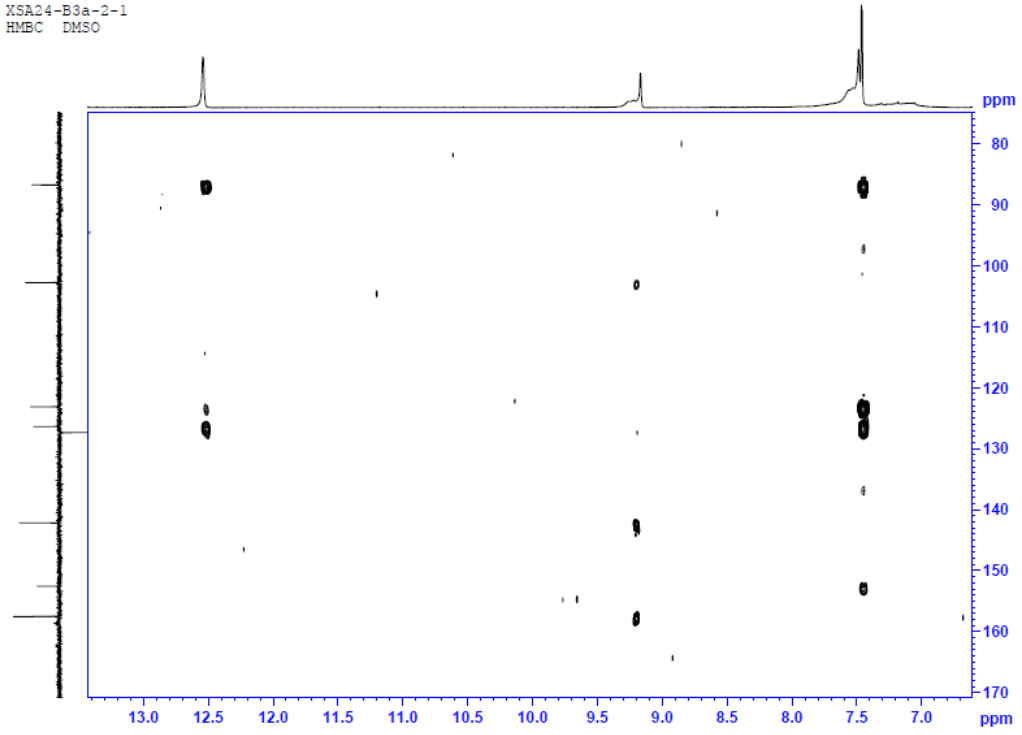
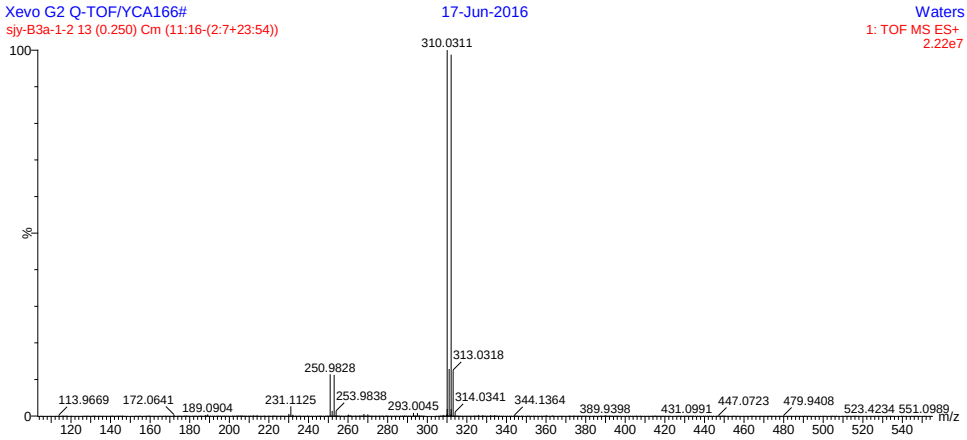


Figure S8. Enlarged HMBC spectrum of **1** (DMSO-d_6, 400MHz)



Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Norm	Conf(%)	Formula
310.0311	310.0303	0.8	2.6	7.5	637.5	0.000	100.00	$C_{11}H_{13}N_5OBr$

Figure S9. HR-ESIMS spectrum of **1**

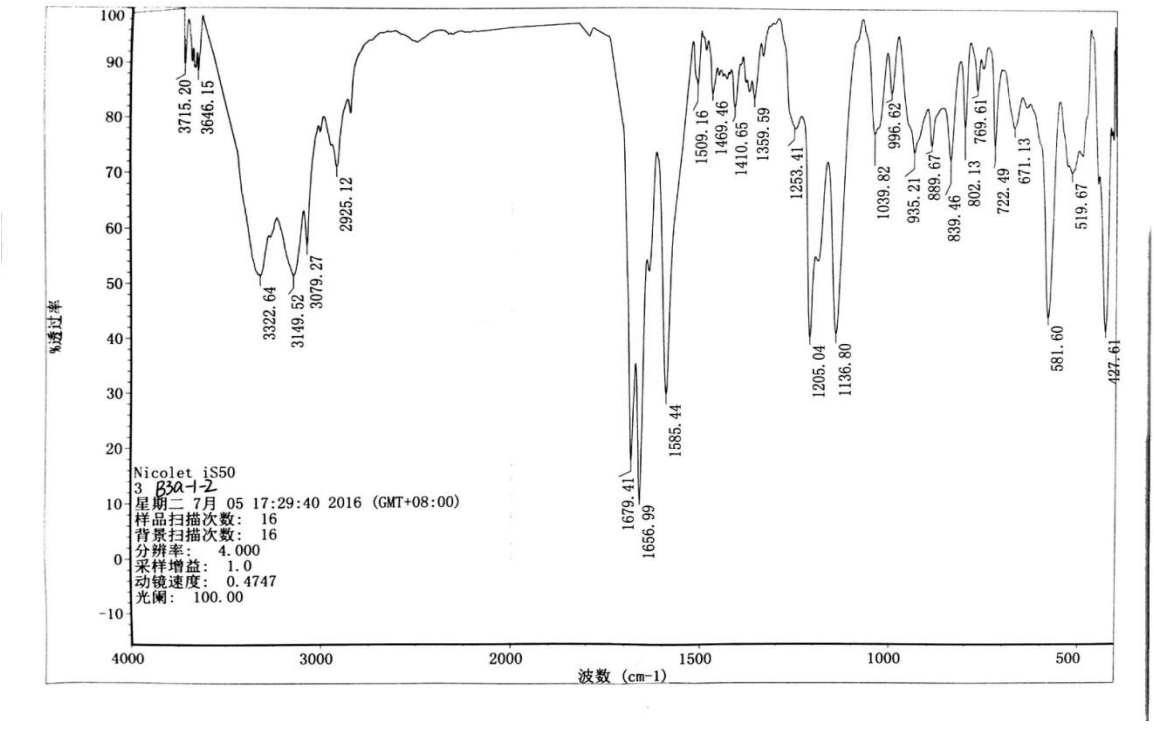


Figure S10. IR spectrum of **1**

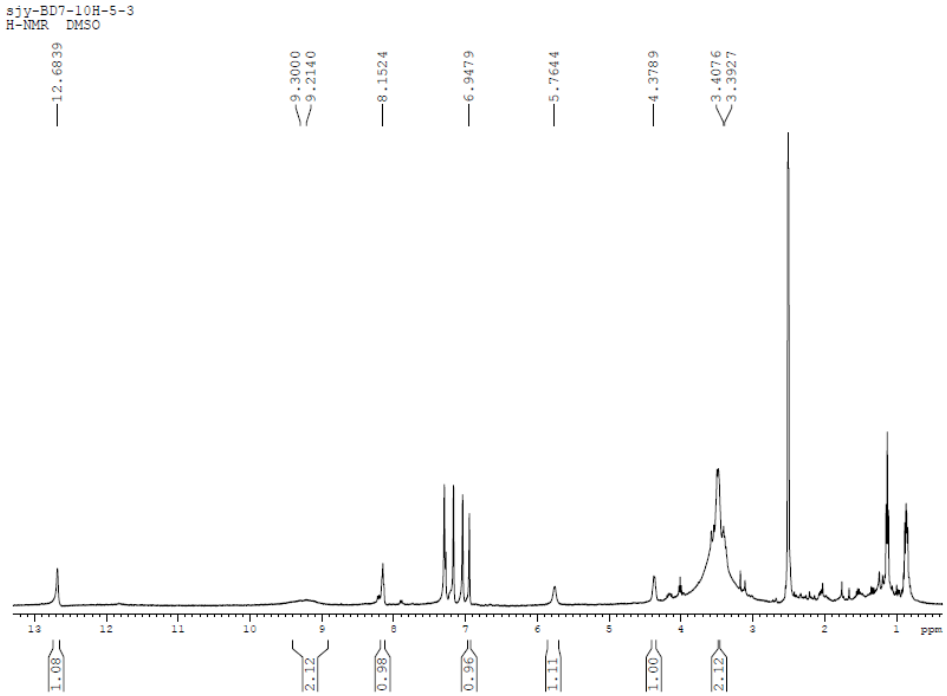


Figure S11. ^{1}H-NMR spectrum of **2/3** (DMSO-d_6, 400MHz)

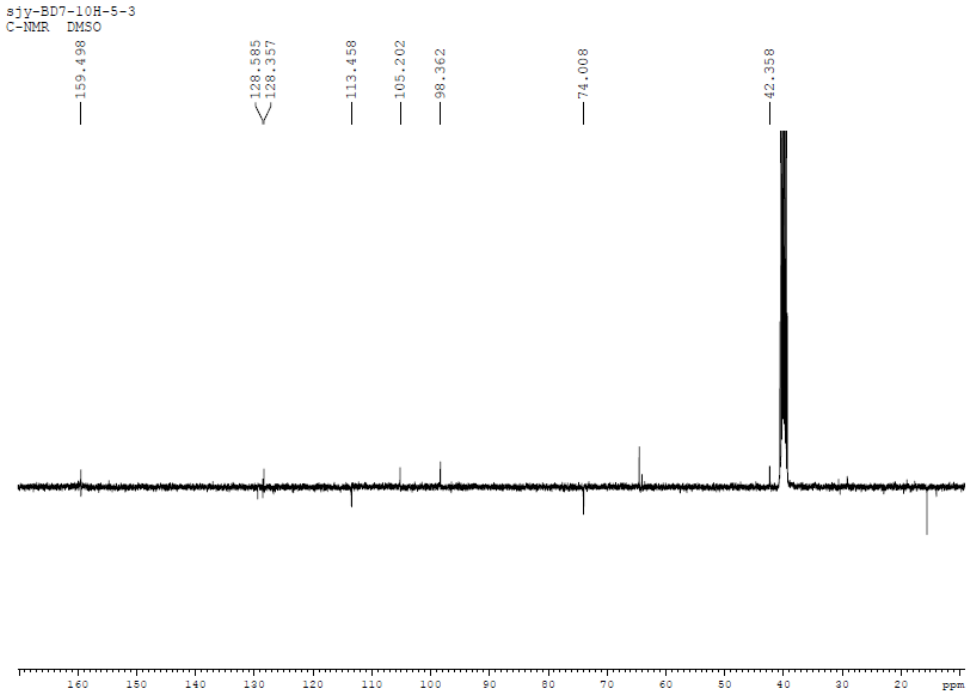


Figure S12. ^{13}C-NMR spectrum of **2/3** (DMSO-d_6, 100MHz)

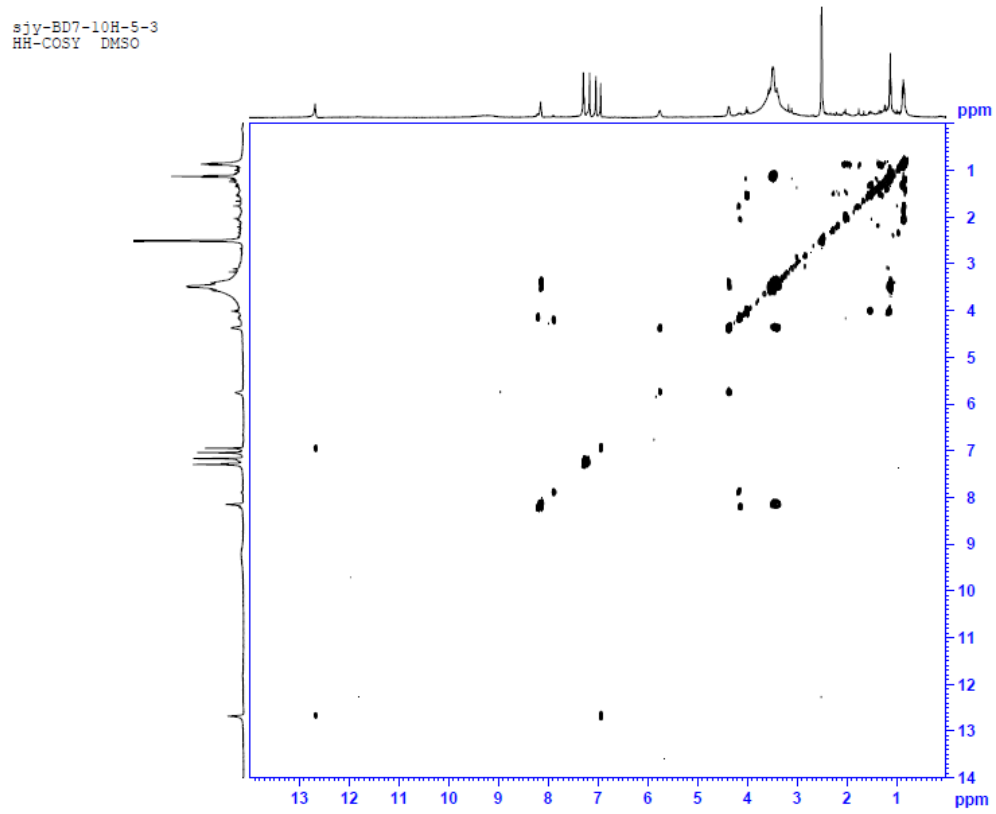


Figure S13. ^{1}H-^{1}H COSY spectrum of **2/3** (DMSO-d_6, 400MHz)

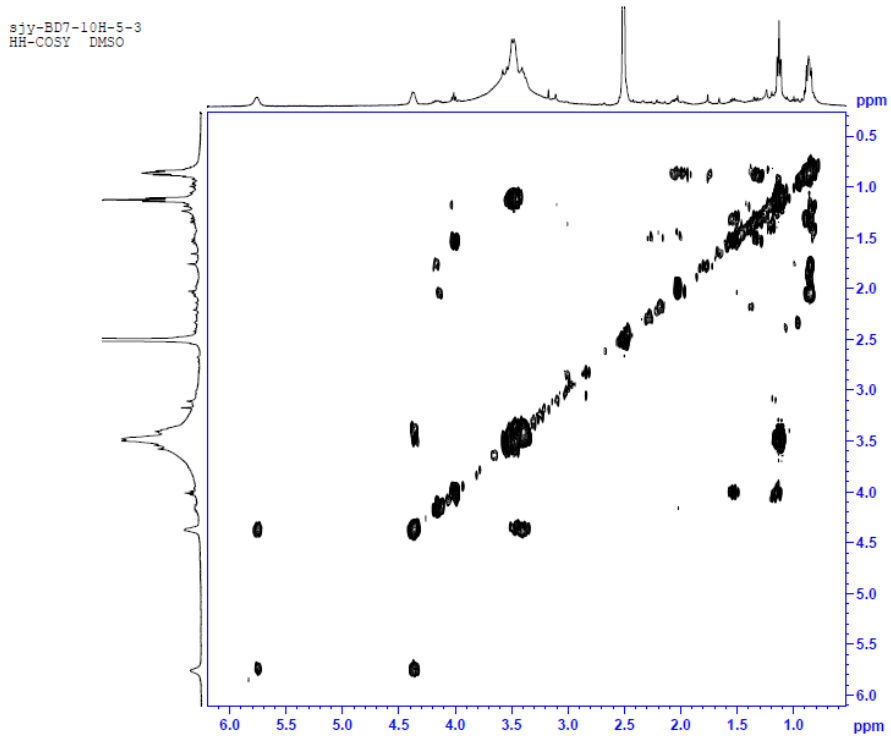


Figure S14. Enlarged ^{1}H-^{1}H COSY spectrum of **2/3** (DMSO-d_6, 400MHz)

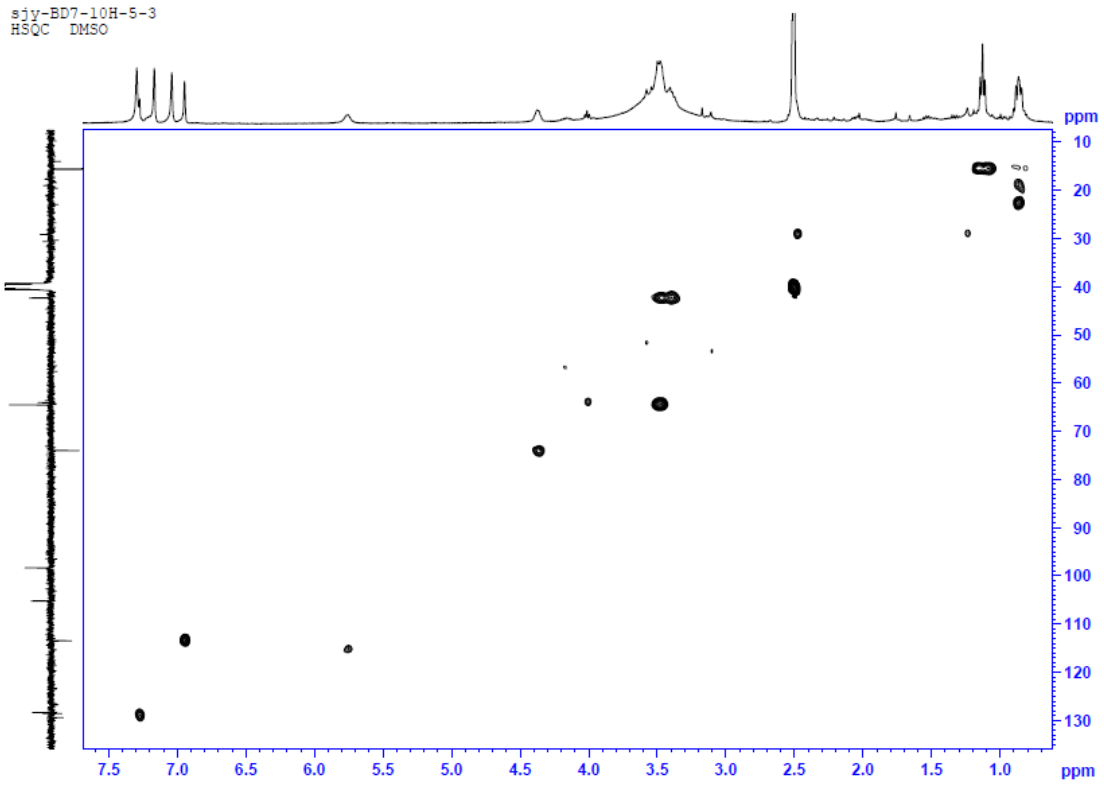


Figure S15. HSQC spectrum of **2/3** (DMSO-d_6, 400MHz)

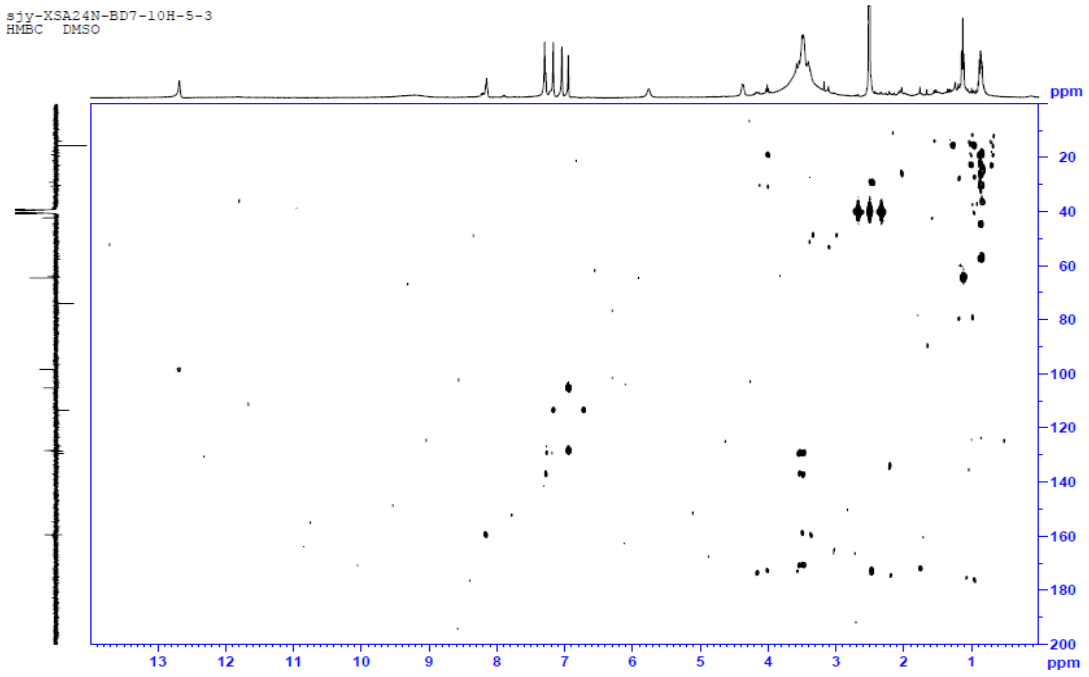


Figure S16. HMBC spectrum of **2/3** (DMSO-d_6, 400MHz)

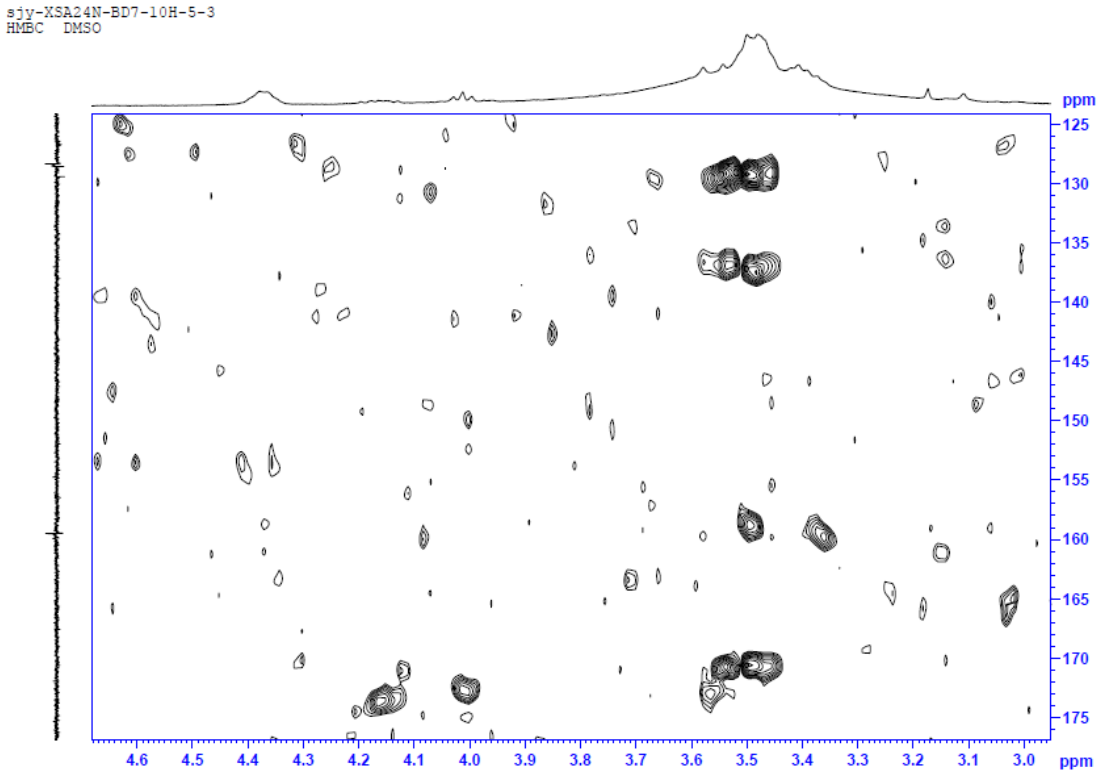


Figure S17. Enlarged HMBC spectrum of **2/3** (DMSO-d_6, 400MHz)

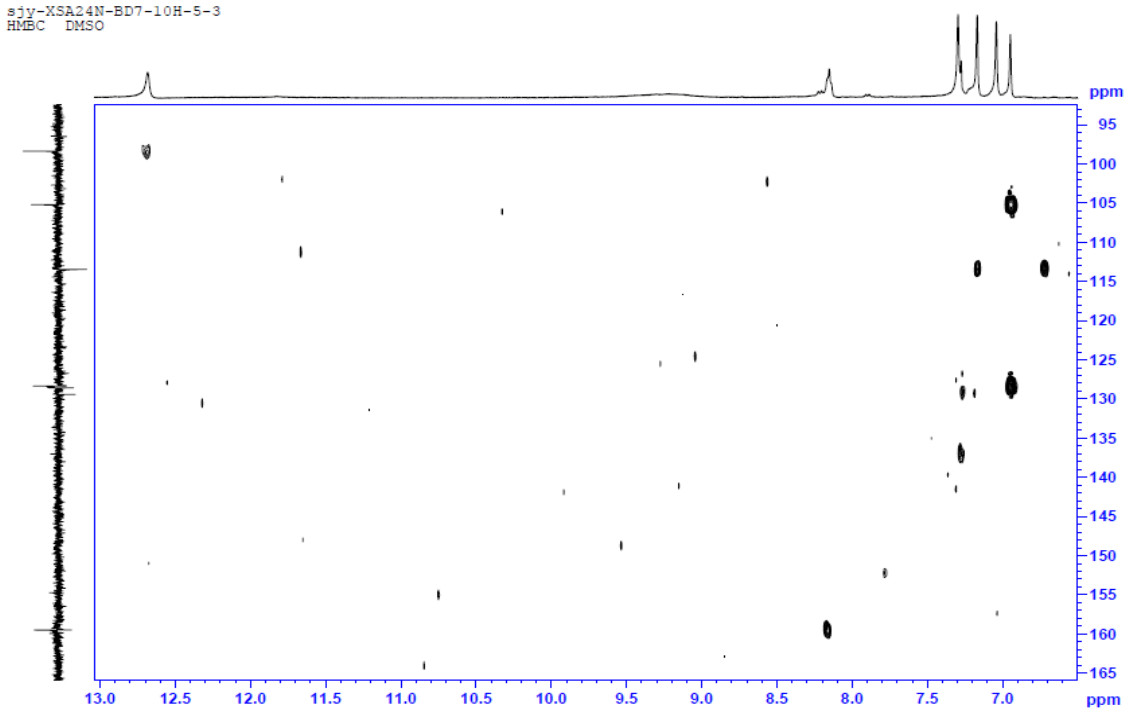
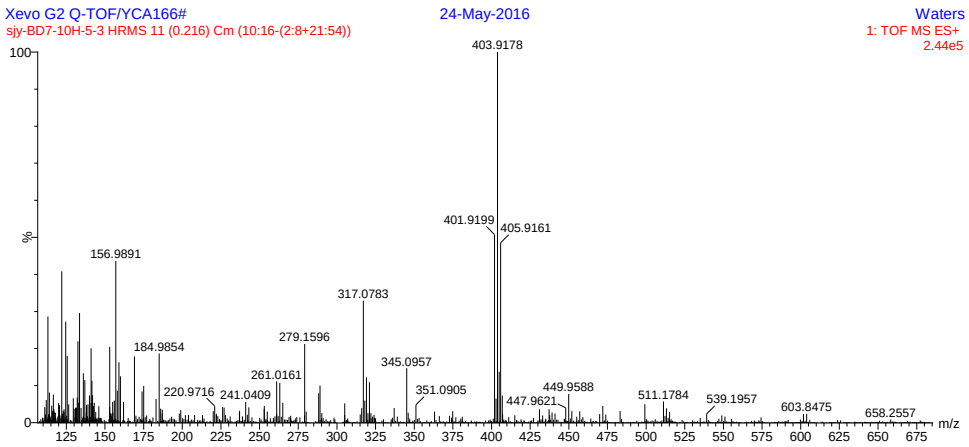


Figure S18. Enlarged HMBC spectrum of **2/3** (DMSO-d_6, 400MHz)



Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Norm	Conf(%)	Formula
401.9199	401.9201	-0.2	-0.5	8.5	274.7	0.250	77.86	$C_{11}H_{10}N_5O_2Br_2$

Figure S19. HR-ESIMS spectrum of **2/3**

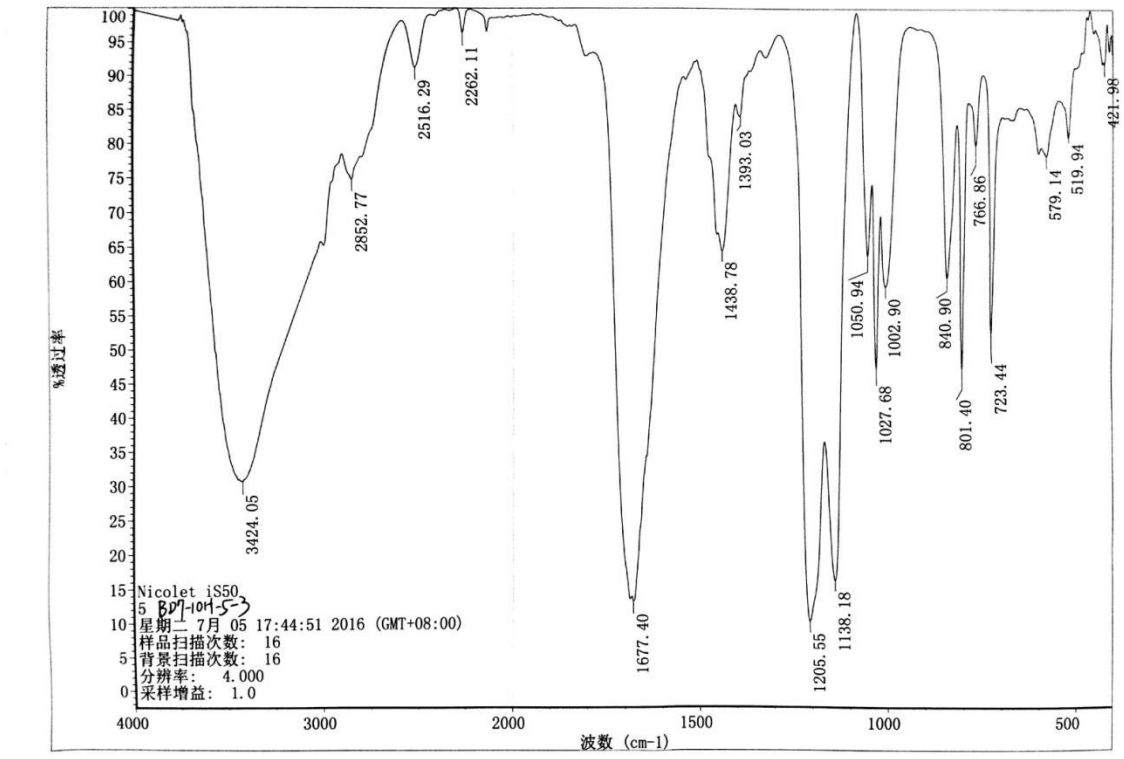


Figure S20. IR spectrum of **2/3**

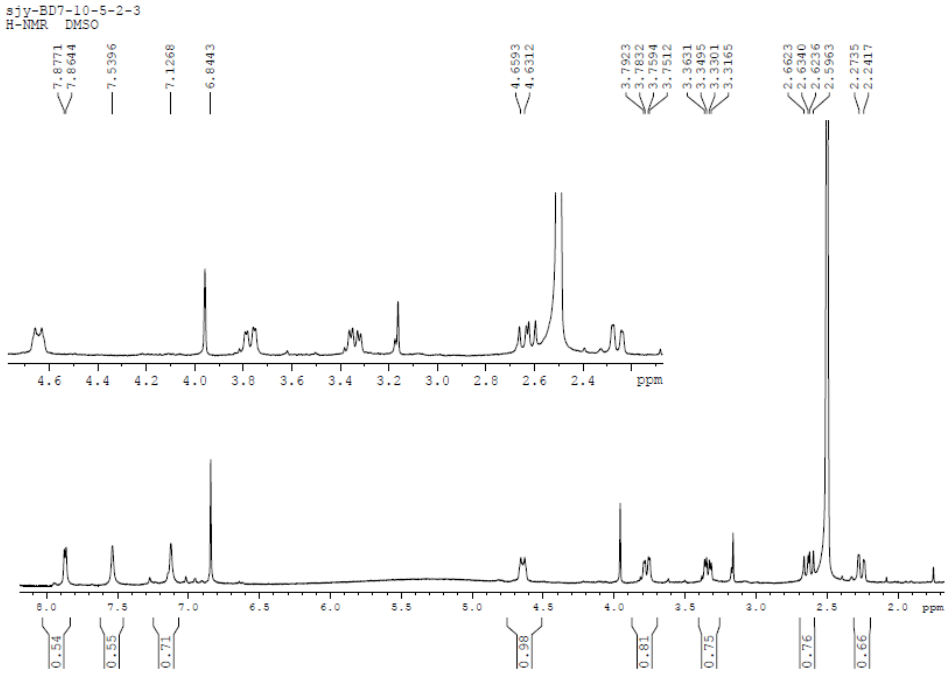


Figure S21. ^{1}H-NMR spectrum of **4/5** (DMSO-d_6, 400MHz)

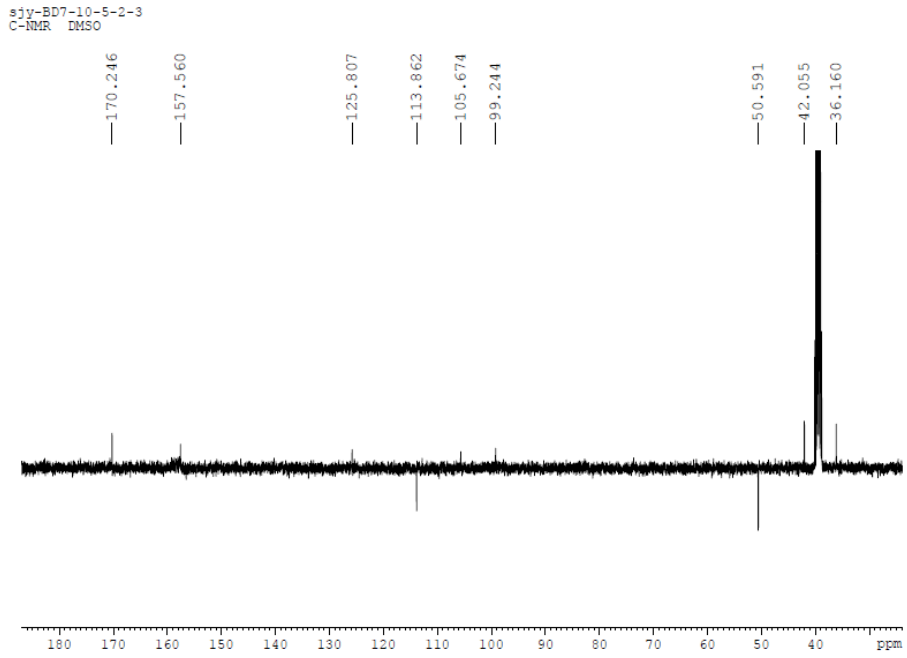


Figure S22. ^{13}C-NMR spectrum of **4/5** (DMSO-d_6, 100MHz)

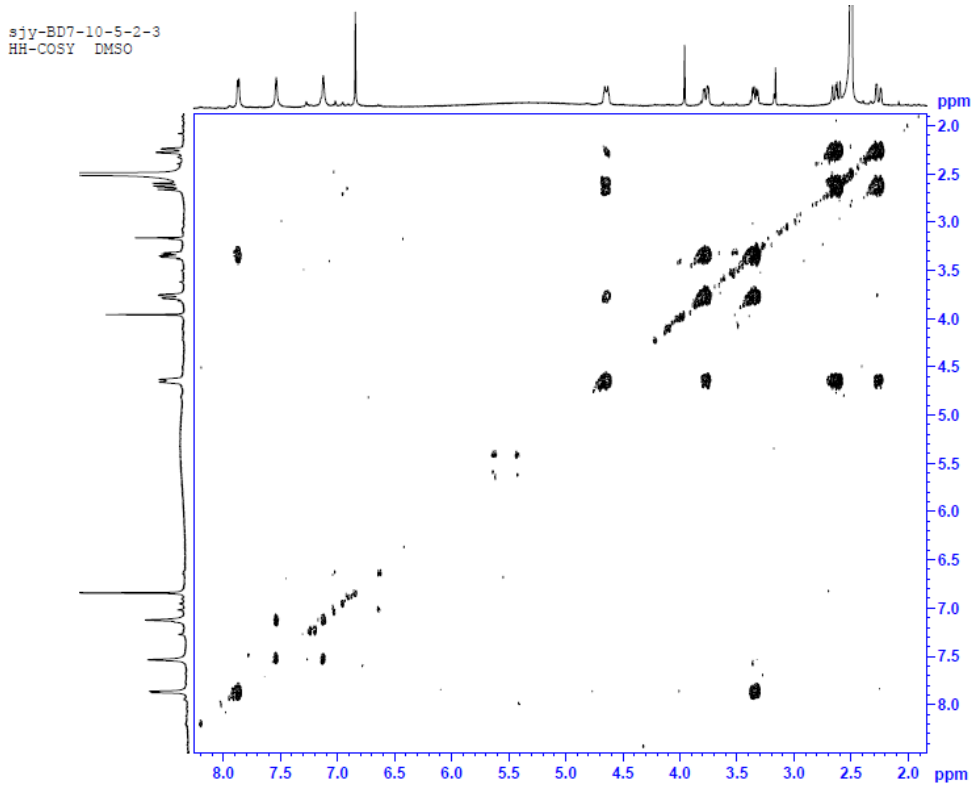


Figure S23. ^{1}H-^{1}H COSY spectrum of **4/5** (DMSO-d_6, 400MHz)

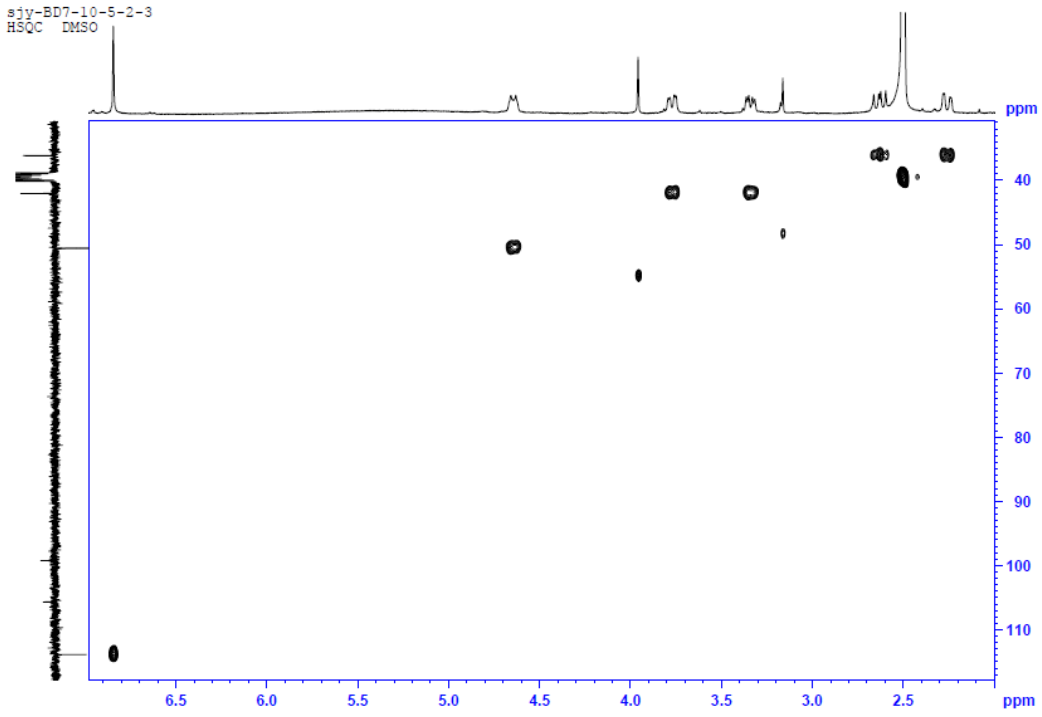


Figure S24. HSQC spectrum of **4/5** (DMSO-d_6, 400MHz)

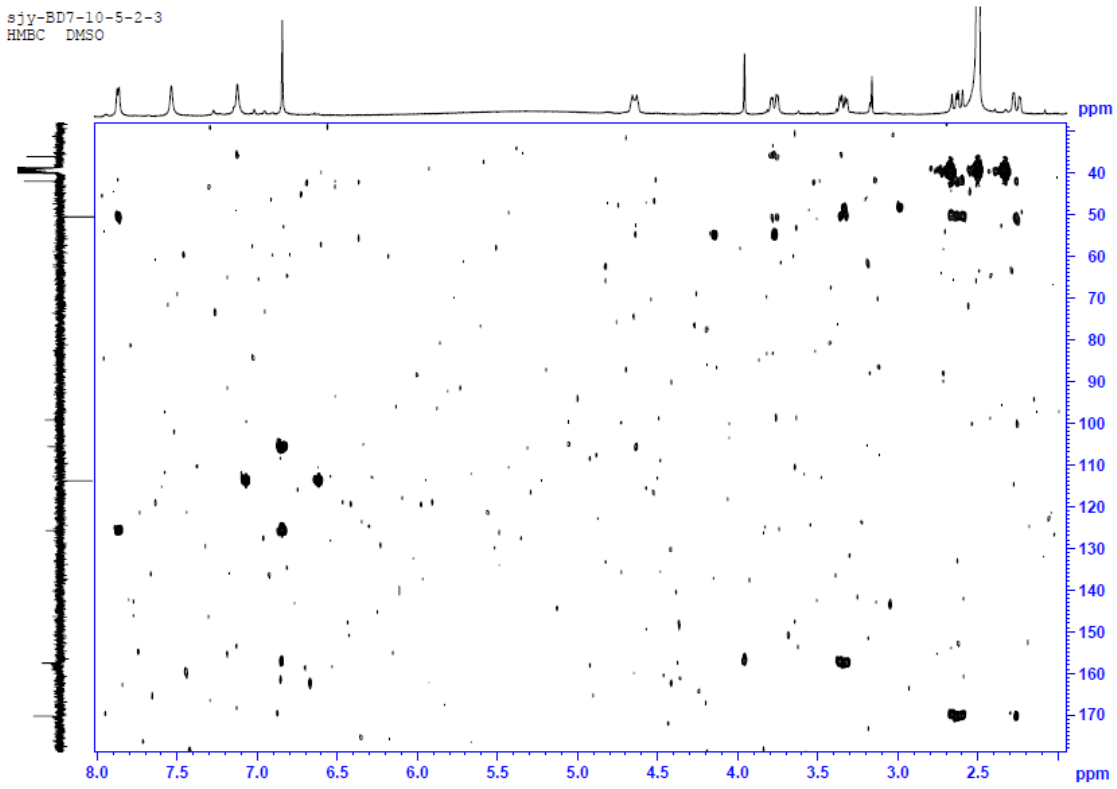
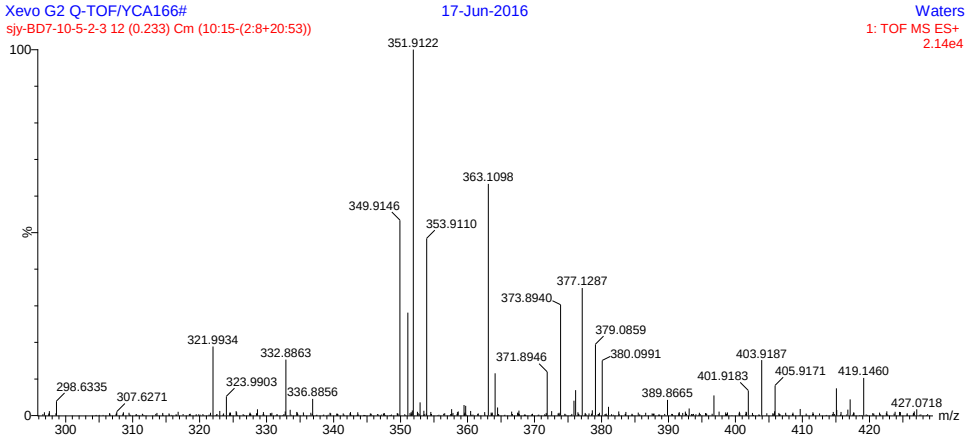


Figure S25. HMBC spectrum of **4/5** (DMSO-d_6, 400 MHz)



Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Norm	Conf(%)	Formula
349.9146	349.9140	0.6	1.7	5.5	117.1	0.490	61.25	$C_9H_{10}N_3O_2Br_2$

Figure S26. HR-ESIMS spectrum of **4/5**

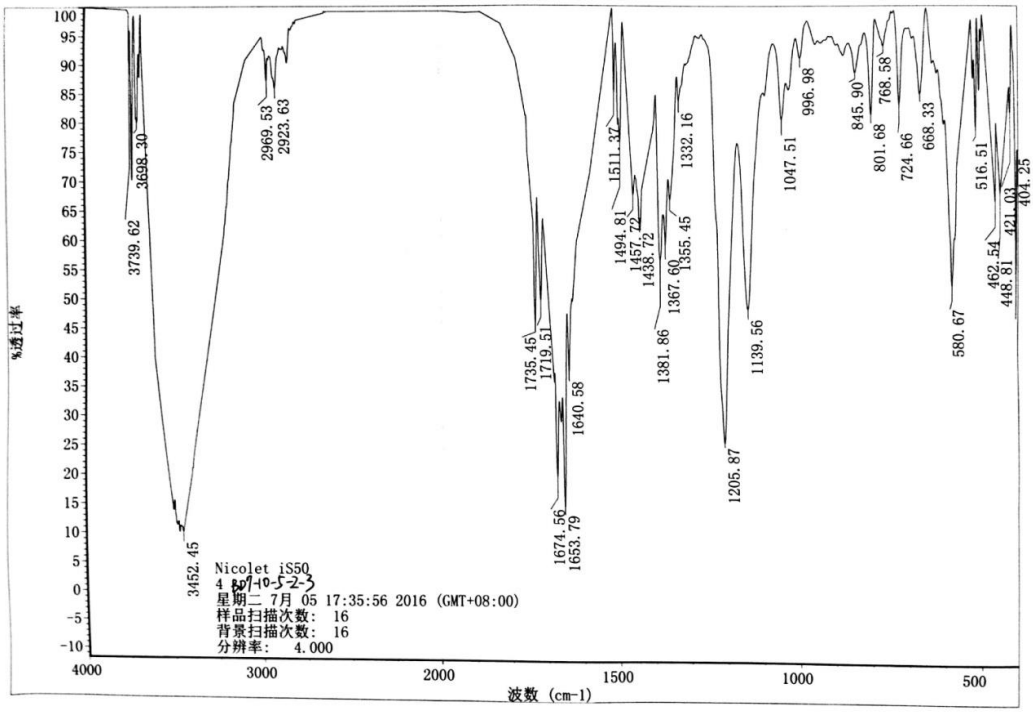


Figure S27. IR spectrum of **4/5**

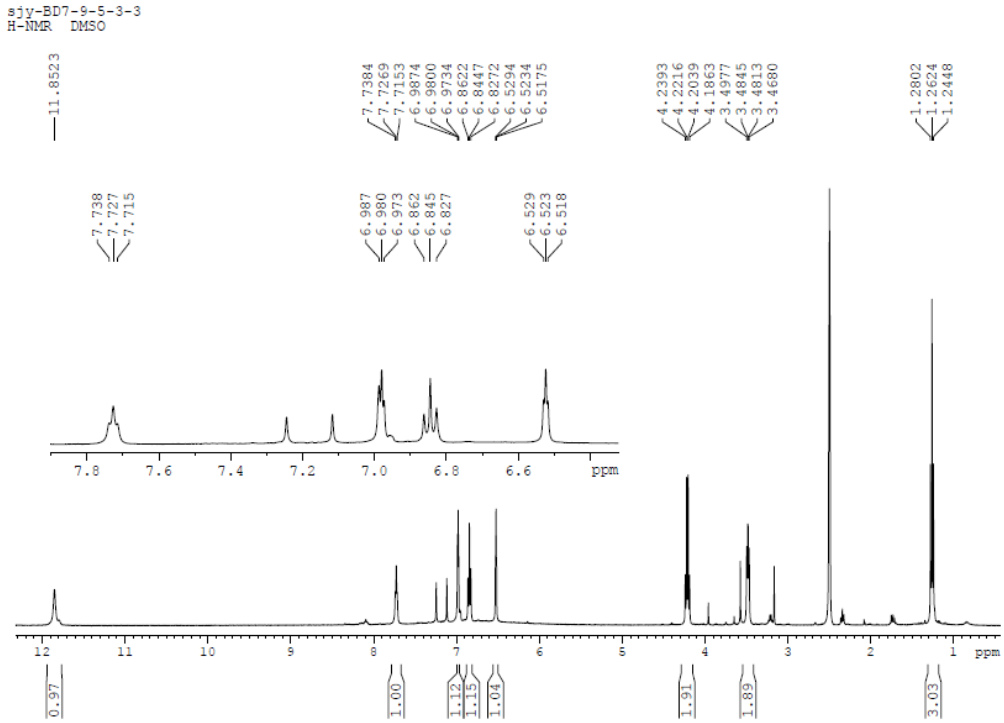


Figure S28. ^{1}H-NMR spectrum of **6**(DMSO-d_6, 400MHz)

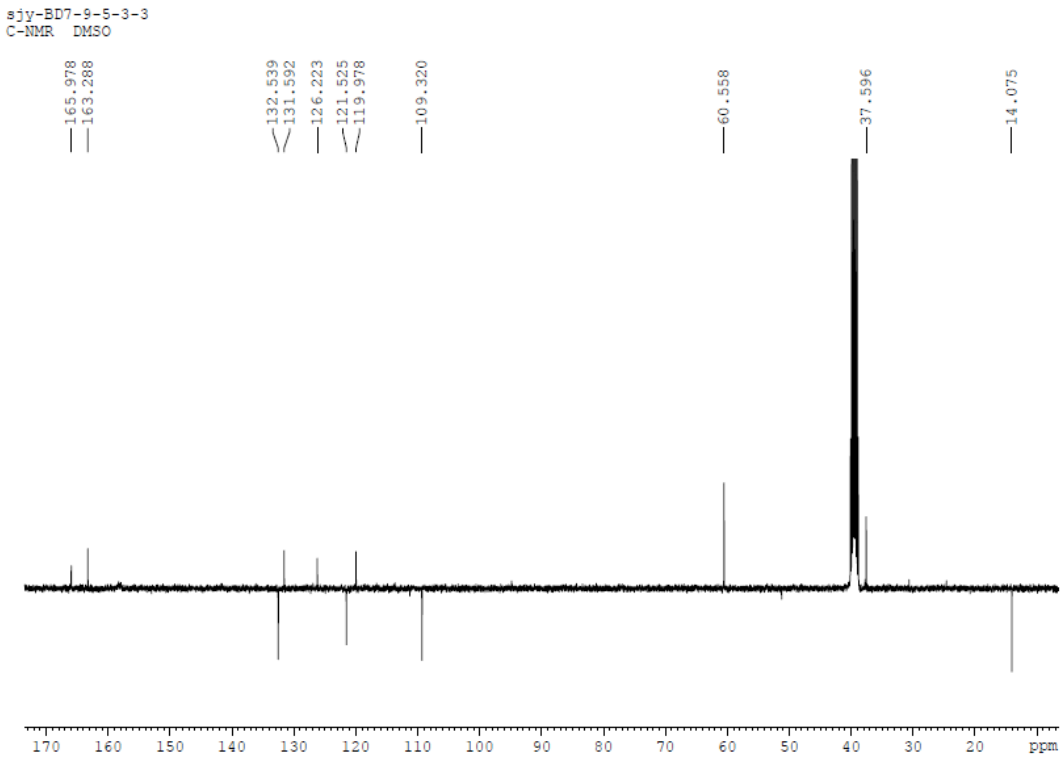


Figure S29. ^{13}C-NMR spectrum of **6** (DMSO-d_6, 100MHz)

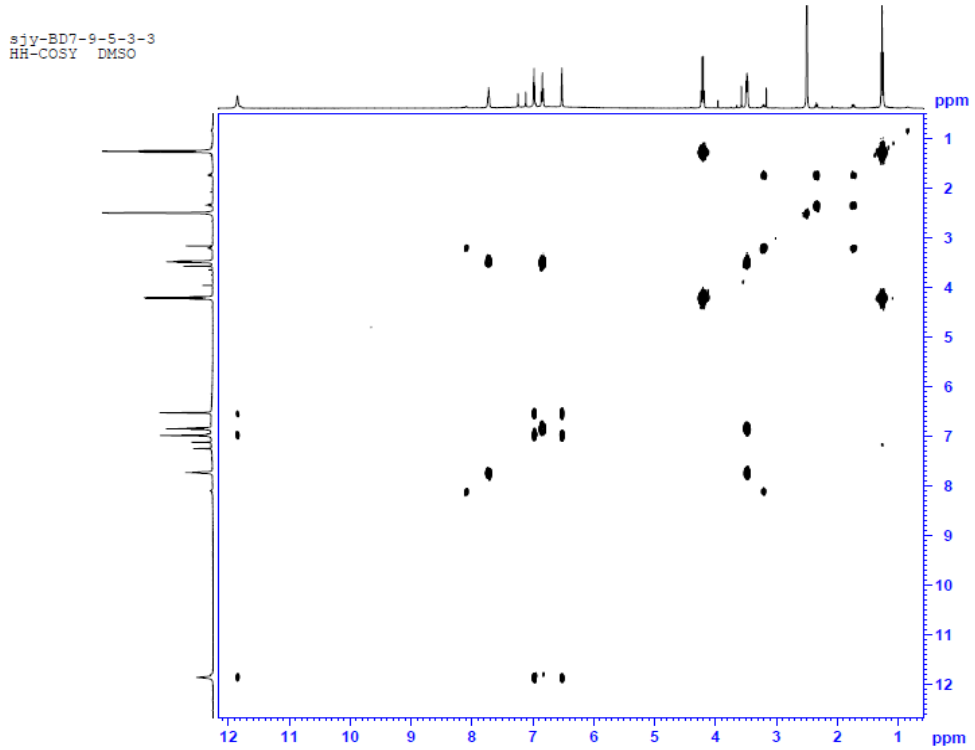


Figure S30. ^{1}H-^{1}H COSY spectrum of **6** (DMSO-d_6, 400MHz)

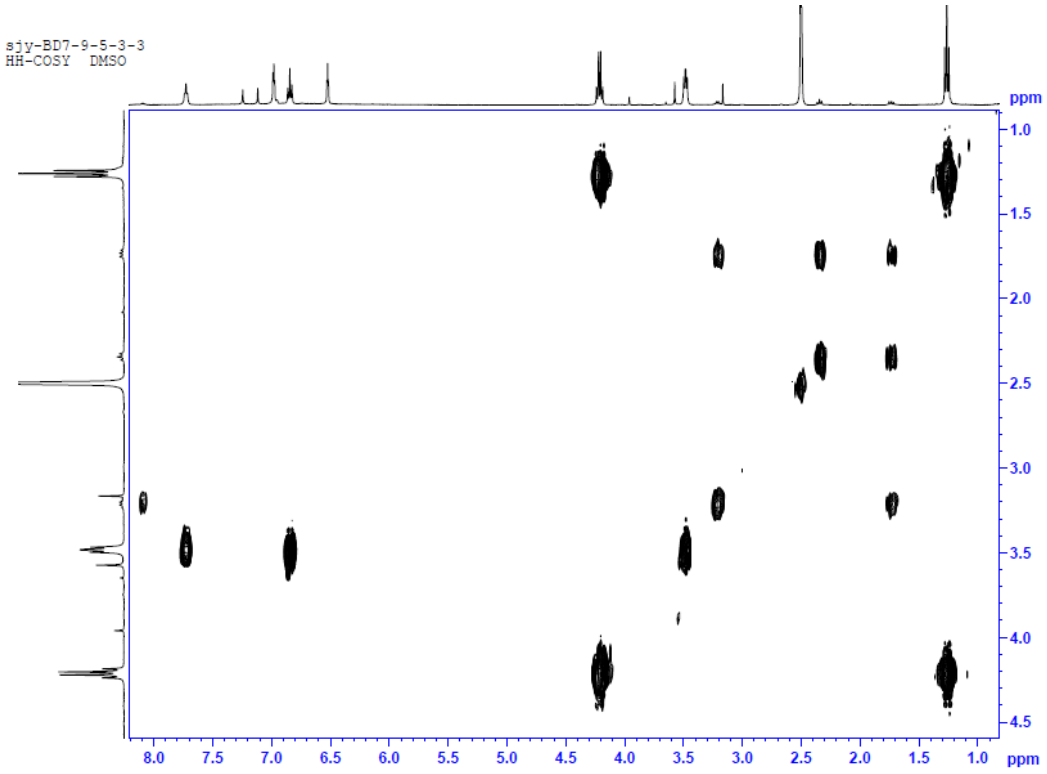


Figure S31. Enlarged ^{1}H-^{1}H COSY spectrum of **6** (DMSO-d_6, 400MHz)

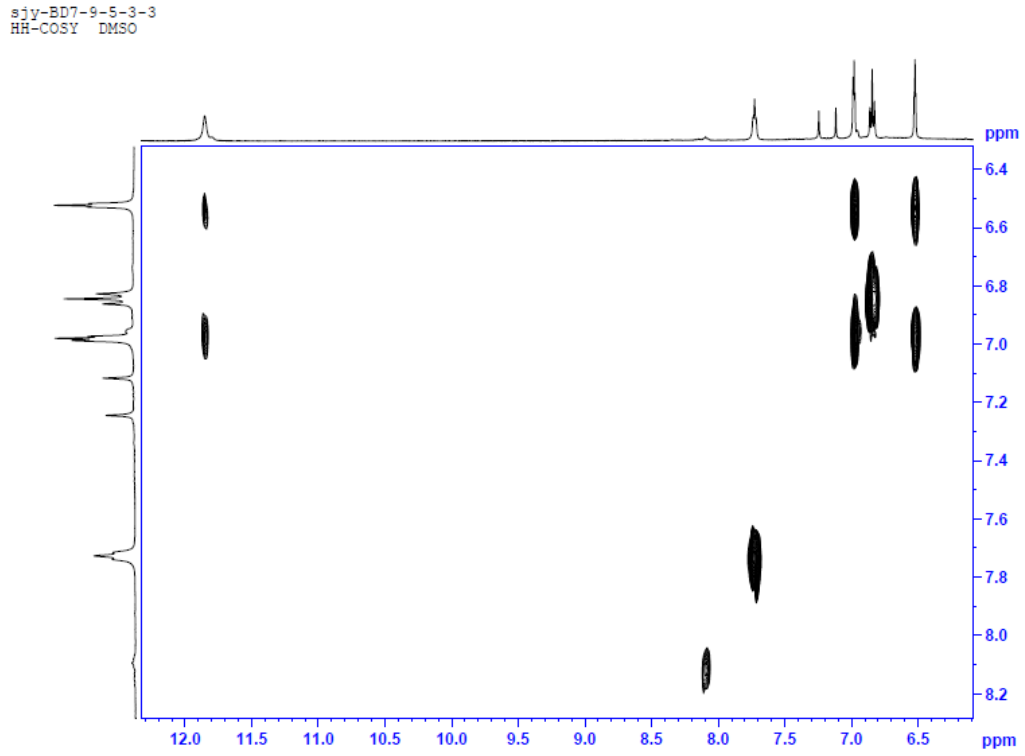


Figure S32. Enlarged ^{1}H-^{1}H COSY spectrum of **6** (DMSO-d_6, 400MHz)

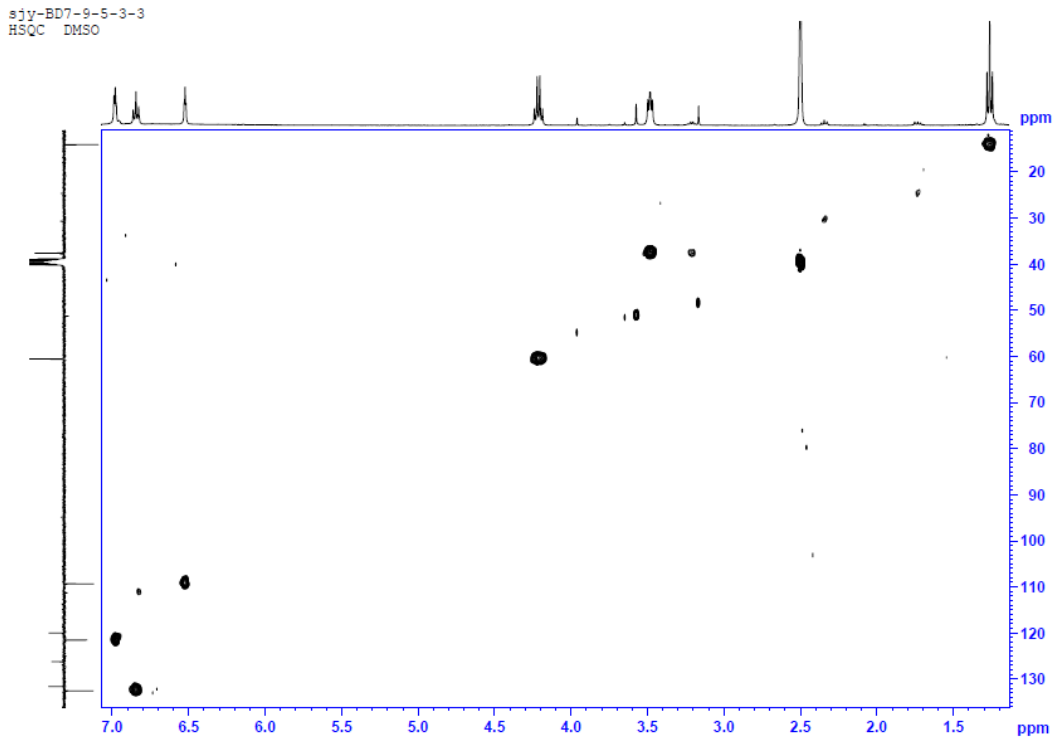


Figure S33. HSQC spectrum of **6** (DMSO-d_6, 400MHz)

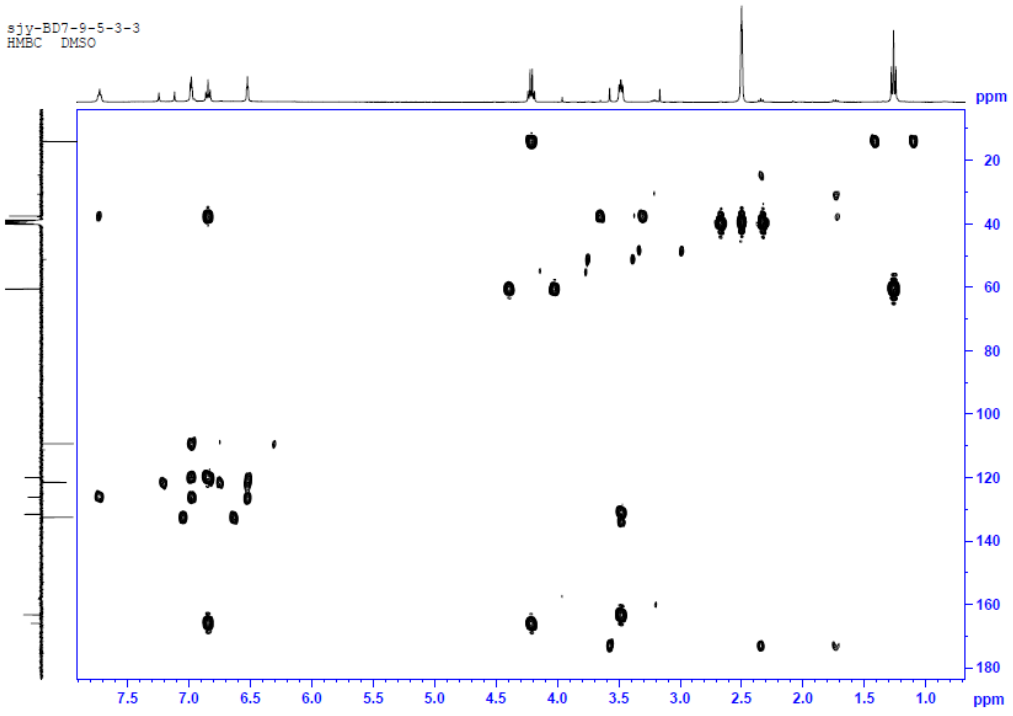


Figure S34. HMBC spectrum of **6** (DMSO-d_6, 400MHz)

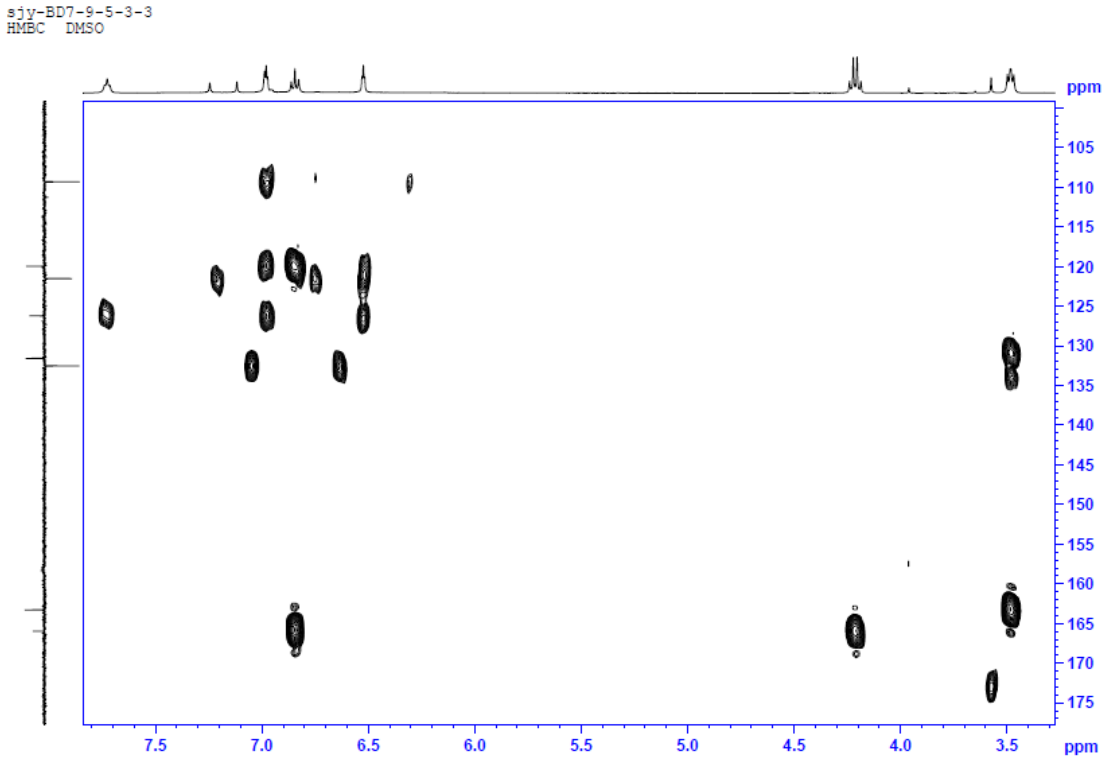
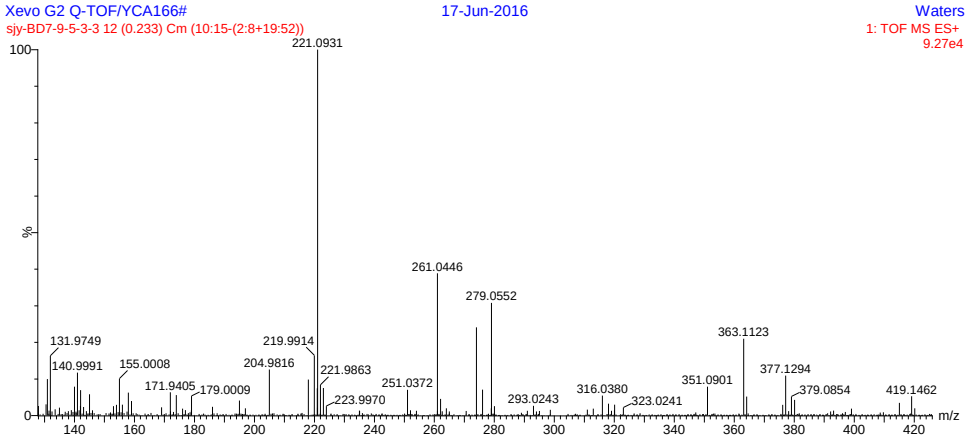


Figure S35. Enlarged HMBC spectrum of **6** (DMSO-d_6, 400MHz)



Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Norm	Conf(%)	Formula
221.0931	221.0926	0.5	2.3	6.5	191.7	n/a	n/a	$C_{11}H_{13}N_2O_3$

Figure S36. HRESIMS spectrum of **6**

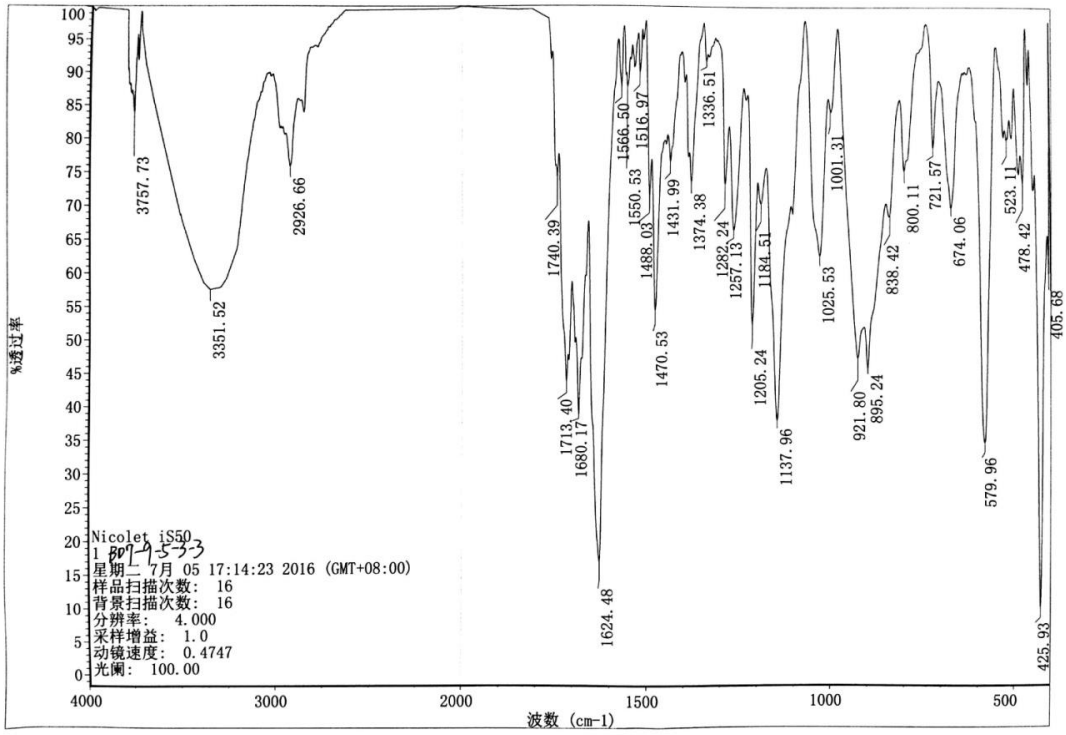


Figure S37. IR spectrum of **6**

The mixture of **2/3** was separated by chiral HPLC (Daciel CHIRALPAK IC column, 0.46cmI.D.*15cmL, *n*-hexane: isopropanol= 78: 22, 1mL/min, 254nm) with ratio of 1:1. [peak a, **2**: $[\alpha]_D^{25}$ +30.80 (c 0.05, MeOH); peak b, **3**: $[\alpha]_D^{25}$-31.20 (c 0.05, MeOH)].

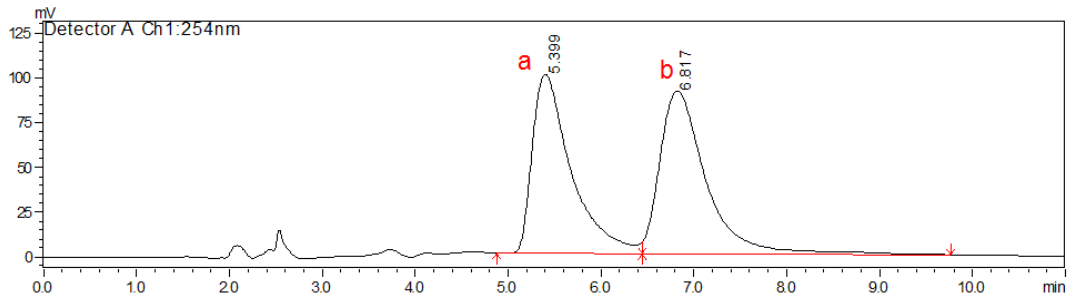


Figure S39. Chiral HPLC separation of **2 (a)** and **3 (b)**

The mixture of **4/5** was separated by chiral HPLC analysis (Daciel CHIRALPAK IC column, 0.46cmI.D.*15cmL, *n*-hexane: ethanol= 75: 25, 1mL/min, 254nm) with ratio of 5:4 [peak a, **4**: $[\alpha]_D^{25}$ -4.00 (c 0.05, MeOH); peak b, **5**: $[\alpha]_D^{25}$+4.00 (c 0.05, MeOH)].

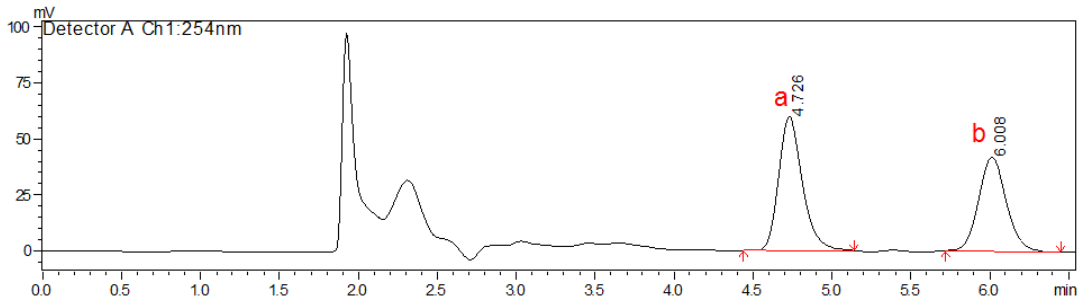


Figure S40. Chiral HPLC separation of **4 (a)** and **5 (b)**

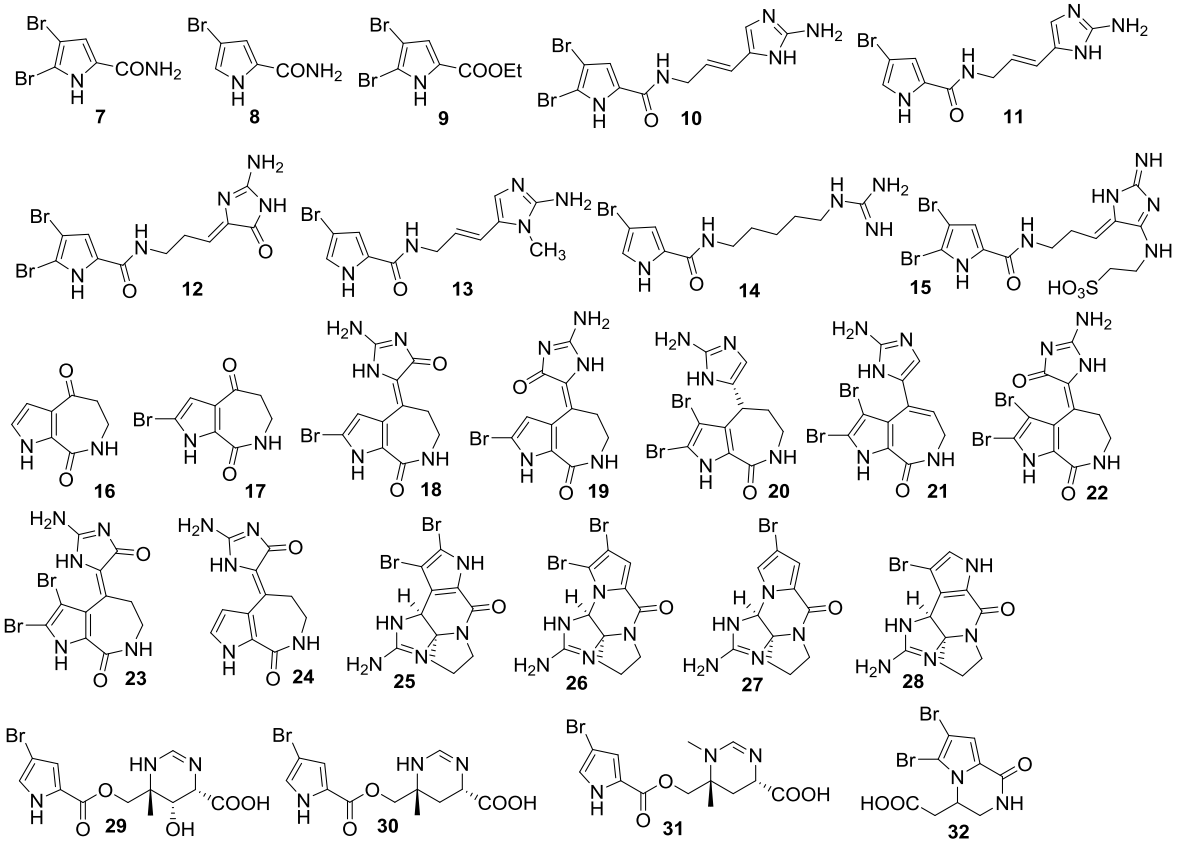


Figure S41. Known alkaloids derived from marine sponge *S. massa*

Physical and spectroscopic data for known compounds

Compound 7 (4,5-dibromopyrrole-2-carbamide): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.64 (1H, brs, NH-1), 7.60 (1H, brs, NH), 7.18 (1H, brs, NH), 6.92 (1H, s, H-3) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 160.4 (C, C-5), 128.2 (C, C-4), 113.1 (CH, C-3), 104.6 (C, C-1), 97.7 (C, C-2) ppm; ESIMS *m/z* 267$[M+H]^+$.

Compound 8 (4-bromopyrrole-2-carbamide): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 11.76 (1H, brs, NH-1), 7.56 (1H, brs, NH), 7.09 (1H, brs, NH), 6.96 (1H, m, H-1), 6.84 (1H, m, H-3) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 161.1 (C, C-5), 126.9 (C, C-4), 121.2 (CH, C-1), 112.0 (CH, C-3), 94.8 (C, C-2) ppm; ESIMS *m/z* 189$[M+H]^+$.

Compound 9 (ethyl 4,5-dibromopyrrole-2-carboxylate): yellow solid; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 13.11 (1H, s, NH), 6.88 (1H, s, H-3), 4.23 (2H, q, J = 7.00 Hz, H-6), 1.27 (3H, t, J = 7.00 Hz, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 158.8 (C, C-5), 124.0 (C, C-4), 117.0 (CH, C-3), 107.4 (C, C-1), 98,9 (C, C-2), 60.2 (CH_2, C-6), 14.2 (CH_3, C-7) ppm; ESIMS *m/z* 296$[M+H]^+$.

Compound 10 (oroidin): yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.86 (1H, brs, NH), 12.72 (1H, brs, NH), 12.20 (1H, brs, NH-1), 8.45 (1H, t, J = 5.66 Hz, NH-2), 7.72 (2H, s, NH_2), 6.98 (1H, d, J = 2.24 Hz, H-3), 6.90 (1H, s, H-10), 6.22 (1H, d, J = 16.1 Hz, H-8), 6.09 (1H, dt, J = 16.1, 5.2 Hz, H-7), 3.96 (2H, m, H-6) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 158.7 (C, C-5), 147.9 (C, C-11), 128.0 (C, C-4), 126.5 (CH, C-7), 124.9 (C, C-9), 116.3 (CH, C-8), 112.8 (CH, C-3), 111.2 (CH, C-10), 104.7 (C, C-1), 97.9 (C, C-2), 39.9 (CH_2, C-6) ppm; ESIMS *m/z* 388$[M+H]^+$.

Compound 11 (hymenidin): yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.76 (1H, brs, NH), 12.12 (1H, brs, NH), 11.85 (1H, s, NH-1), 8.42 (1H, t, J = 5.7 Hz, NH-2), 7.67 (2H, s, NH_2), 6.98 (1H, m, C-1), 6.91 (1H, s, H-10), 6.89 (1H, m, C-3), 6.22 (1H, d, J = 16.4 Hz, H-8), 6.10 (1H, dt, J = 16.4, 5.4 Hz, H-7), 3.96 (2H, m, H-6) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 159.4 (C, C-5), 147.8 (C, C-11), 126.8 (CH, C-7), 126.7 (C, C-4), 124.9 (C, C-9), 121.3 (CH, C-1), 116.2 (CH, C-8), 111.6 (CH, C-3), 111.1 (CH, C-10), 94.9 (C, C-2), 39.8 (CH_2, C-6) ppm; ESIMS *m/z* 310$[M+H]^+$.

Compound 12 (dispacamide 1): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400

MHz) δ 12.70 (1H, s, NH-1), 9.57 (2H, brs, NH_2), 8.30 (1H, t, J = 5.7 Hz, NH-2), 6.90 (1H, d, J = 2.3 Hz, H-3), 5.99 (1H, t, J = 7.6 Hz, H-8), 3.38 (2H, m, H-6), 2.52 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 162.9 (C, C-10), 158.9 (C, C-5), 155.7 (C, C-11), 129.2 (C, C-9), 128.0 (C, C-4), 117.1 (CH, C-8), 112.6 (CH, C-3), 104.6 (C, C-1), 97.8 (C, C-2), 37.3 (CH_2, C-6), 27.3 (CH_2, C-7) ppm; ESIMS *m/z* 404$[M+H]^+$.

Compound 13 (keramadine): light yellow amorphous; ^{1}H NMR(DMSO-d_6, 400 MHz) δ 12.69 (1H, s, NH-3), 11.85 (1H, s, NH-1), 8.46 (1H, t, J = 5.5 Hz, NH-2), 7.80 (1H, s, NH-4), 7.11 (1H, s, H-10), 6.98 (1H, m, C-1), 6.84 (1H, m, C-3), 6.25 (1H, d, J = 11.7 Hz, H-8), 5.85 (1H, m, H-7), 4.01 (2H, m, H-6), 3.39 (3H, s, CH_3) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 159.5 (C, C-5), 146.6 (C, C-11), 133.3 (CH, C-7), 126.6 (C, C-4), 123.7 (C, C-9), 121.3 (CH, C-1), 113.7 (CH, C-8), 111.9 (CH, C-10), 111.5 (CH, C-3), 94.9 (C, C-2), 37.7 (CH_2, H-6), 29.2 (CH_3) ppm; ESIMS *m/z* 324$[M+H]^+$.

Compound 14 (laughine): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 11.77 (1H, s, NH-1), 8.08 (1H, t, J = 5.6 Hz, NH-3), 7.80 (2H, s, NH_2), 7.66 (1H, t, J = 5.3 Hz, NH-2), 6.95 (1H, m, H-1), 6.82 (1H, m, H-3), 3.19 (2H, m, H-10), 3.08 (2H, m, H-6), 1.49 (2H, m, H-7), 1.48 (2H, m, H-9), 1.30 (2H, m, H-8) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 159.4 (C, C-11), 156.7 (C, C-5), 127.0 (C, C-4), 120.9 (CH, C-1), 111.2 (CH, C-3), 94.8 (C, C-2), 40.6 (CH_2, C-6), 38.2 (CH_2, C-10), 28.8 (CH_2, C-7), 28.1 (CH_2, C-9), 23.4 (CH_2, C-8) ppm； ESIMS *m/z* 316$[M+H]^+$.

Compound 15 (taurodispacamide A): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.72 (1H, s, NH-1), 11.27 (1H, s, NH-5), 9.60 (1H, t, NH-6), 9.20 (1H, s, NH), 8.48 (1H, s, NH), 8.27 (1H, t, NH-2), 6.92 (1H, s, H-3), 6.14 (1H, t, J = 7.5 Hz, H-8), 3.67 (2H, m, H-12), 3.35 (2H, m, H-6), 2.78 (2H, m, H-13), 2.53 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 167.1 (C, C-11), 166.0 (C, C-10), 159.0 (C, C-5), 132.8 (C, C-9), 128.0 (C, C-4), 114.3 (CH, C-8), 112.6 (CH, C-3), 104.6 (C, C-1), 97.8 (C, C-2), 49.2 (CH_2, C-13), 39.9 (CH_2, C-12), 37.7 (CH_2, C-6), 27.8 (CH_2, C-7) ppm; ESIMS *m/z* 511$[M+H]^+$.

Compound 16 (aldizine): yellow solid; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.16 (1H, brs, NH-1), 8.32 (1H, t, J = 5.1 Hz, NH-2), 6.98 (1H, t, J = 2.7 Hz, H-1), 6.55 (1H, t, J = 2.7 Hz, H-2), 3.35 (2H, m, H-6), 2.70 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 194.4 (C, C-8), 162.2 (C, C-5), 127.9 (C, C-4), 123.6 (C, C-3), 122.4 (CH, C-1), 109.5

(CH, C-2), 43.5 (CH_2, C-7), 36.6 (CH_2, C-6) ppm; ESIMS *m/z* 265$[M+H]^+$.

Compound 17 (2-bromoaldizine): light yellow single crystal; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.97 (1H, brs, NH-1), 8.40 (1H, t, J = 5.1 Hz, NH), 6.56 (1H, s, H-2), 3.34 (2H, m, H-6), 2.70 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 193.5 (C, C-8), 161.3 (C, C-5), 129.4 (C, C-4), 124.6 (C, C-3), 111.2 (CH, C-2), 105.2 (C, C-1), 43.4 (CH_2, C-7), 36.3 (CH_2, C-6) ppm; ESIMS *m/z* 243$[M+H]^+$.

Compound 18 (10Z-hymenialdisine): light yellow single crystal; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.84 (1H, brs, NH-1), 8.92 (2H, brs, NH_2), 8.09 (1H, s, NH), 6.59 (1H, s, H-2), 3.27 (2H, m, H-7) , 3.26 (2H, m, H-6) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 164.3 (C, C-10), 162.3 (C, C-5), 155.1 (C, C-11), 128.1 (C, C-4), 127.9 (C, C-8), 121.9 (C, C-3), 111.4 (CH, C-2), 104.8 (C, C-1), 39.1 (CH_2, C-6), 31.9 (CH_2, C-7) ppm； ESIMS *m/z* 324$[M+H]^+$.

Compound 19 (10E-hymenialdisine): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.63 (1H, brs, NH-1), 9.26 (2H, brs, NH_2), 8.03 (1H, t, J = 5.1 Hz, NH-2), 6.73 (1H, d, J = 2.1 Hz, H-2), 3.26 (2H, m, H-6) , 2.83 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 163.0 (C, C-10), 161.3 (C, C-5), 153.7 (C, C-11), 128.2 (C, C-4), 127.6 (C, C-8), 123.3 (C, C-9), 119.9 (C-3), 113.9 (CH, C-2), 102.2 (C, C-1), 38.0 (CH_2, C-6), 36.6 (CH_2, C-7) ppm； ESIMS *m/z* 324$[M+H]^+$.

Compound 20 ((-)-hymenin): light yellow amorphous; $[\alpha]_D^{25}$ -8.65 (*c* 1.62, MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.62 (1H, s, NH-1), 12.39 (1H, s, NH), 11.94 (1H, s, NH), 7.96 (1H, m, NH-2), 7.45 (2H, s, NH_2), 6.23 (1H, s, H-10), 4.09 (1H, t, J = 3.9 Hz, H-8), 3.10 (2H, m, H-6), 2.15 (1H, m, H-7), 2.00 (1H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 161.1 (C, C-5), 147.1 (C, C-11), 128.9 (C, C-4), 125.2 (C, C-9), 123.2 (C, C-3), 111.1 (CH, C-10), 106.2 (C, C-1), 100.6 (C, C-2), 36.4 (CH_2, C-6), 34.2 (CH, C-8), 31.8 (CH_2, C-7) ppm； ESIMS *m/z* 388$[M+H]^+$.

Compound 21 (stevensine): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 13.29 (1H, s, NH-1), 12.44 (1H, brs, NH), 12.24 (1H, brs, NH), 8.12 (1H, t, J = 5.0 Hz, NH-2), 7.49 (2H, s, NH_2), 6.89 (1H, s, H-10), 6.20 (1H, t, J = 7.2 Hz, H-7), 3.44 (2H, m, H-6) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 161.5 (C, C-5), 147.2 (C, C-11), 128.6 (C, C-4), 126.0 (CH, C-7), 125.9 (C, C-8), 124.7 (C, C-9), 120.9 (C, C-3), 111.7 (CH, C-10), 107.6 (C, C-1), 97.7 (C, C-2), 37.1 (CH_2, C-6) ppm； ESIMS *m/z* 386$[M+H]^+$.

Compound 22 ((10E)-3-bromohymenialdisine): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 13.16 (1H, s, NH-1), 9.36 (2H, brs, NH_2), 8.03 (1H, t, J = 5.2, 5.6 Hz, NH-2), 3.25 (2H, m, H-6), 2.85 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 163.8 (C, C-10), 161.9 (C, C-5), 153.7 (C, C-11), 126.85.2 (C, C-4), 123.3 (C, C-8), 121.9 (C, C-9), 118.4 (C, C-3), 105.8 (C, C-1), 101.9 (C, C-2), 37.8 (CH_2, C-6) , 37.7 (CH_2, C-7) ppm；ESIMS *m/z* 402$[M+H]^+$.

Compound 23 ((10Z)-3-bromohymenialdisine): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 13.40 (1H, NH-1), 11.23 (1H, brs, NH), 9.53 (1H, brs, NH_2), 8.90 (1H, brs, NH_2), 8.07 (1H, t, J = 4.9 Hz, NH-2), 3.27 (2H, m, H-6) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 163.3 (C, C-10), 162.8 (C, C-5), 154.4 (C, C-11), 127.2 (C-4), 125.7 (C-8), 124.0 (C-9), 120.8 (C-3), 107.4 (C, C-1), 98.6 (C, C-2), 38.7 (CH_2, C-6) , 35.2 (CH_2, C-7) ppm；ESIMS *m/z* 402$[M+H]^+$.

Compound 24 ((10Z)-debromohymenialdisine): light yellow amorphous; ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.06 (1H, NH-1), 8.03 (1H, t, J = 4.7 Hz, NH-2), 7.09 (1H, t, J = 2.7 Hz, H-1), 6.58 (1H, t, J = 2.2 Hz, H-2), 3.3 (2H, m, C-7) , 3.26 (2H, m, C-6) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 163.0 (C, C-5), 155.3 (C, C-11), 129.2 (C, C-4), 126.5 (C, C-8), 122.6 (CH, C-1), 120.6 (C, C-3), 109.7 (CH, C-2), 39.4 (CH_2, C-6) , 31.3 (CH_2, C-7) ppm；ESIMS *m/z* 402$[M+H]^+$.

Compound 25 ((-)-dibromoisophakellin): light yellow amorphous; $[\alpha]_D^{25}$-59.1 (*c* 1.10 , MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 13.34 (1H, s, NH-1), 9.79 (1H, s, NH), 8.84 (1H, s, NH), 7.96 (2H, brs, NH_2), 5.22 (1H, s, H-10), 3.55 (1H, m, H-6), 3.45 (1H, m, H-6), 2.21 (2H, m, H-8), 2.00 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 156.8 (C, C-11), 154.7 (C, C-5), 122.8 (C, C-4), 122.4 (C, C-3), 108.4 (C, C-1), 96.3 (C, C-2), 84.1 (C, C-9), 54.0 (CH, C-10), 44.1 (CH_2, C-6), 39.1 (CH_2, C-8), 19.1 (CH_2, C-7) ppm；ESIMS *m/z* 388$[M+H]^+$.

Compound 26 ((-)-dibromophakellin): light yellow amorphous; $[\alpha]_D^{25}$-94.2 (*c* 1.54 , MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 10.23 (1H, s, NH_2), 9.75 (1H, s, NH_2), 8.56 (1H, brs, NH), 8.19 (1H, brs, NH), 7.03 (H, s, H-3), 6.30 (1H, s, H-10), 3.67 (1H, m, H-6), 3.48 (1H, m, H-6), 2.40 (1H, m, H-8), 2.28 (1H, m, H-8) , 2.05 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 156.4 (C, C-11), 153.7 (C, C-5), 125.0 (C, C-4), 114.8 (CH, C-3), 106.1 (C, C-1), 102.0 (C, C-2), 82.4 (C, C-9), 68.2 (CH, C-10), 44.7 (CH_2, C-6), 38.5

(CH_2, C-8), 19.0 (CH_2, C-7) ppm； ESIMS *m/z* 388$[M+H]^+$.

Compound 27 ((-)-monobromophakellin): light yellow amorphous; $[\alpha]_D^{25}$-63.1 (*c* 2.56 , MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 10.26 (1H, brs, NH_2), 10.08 (1H, brs, NH_2), 8.65 (1H, s, NH), 7.29 (1H, d, *J* = 1.7 Hz, H-1), 6.80 (H, d, *J* = 1.7 Hz, H-3), 6.10 (1H, s, H-10), 3.64 (1H, m, H-6), 3.50 (1H, m, H-6), 2.35 (1H, m, H-8), 2.24 (1H, m, H-8), 2.06 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 156.7 (C, C-11), 154.2 (C, C-5), 123.9 (C, C-4), 121.7 (CH, C-1), 113.3 (CH, C-3), 98.1 (C, C-2), 82.1 (C, C-9), 68.1 (CH, C-10), 45.0 (CH_2, C-6), 38.1 (CH_2, C-8), 19.3 (CH_2, C-7) ppm； ESIMS *m/z* 310$[M+H]^+$.

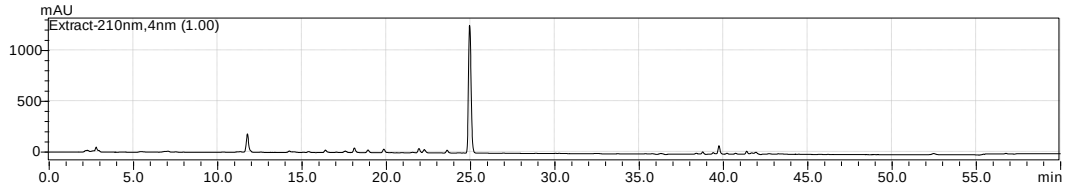
Compound 28 ((-)-monobromoisophakellin): light yellow amorphous; $[\alpha]_D^{25}$-31.0 (*c* 0.48 , MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.46 (1H, s, NH-1), 9.67 (1H, s, NH_2), 8.68 (1H, s, NH_2), 7.86 (1H, brs, NH), 7.23 (1H, d, *J* = 2.8 Hz, H-1), 5.23 (1H, s, H-10), 3.58 (1H, m, H-6), 3.46 (1H, m, H-6), 2.22 (2H, m, H-8), 2.01 (2H, m, H-7) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 156.7 (C, C-11), 155.5 (C, C-5), 124.4 (CH, C-1), 121.6 (C, C-4), 121.4 (C, C-3), 93.2 (C, C-2), 84.2 (C, C-9), 54.1 (CH, C-10), 48.3 (CH_2, C-6), 44.0 (CH_2, C-8), 19.2 (CH_2, C-7) ppm； ESIMS *m/z* 310$[M+H]^+$.

Compound 29 ((-)-manzacidins B): light yellow amorphous; $[\alpha]_D^{25}$-38.2 (*c* 2.32, MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.47 (1H, brs, NH-1), 10.22 (1H, brs, NH), 8.05 (1H, s, H-10), 7.25 (1H, s, H-1), 6.99 (1H, s, H-3), 4.30 (1H, m, H-6), 4.28 (1H, m, H-8), 4.21 (1H, m, H-6), 4.18 (1H, m, H-9), 1.32 (3H, s, CH_3) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 168.5 (C, COOH), 158.9 (C, C-5), 149.9 (CH, C-10), 124.2 (CH, C-1), 122.3 (C, C-4), 117.0 (CH, C-3), 96.1 (C, C-2), 65.4 (CH_2, C-6), 63.8 (CH, C-8), 56.1 (C, C-7), 54.1 (CH, C-9), 23.2 (CH_3) ppm； ESIMS *m/z* 360$[M+H]^+$.

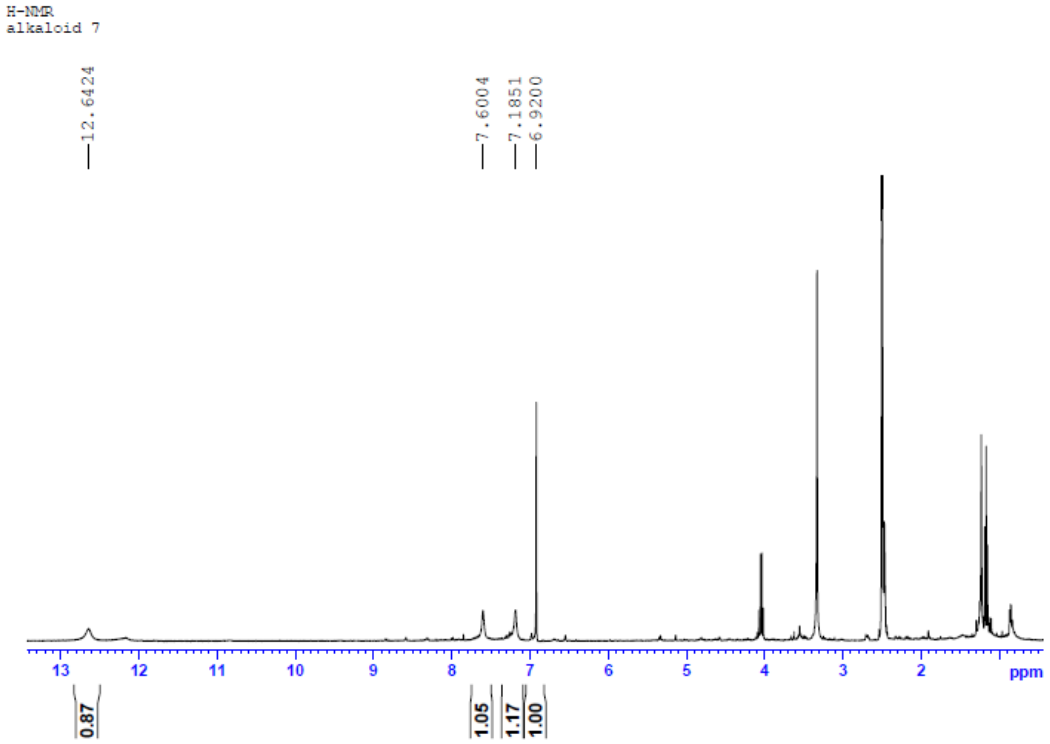
Compound 30 (manzacidins C): light yellow amorphous; $[\alpha]_D^{25}$+ 27.3 (*c* 3.26, MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.63 (1H, brs, NH-1), 10.59 (1H, brs, NH), 8.11 (1H, s, H-10), 7.22 (1H, s, H-1), 6.95 (1H, s, H-3), 4.33 (1H, d, *J* = 11.0 Hz, H-6), 4.08 (1H, d, *J* = 11.0 Hz, H-6), 4.01 (1H, m, H-9), 2.22 (1H, dd, *J* = 13.7, 4.1 Hz, H-8), 1.88 (1H, m, H-8), 1.31 (3H, s, CH_3) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 170.5 (C, COOH), 158.8 (C, C-5), 150.0 (CH, C-10), 124.3 (CH, C-1), 122.1 (C, C-4), 117.0 (CH, C-3), 96.1 (C, C-2), 68.1 (CH_2, C-6), 52.1 (C, C-7), 49.0 (CH, C-9), 30.4 (CH_2, C-8), 23.5 (CH_3) ppm; ESIMS *m/z* 344$[M+H]^+$.

Compound 31 (N-methylmanzacidin C): light yellow single crystal; Mp: 200.5-201.5 ^{o}C; molecular formula $C_{13}H_{16}O_4N_3Br$.

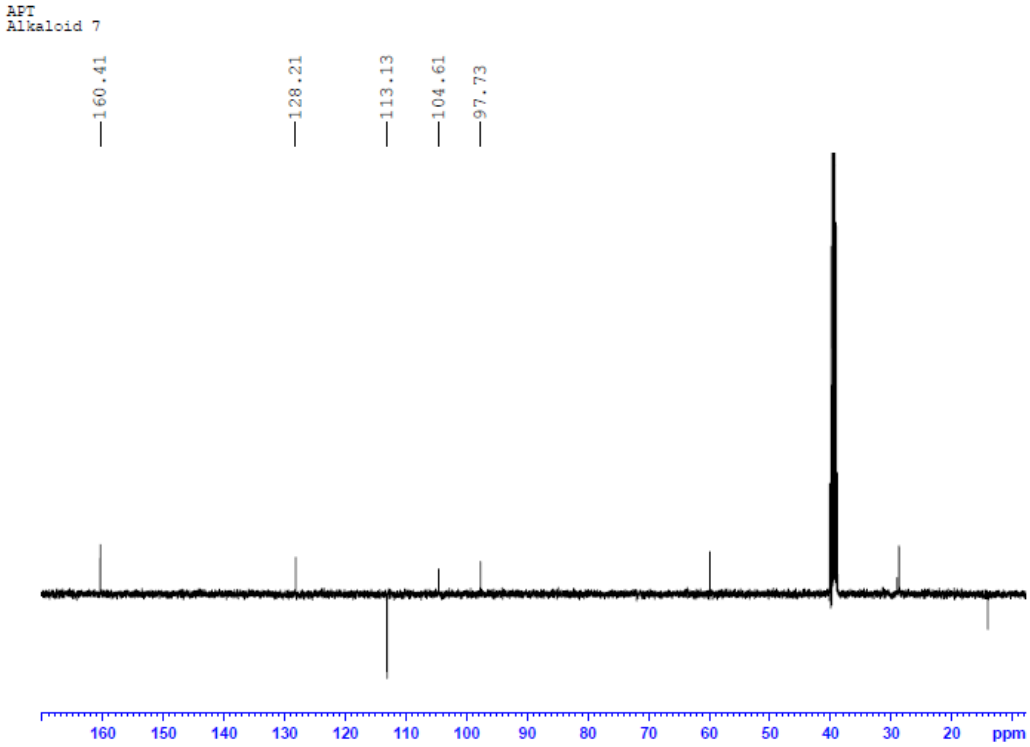
Compound 32 (longamide B): light yellow amorphous; $[\alpha]_D^{25}$ 0 (*c* 0.05, MeOH); ^{1}H NMR (DMSO-d_6, 400 MHz) δ 7.84 (1H, NH), 6.85 (1H, s, H-3), 4.66 (1H, d, *J* = 10.5 Hz, H-7), 3.82 (1H, m, H-6), 3.39 (1H, m, H-6), 2.73 (2H, m, H-8), 2.46 (2H, m, H-8) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 170.9 (C, C-9), 157.5 (C, C-5), 125.7 (C, C-4), 113.9 (CH, C-3), 105.8 (C, C-1), 99.4 (C, C-2), 50.2 (CH, C-7), 42.1 (CH_2, C-6), 35.7 (CH_2, C-8) ppm； ESIMS *m/z* 351$[M+H]^+$.



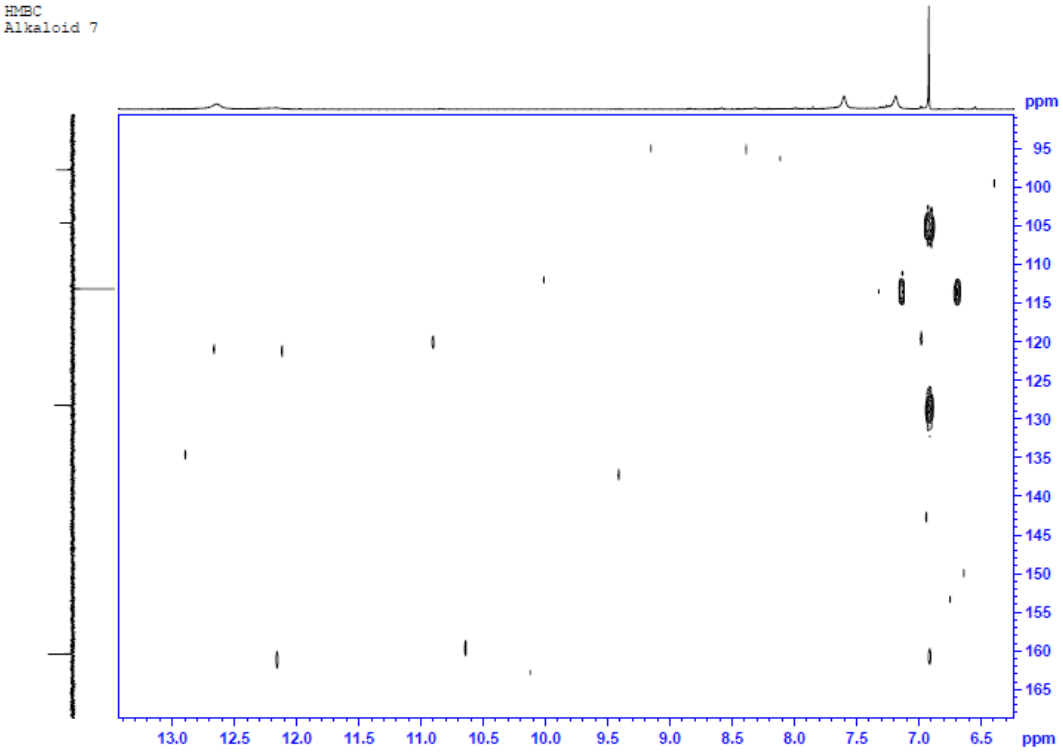
The DAD-HPLC of **7** (0-40min, 5%-100%MeOH-H_2O)



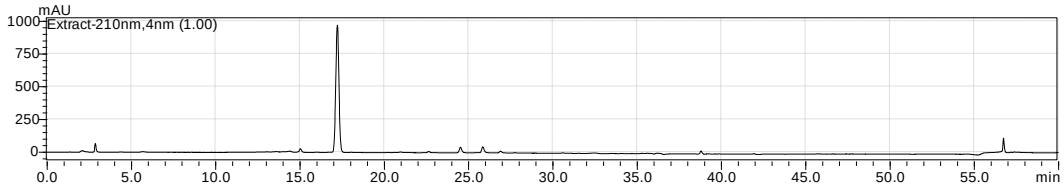
^{1}H-NMR spectrum of **7** (DMSO-d_6, 400MHz)



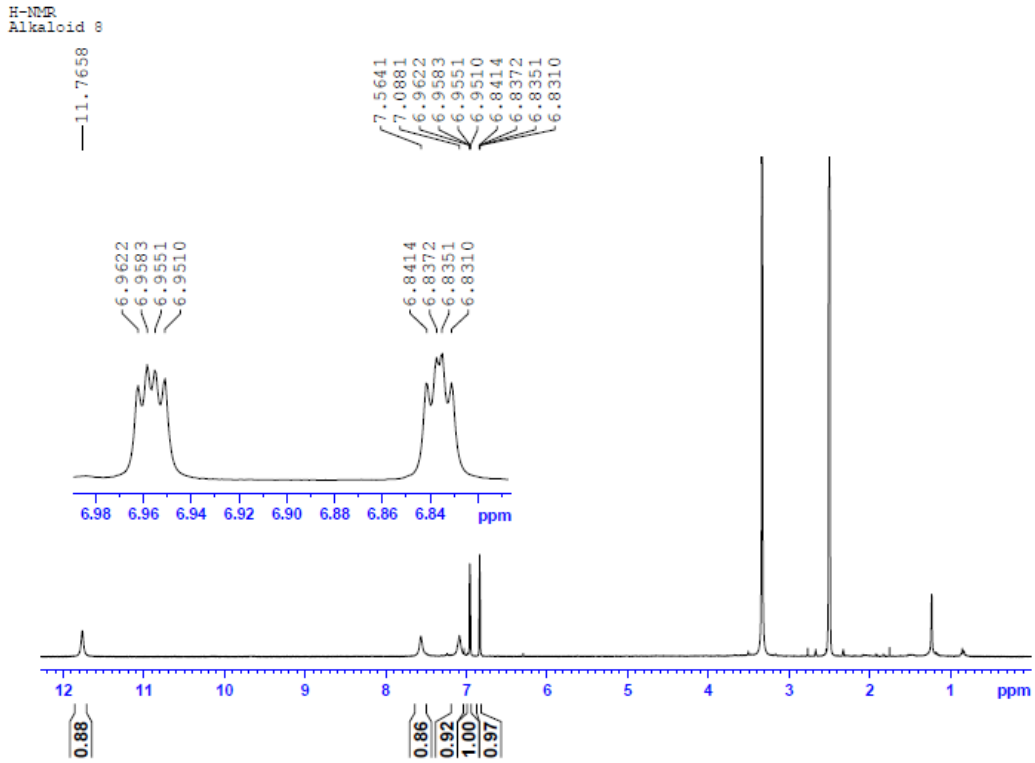
^{13}C-NMR spectrum of **7** (DMSO-d_6, 100MHz)



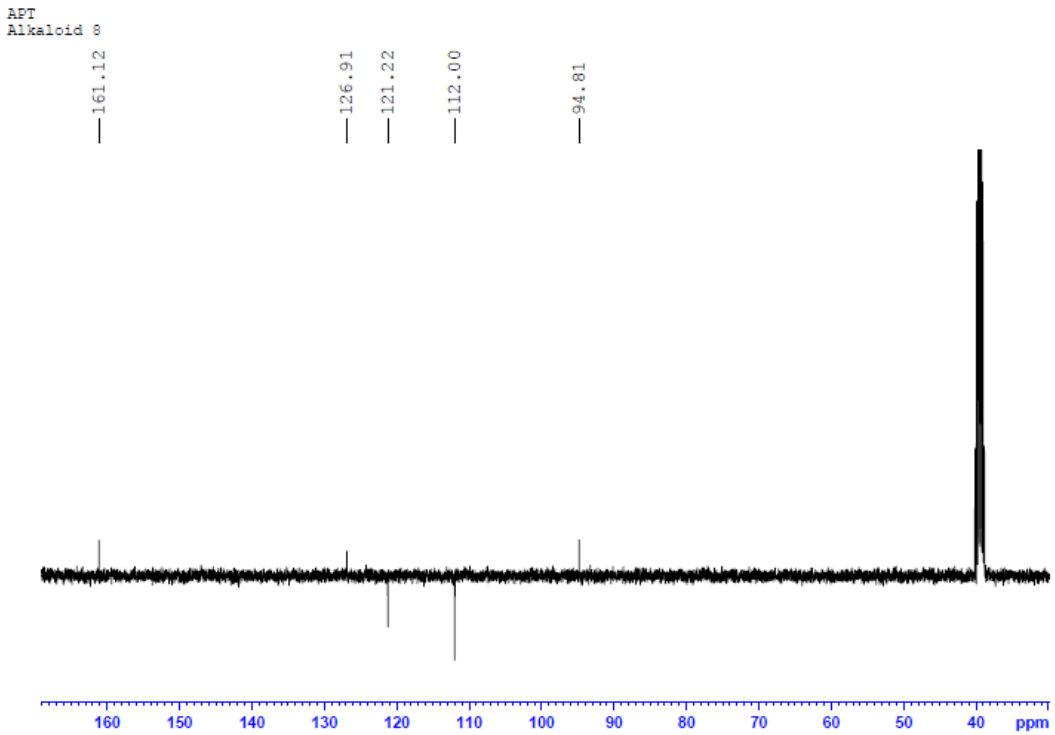
HMBC spectrum of **7** (DMSO-d_6, 400MHz)



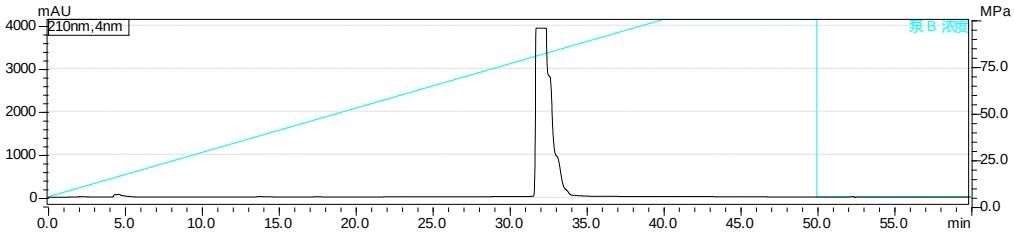
The DAD-HPLC of **8** (0-40min, 5%-100%MeOH-H_2O)



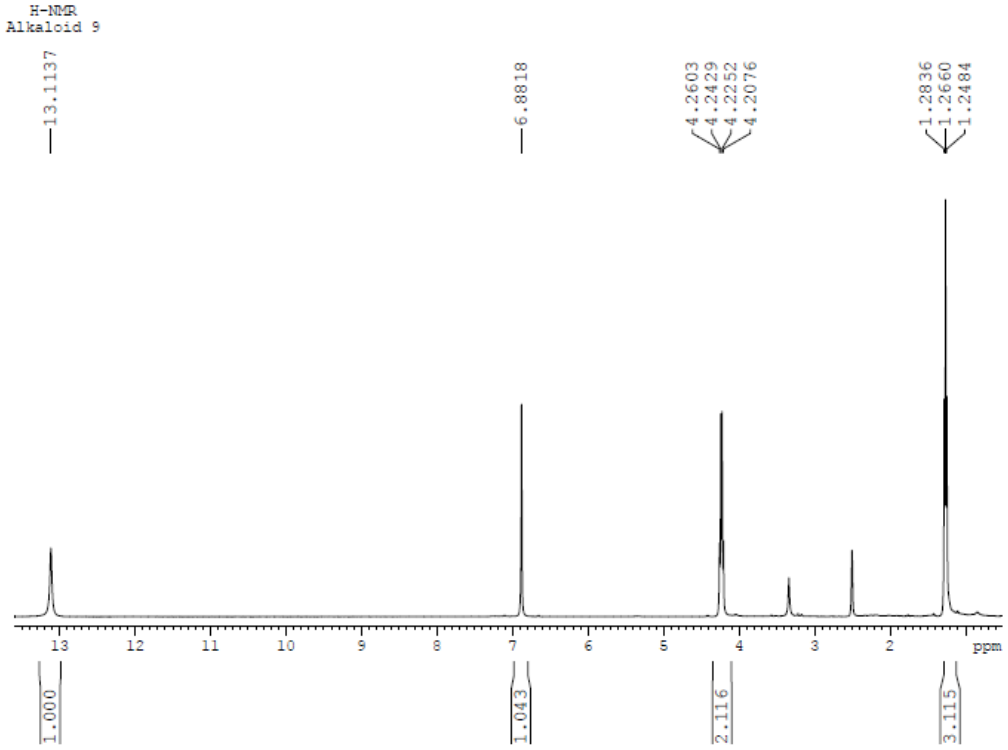
^{1}H-NMR spectrum of **8** (DMSO-d_6, 400MHz)



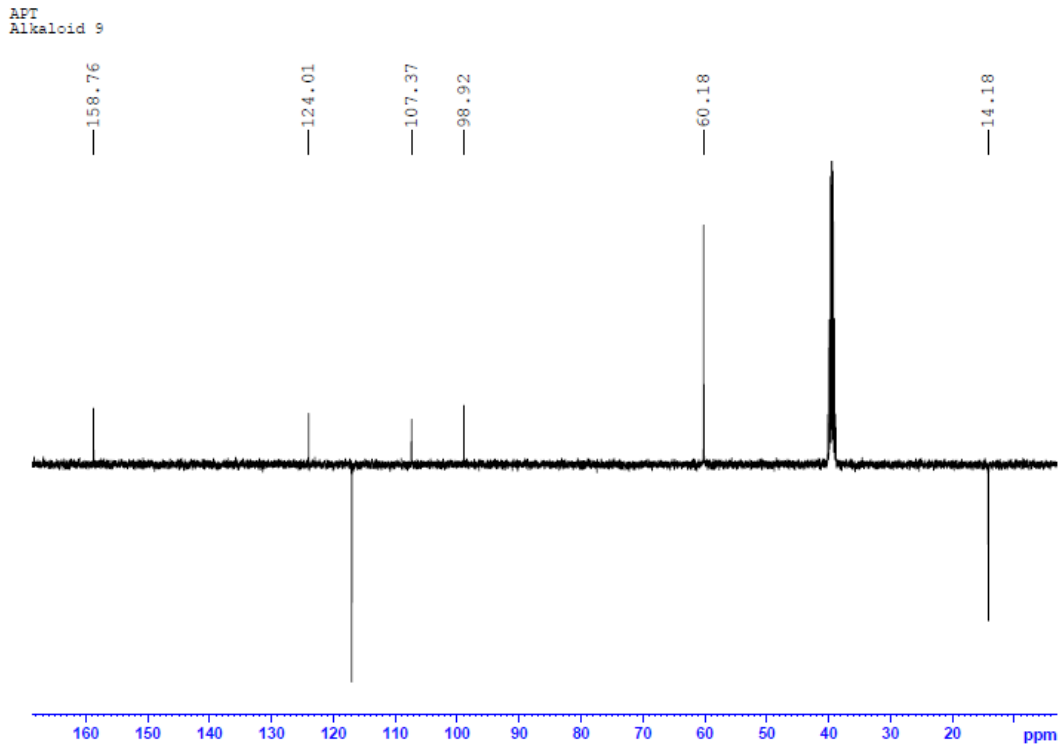
^{13}C-NMR spectrum of **8** (DMSO-d_6, 100MHz)



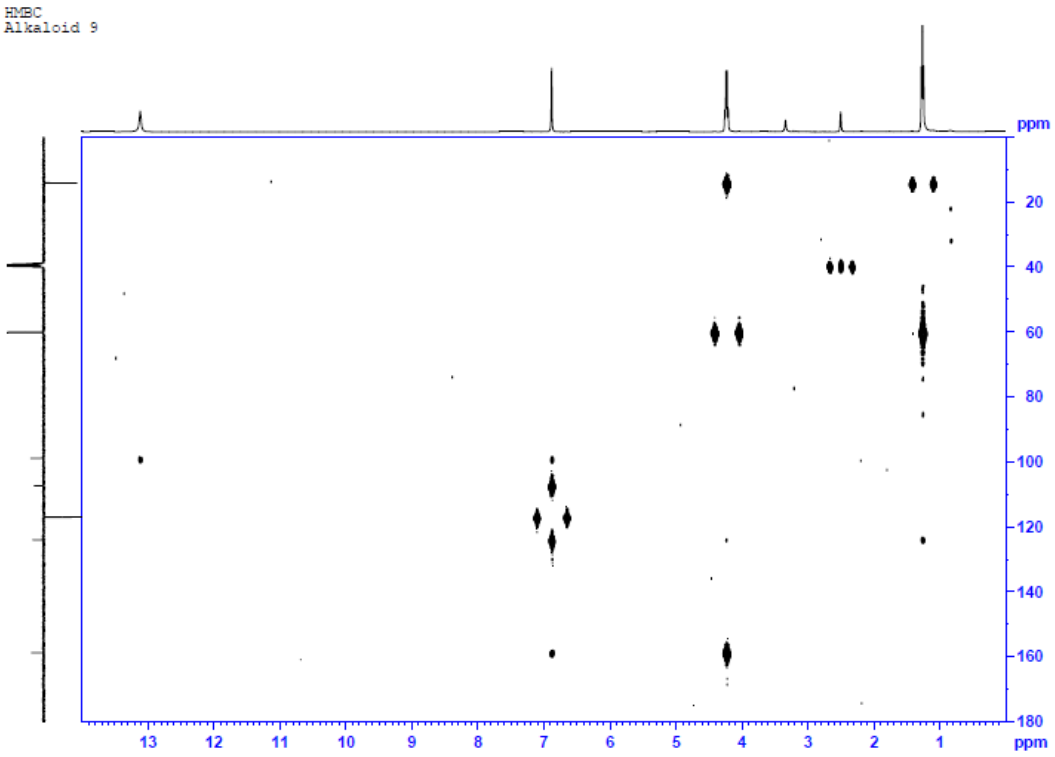
The DAD-HPLC of **9** (0-40min, 5%-100%MeOH-H_2O)



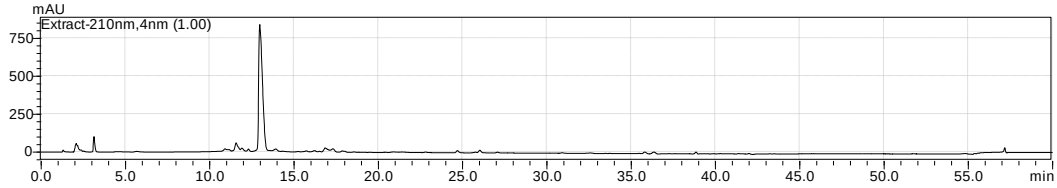
^{1}H-NMR spectrum of **9** (DMSO-d_6, 400MHz)



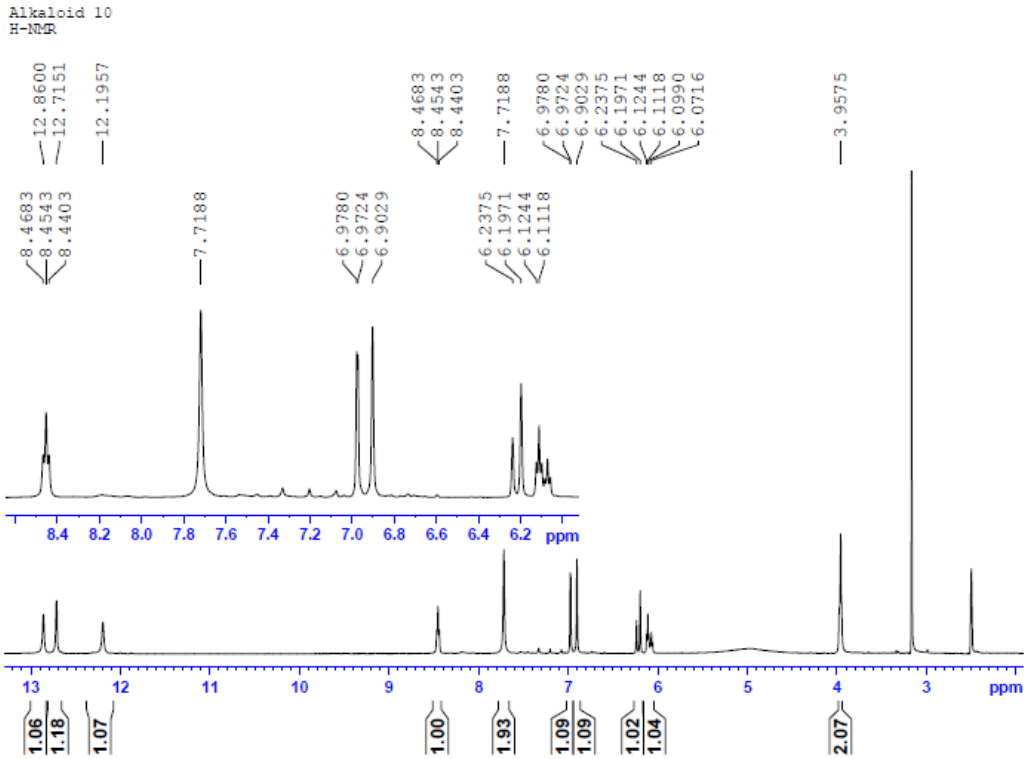
^{13}C-NMR spectrum of **9** (DMSO-d_6, 100MHz)



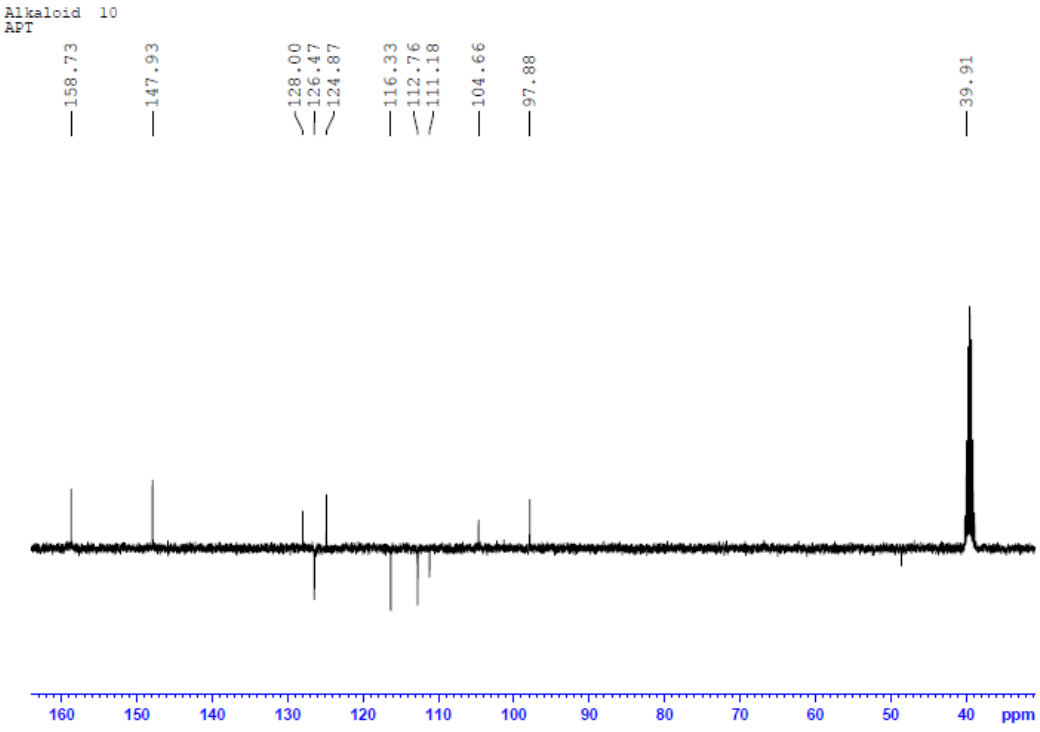
HMBC spectrum of **9** (DMSO-d_6, 400MHz)



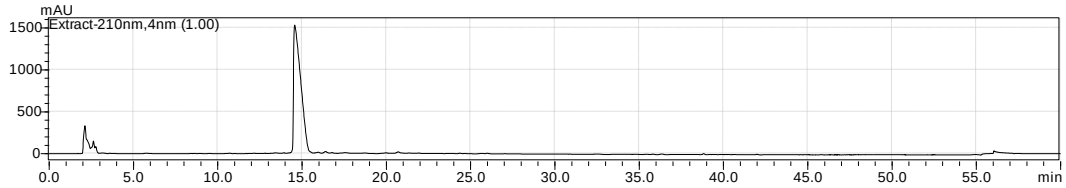
The DAD-HPLC of **10** (0-40min, 5%-100%MeOH-H_2O)



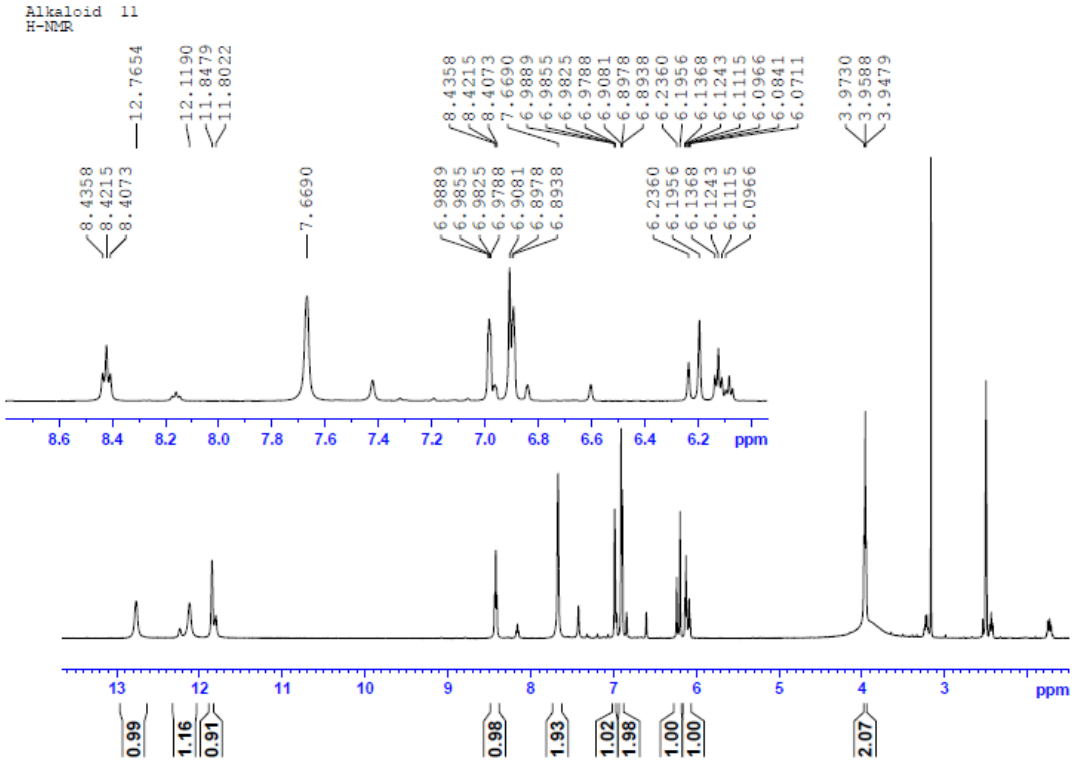
^{1}H-NMR spectrum of **10** (DMSO-d_6, 400MHz)



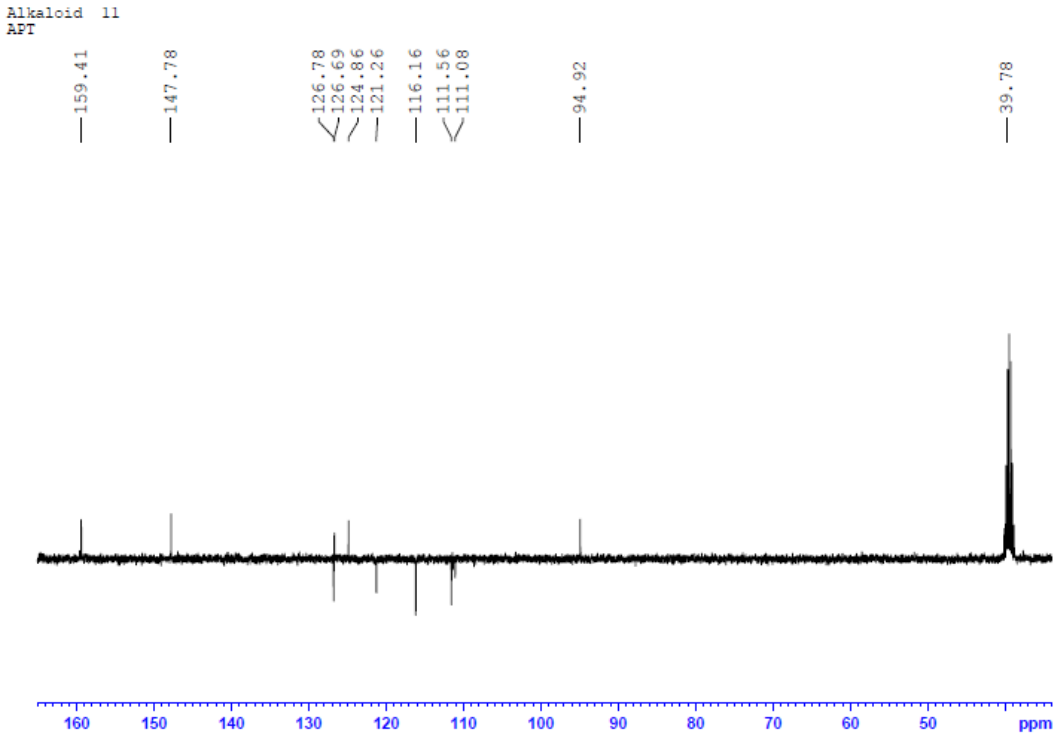
^{13}C-NMR spectrum of **10** (DMSO-d_6, 100MHz)



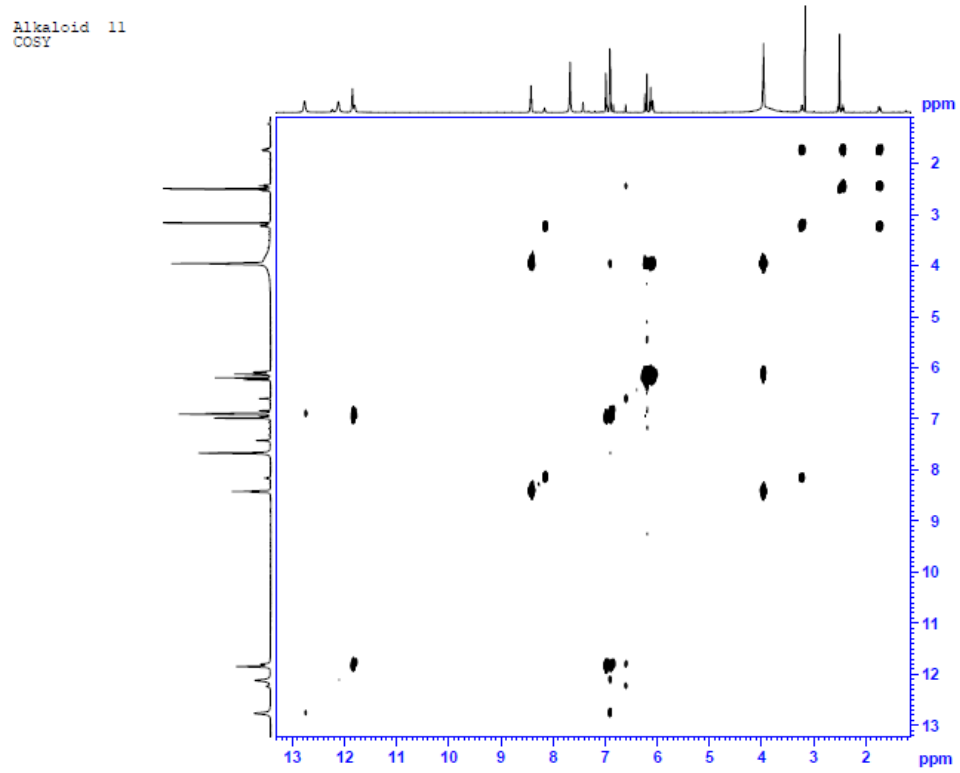
The DAD-HPLC of **11** (0-40min, 5%-100%MeOH-H_2O)



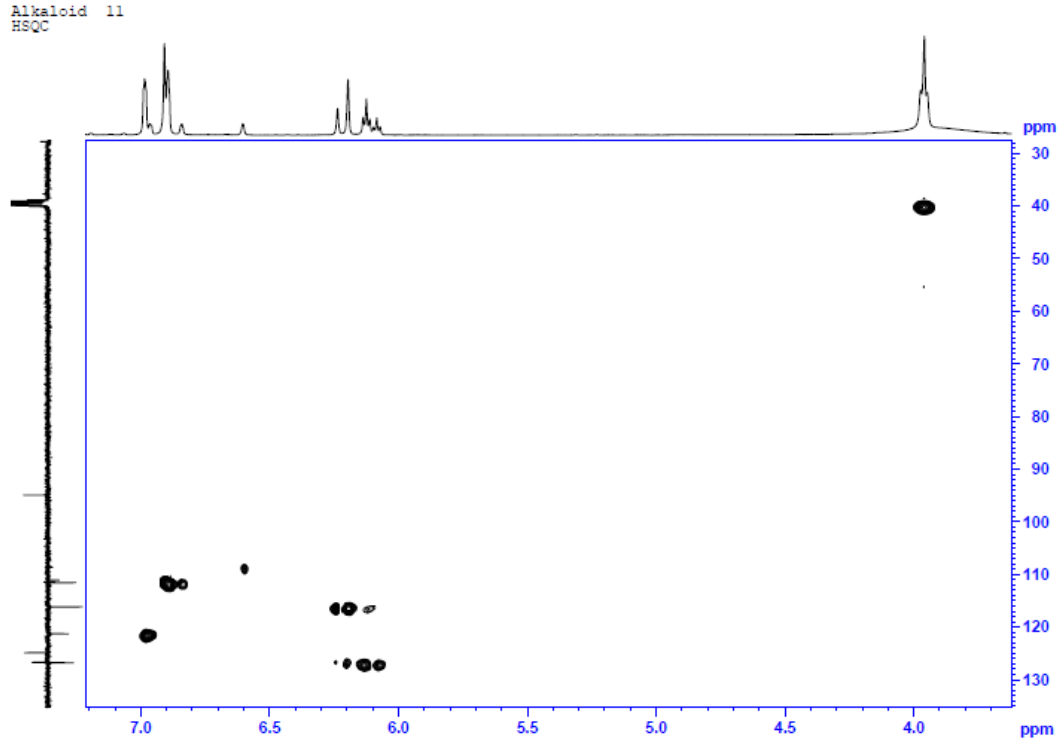
^{1}H-NMR spectrum of **11** (DMSO-d_6, 400MHz)



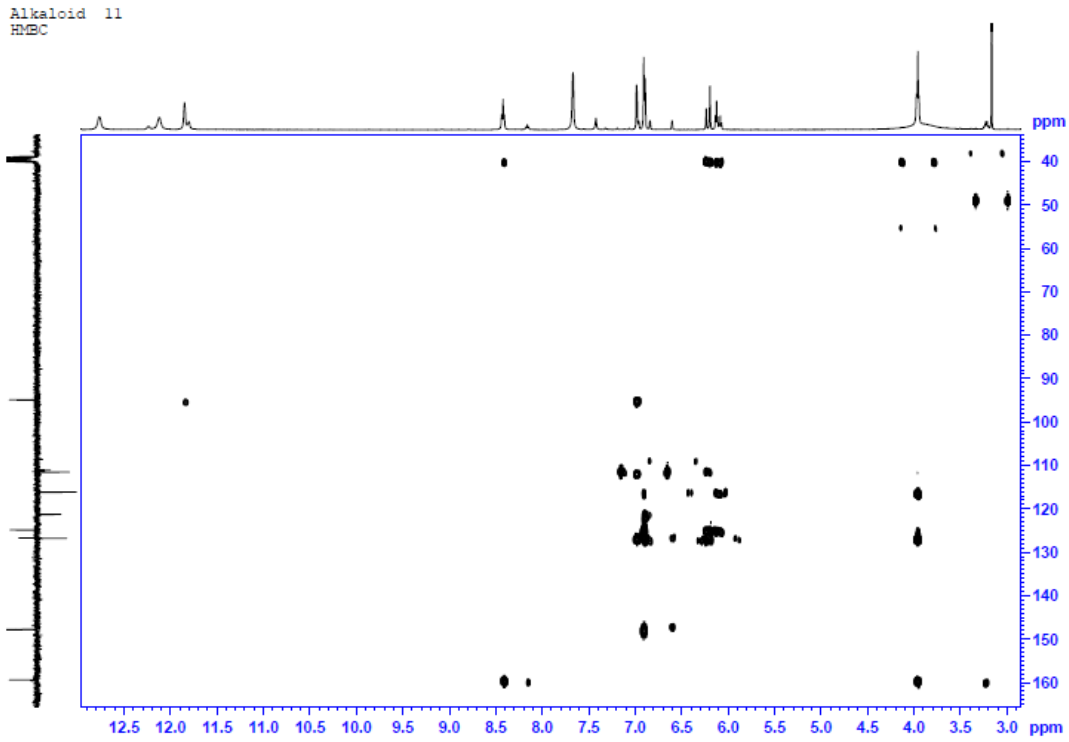
^{13}C-NMR spectrum of **11** (DMSO-d_6, 100MHz)



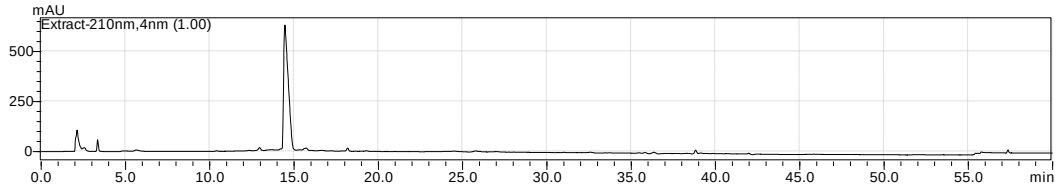
^{1}H-^{1}H COSY spectrum of **11** (DMSO-d_6, 400MHz)



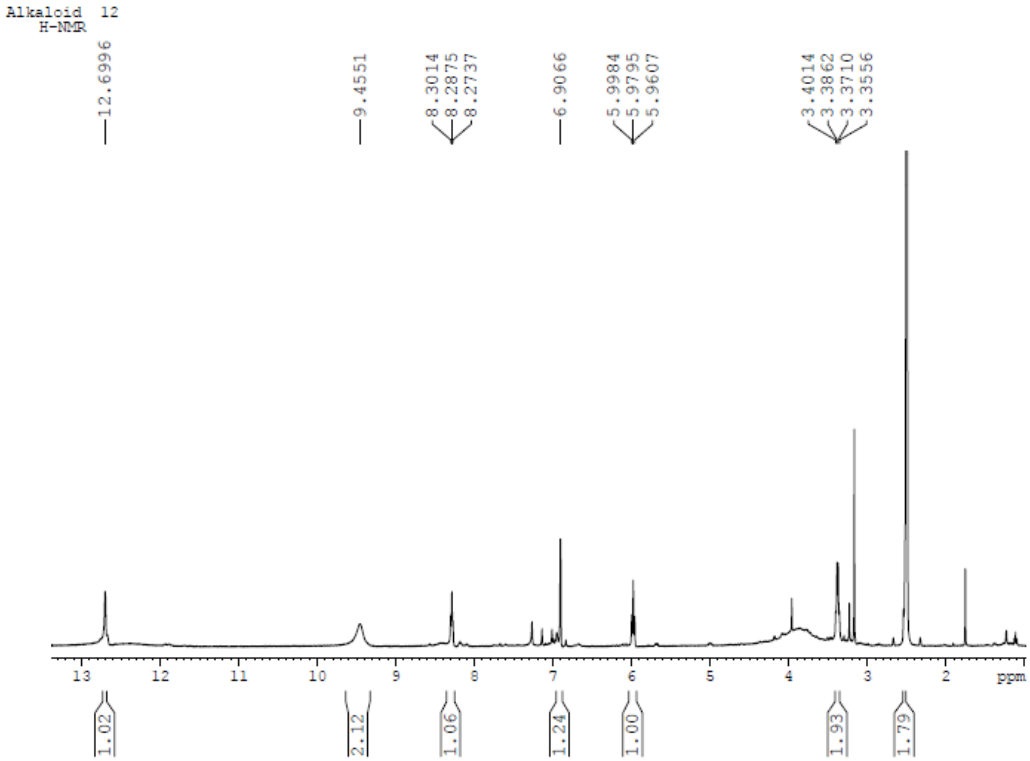
HSQC spectrum of **11** (DMSO-d_6, 400MHz)



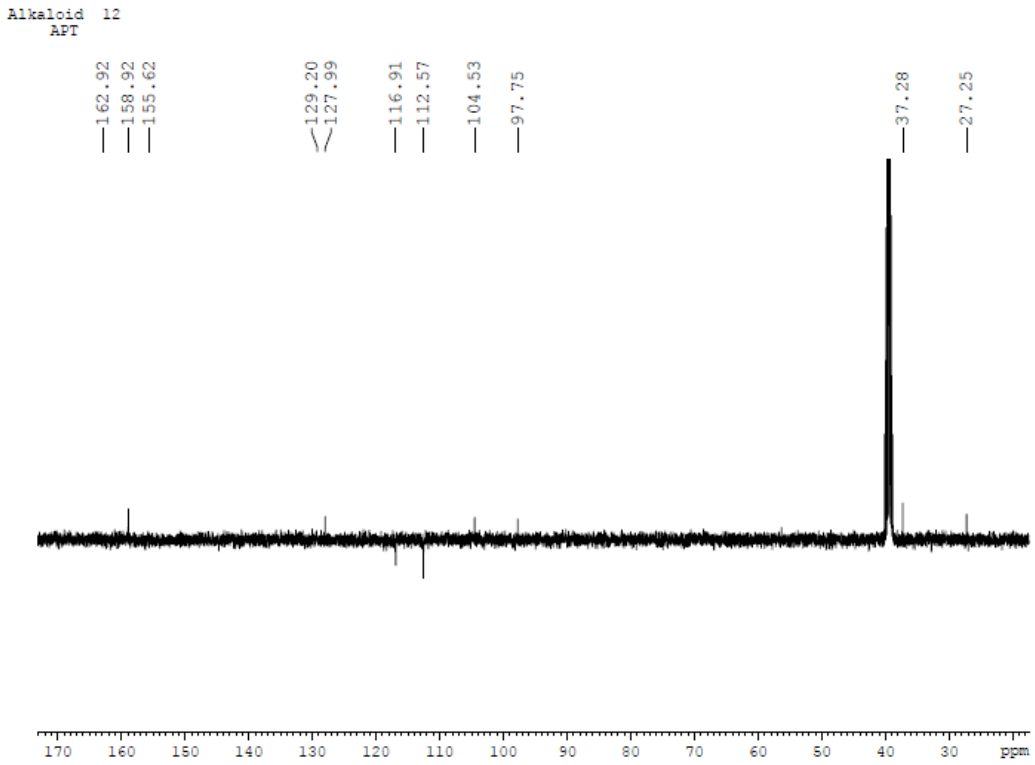
HMBC spectrum of **11** (DMSO-d_6, 400MHz)



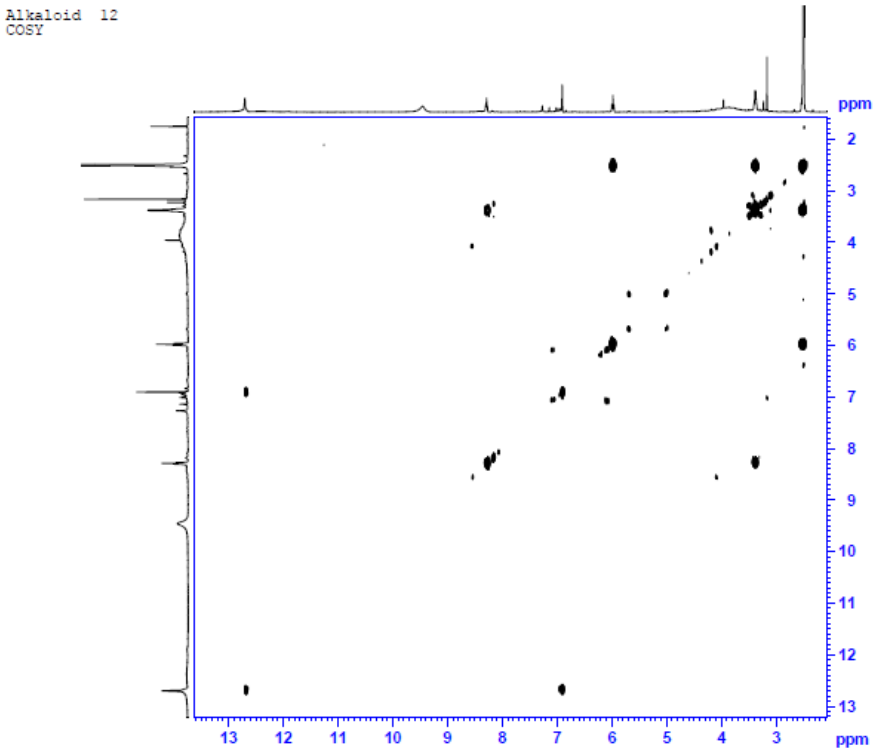
The DAD-HPLC of **12** (0-40min, 5%-100%MeOH-H_2O)



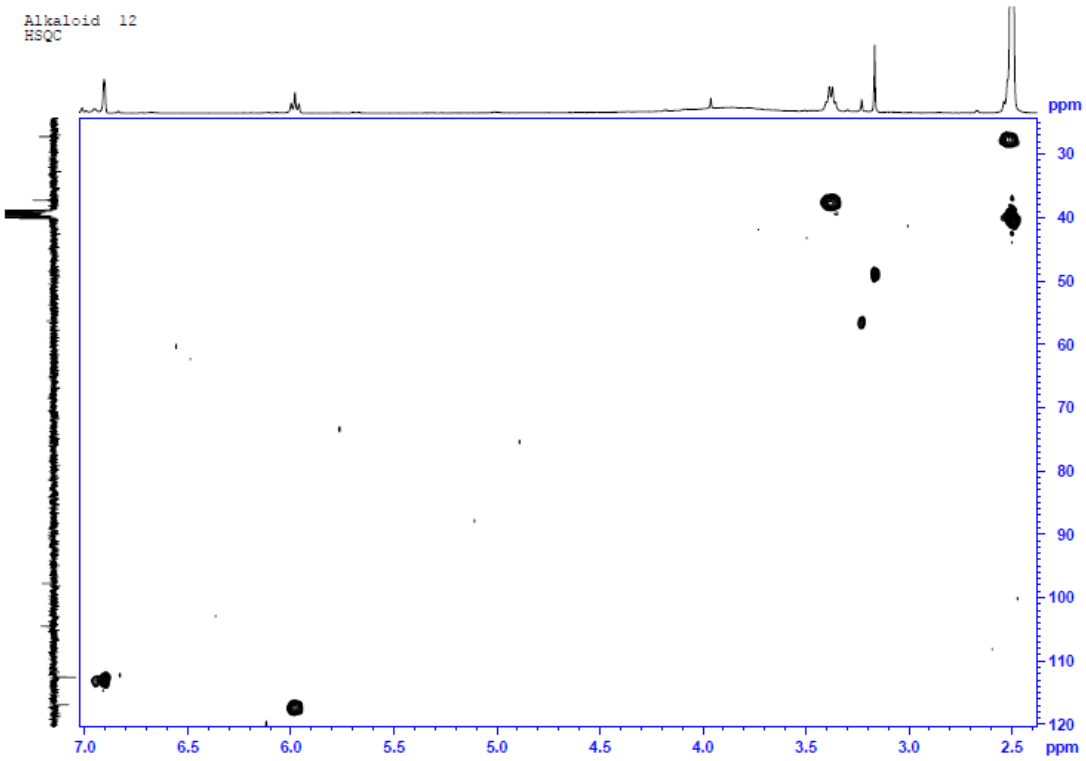
^{1}H-NMR spectrum of **12** (DMSO-d_6, 400MHz)



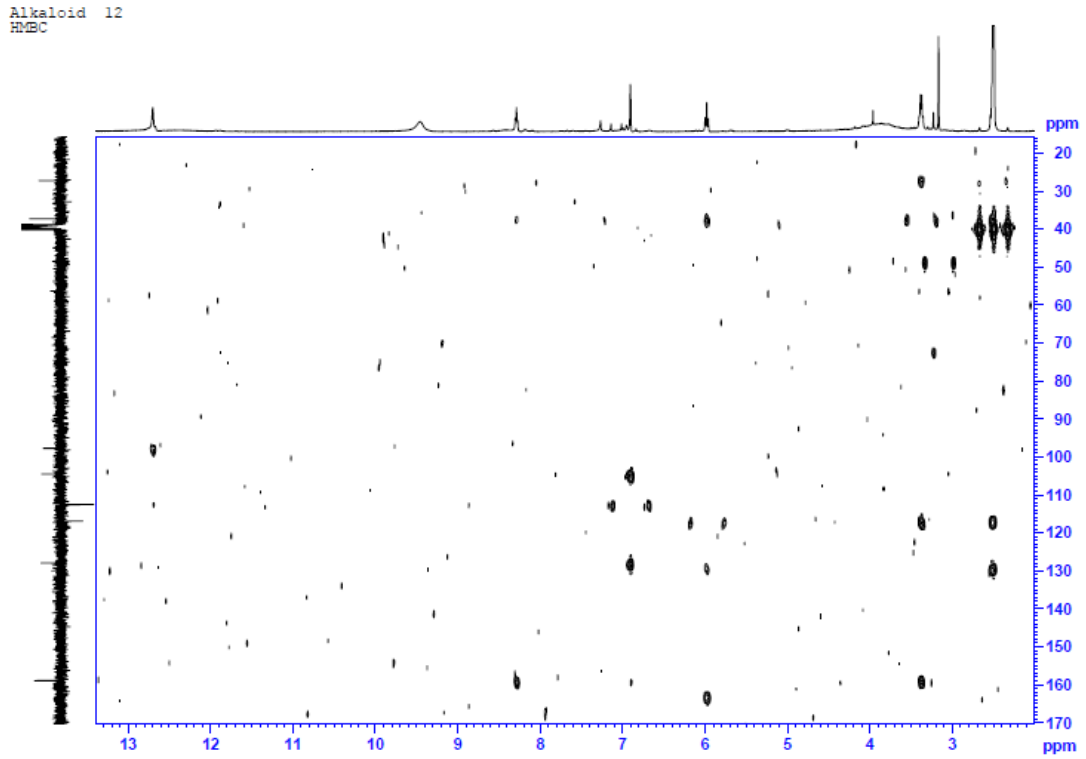
^{13}C-NMR spectrum of **12** (DMSO-d_6, 100MHz)



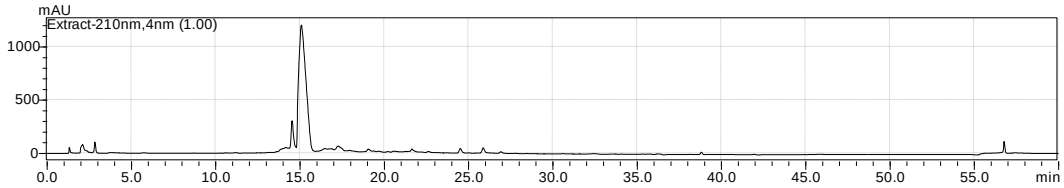
^{1}H-^{1}H COSY spectrum of **12** (DMSO-d_6, 400MHz)



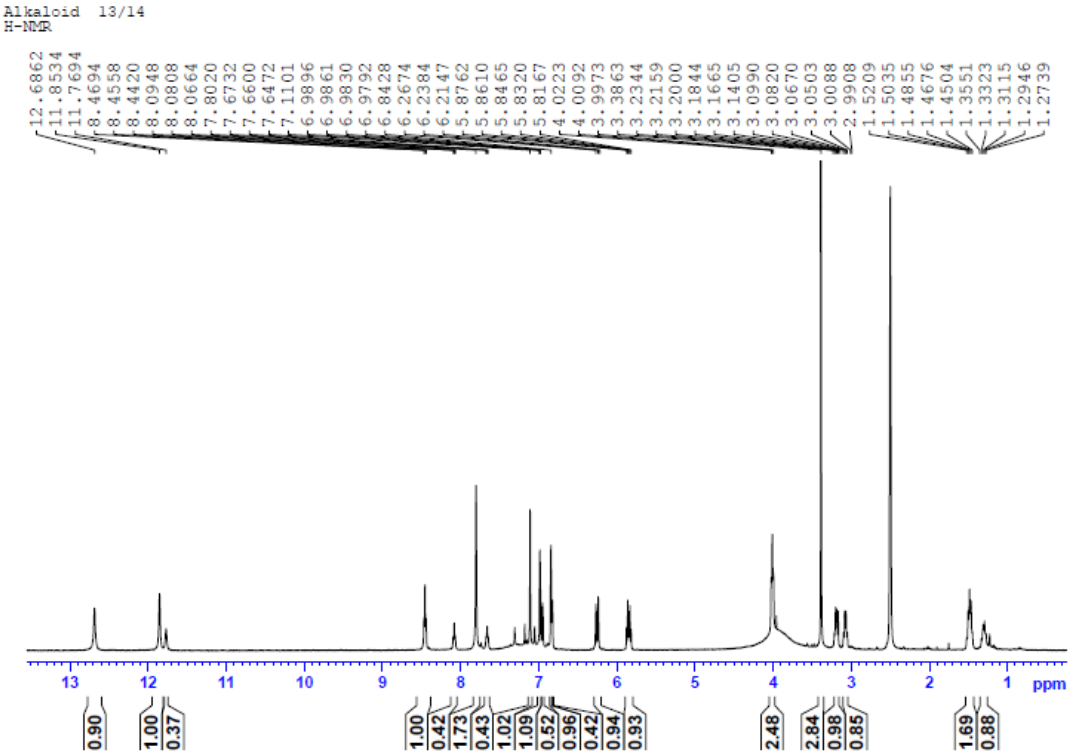
HSQC spectrum of **12** (DMSO-d_6, 400MHz)



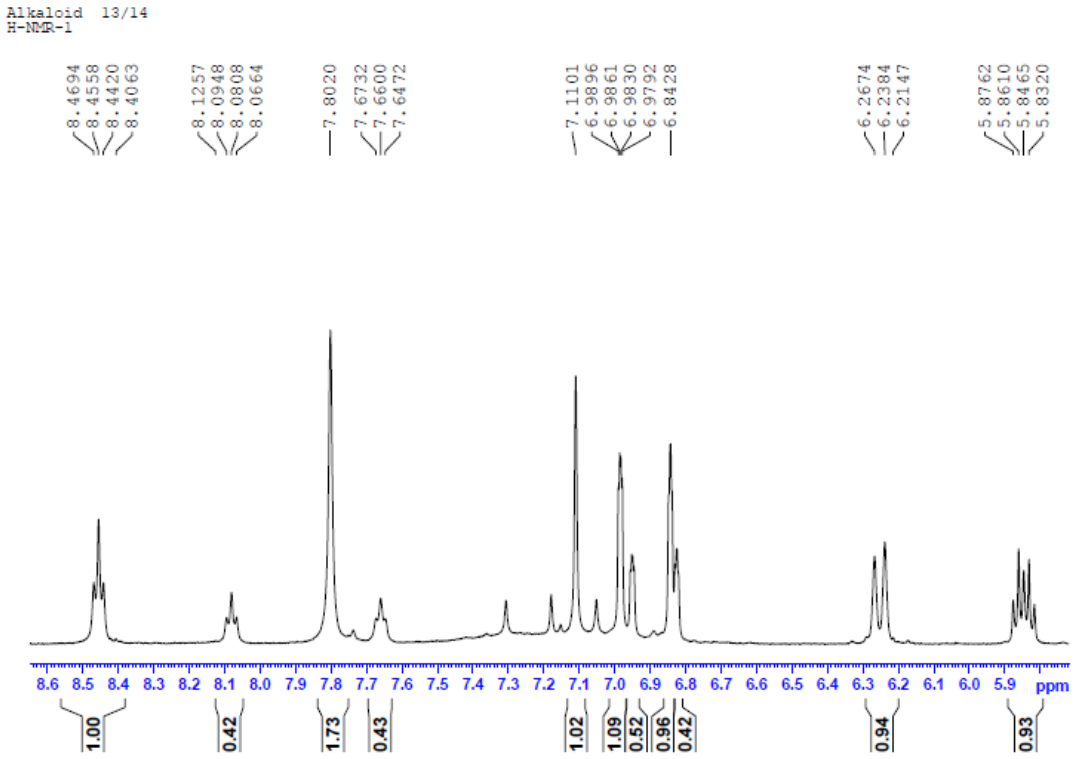
HMBC spectrum of **12** (DMSO-d_6, 400MHz)



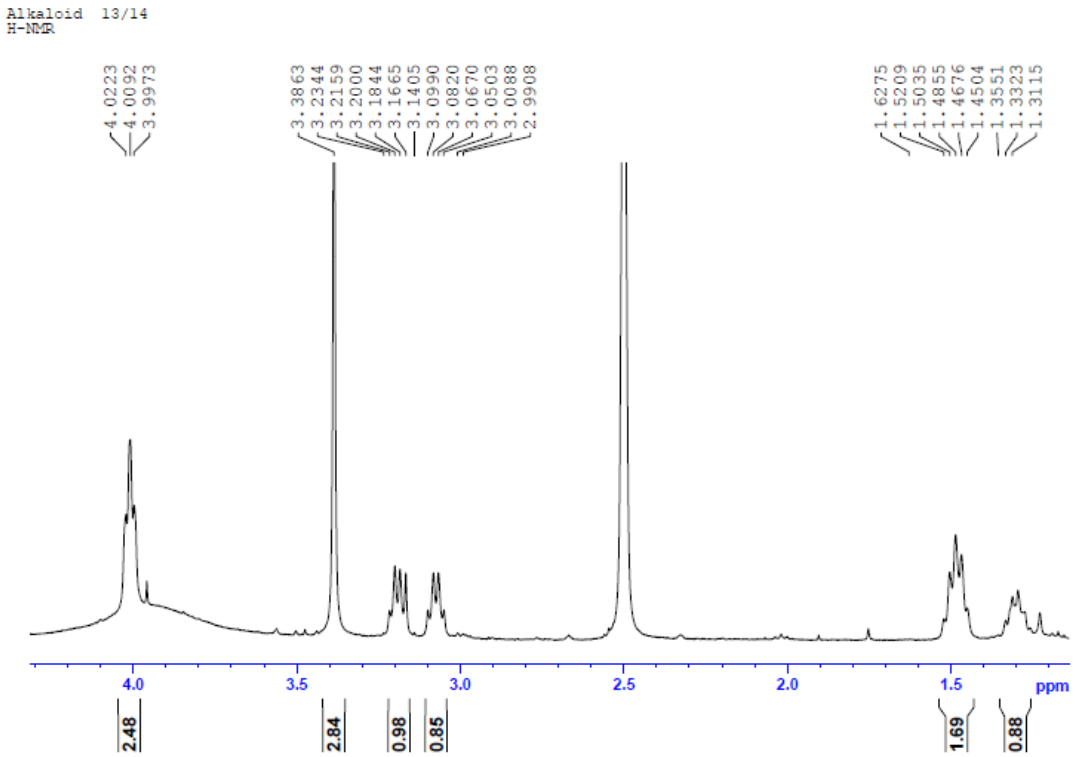
The DAD-HPLC of **13/14** (0-40min, 5%-100%MeOH-H_2O)



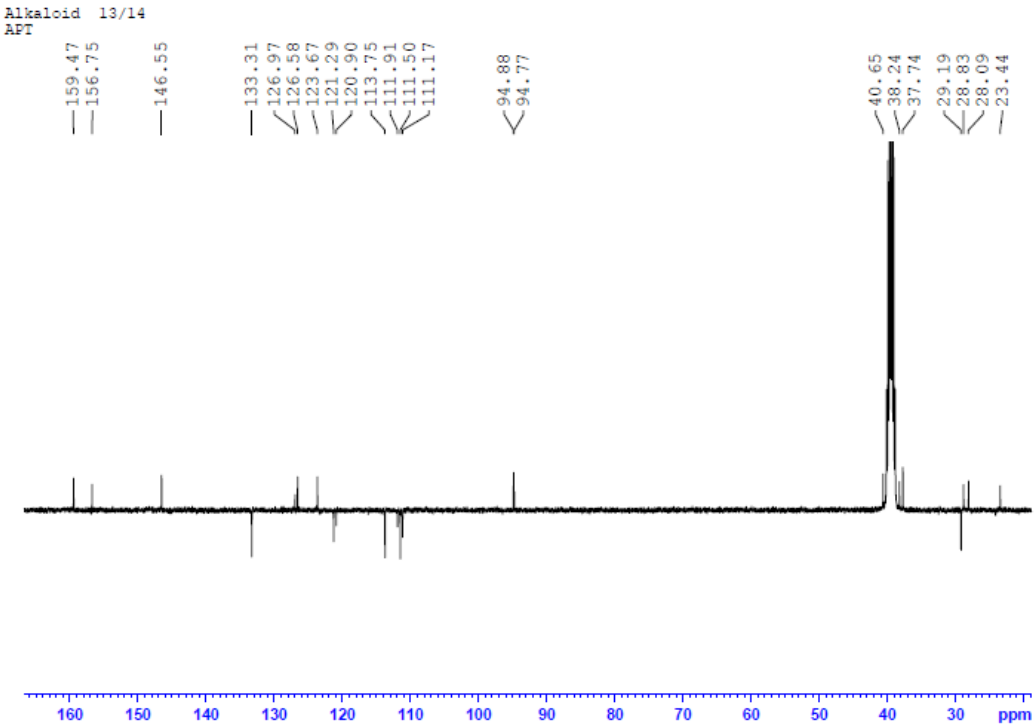
^{1}H-NMR spectrum of **13/14** (DMSO-d_6, 400MHz)



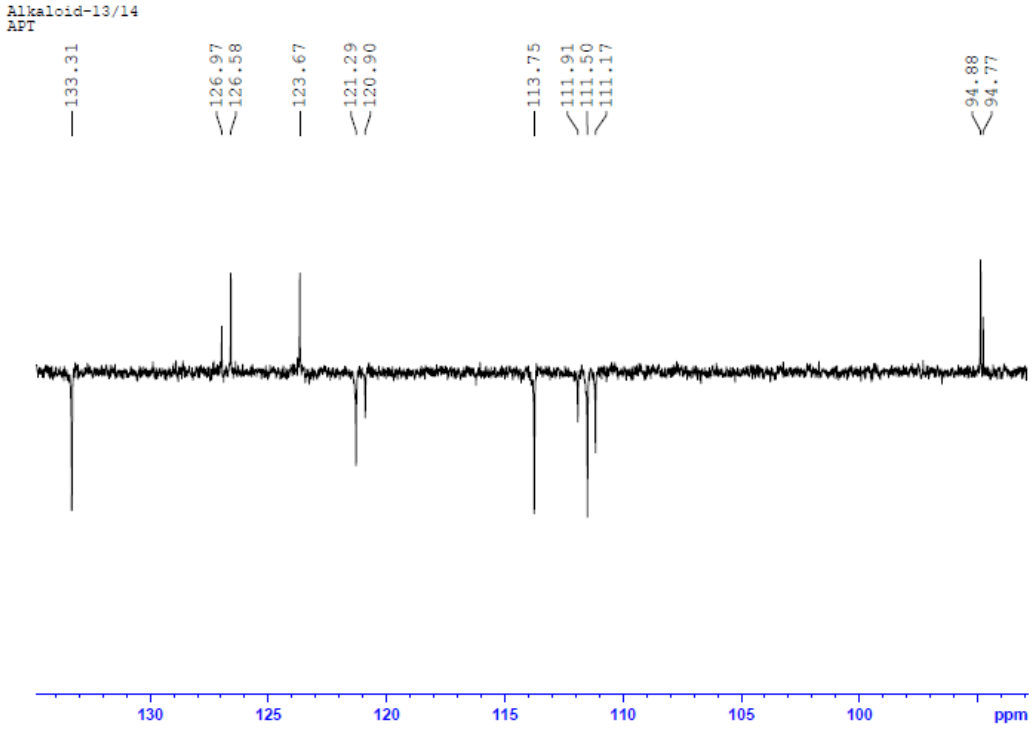
^{1}H-NMR spectrum of **13/14** (DMSO-d_6, 400MHz), expansion-1



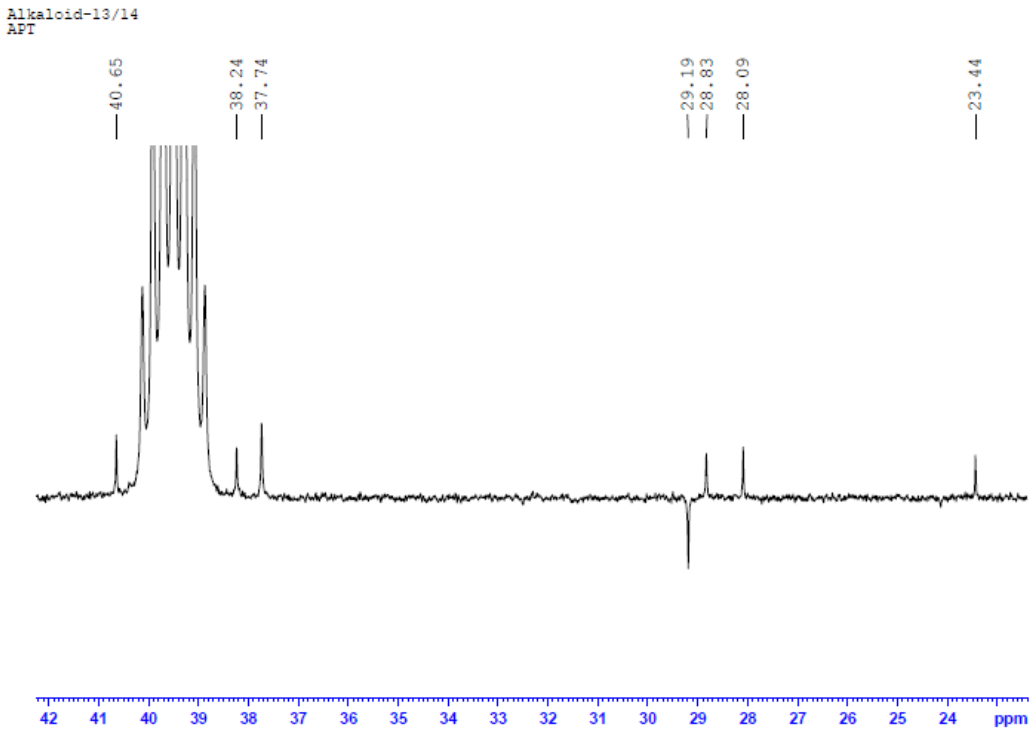
^{1}H-NMR spectrum of **13/14** (DMSO-d_6, 400MHz), expansion-2



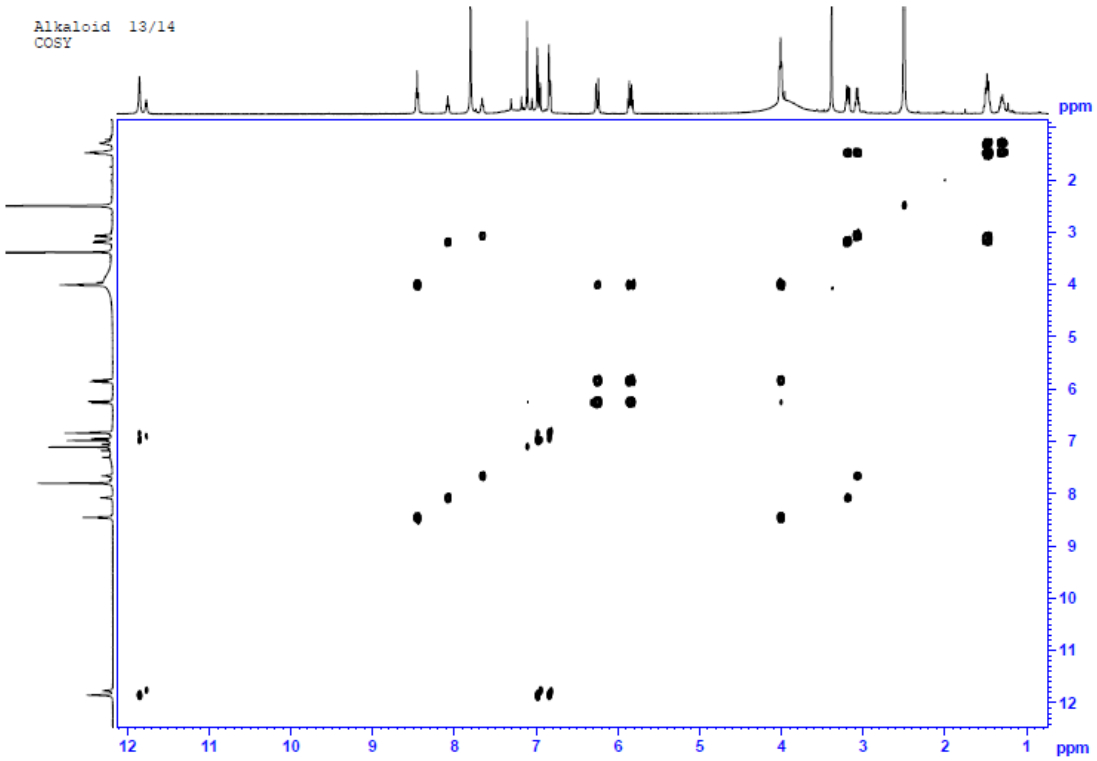
^{13}C-NMR spectrum of **13/14** (DMSO-d_6, 100MHz)



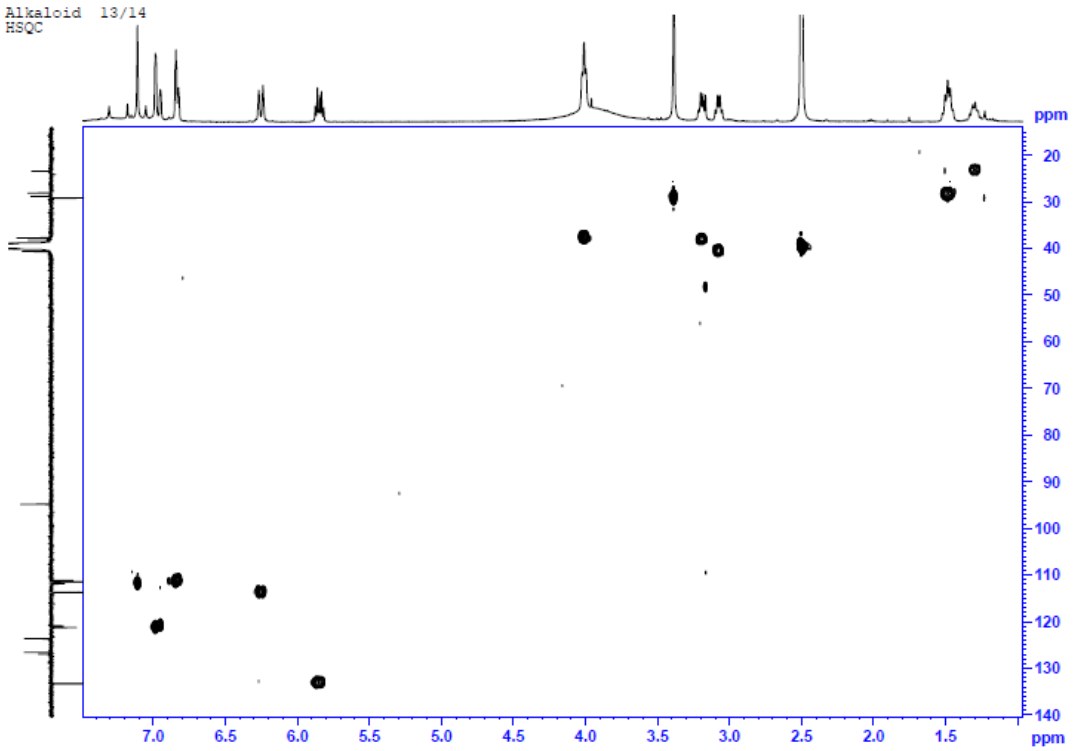
^{13}C-NMR spectrum of **13/14** (DMSO-d_6, 100MHz), expansion-1



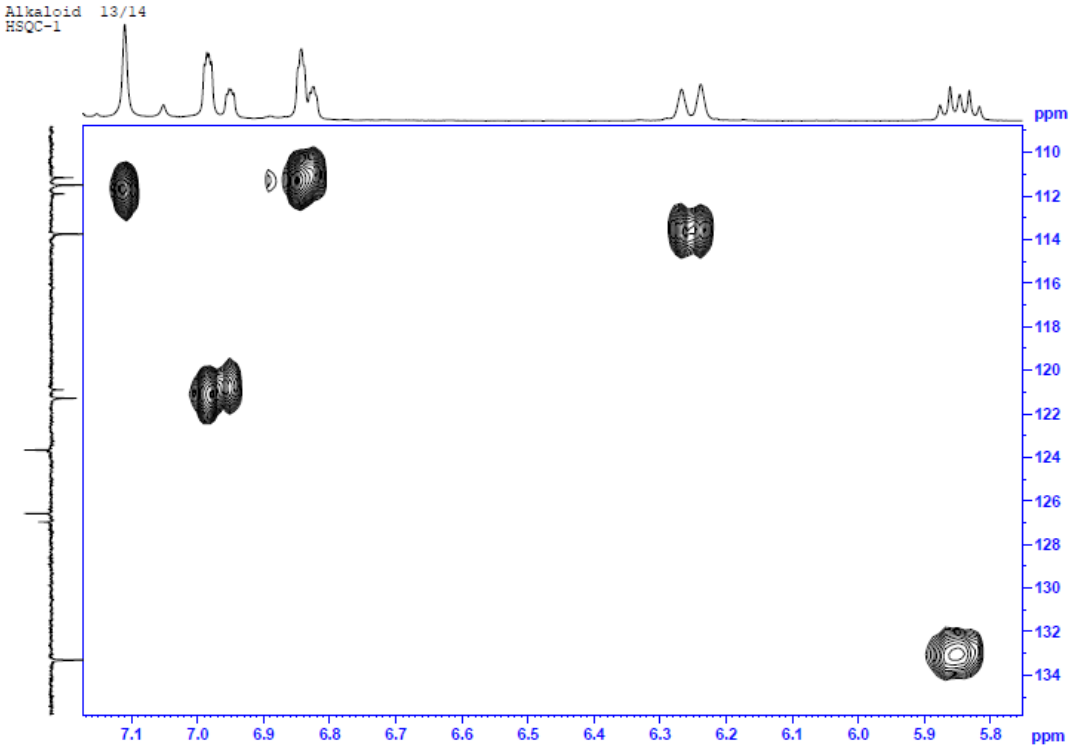
^{13}C-NMR spectrum of **13/14** (DMSO-d_6, 100MHz), expansion-2



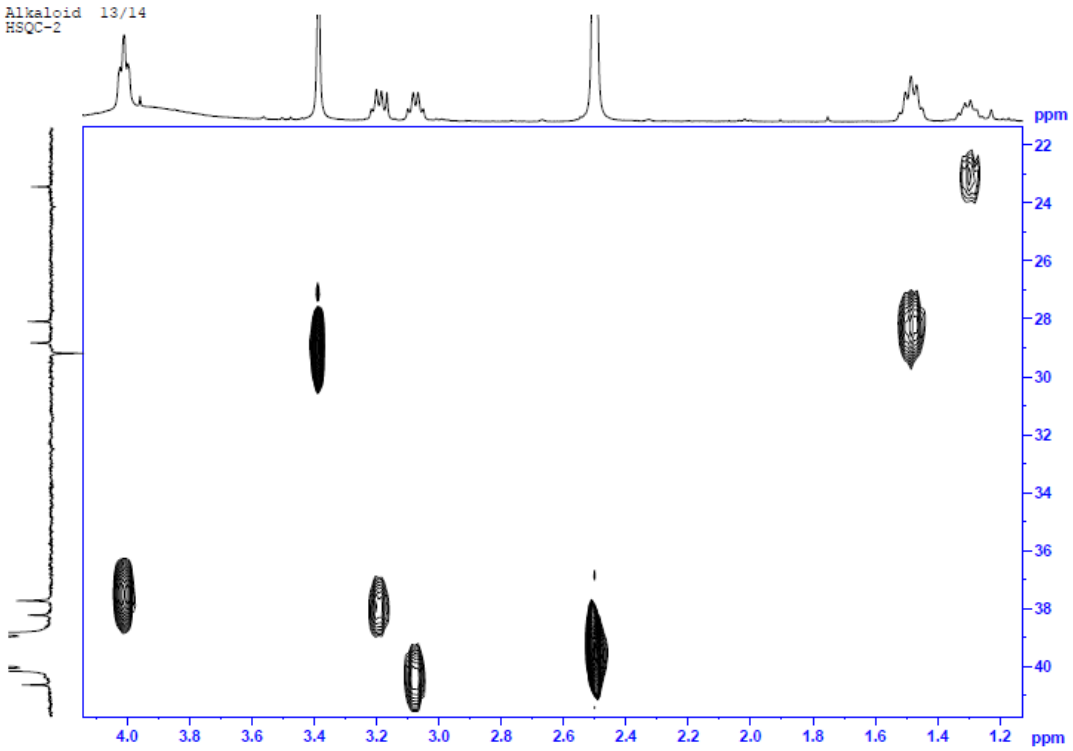
^{1}H-^{1}H COSY spectrum of **13/14** (DMSO-d_6, 400MHz)



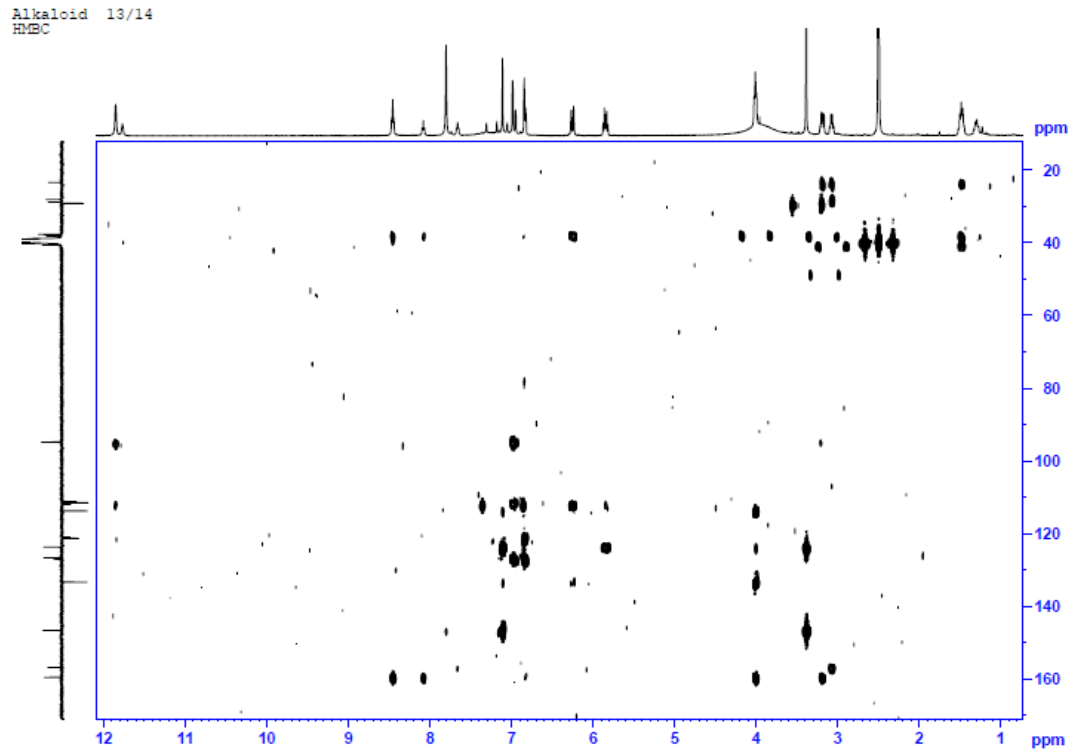
HSQC spectrum of **13/14** (DMSO-d_6, 400MHz)



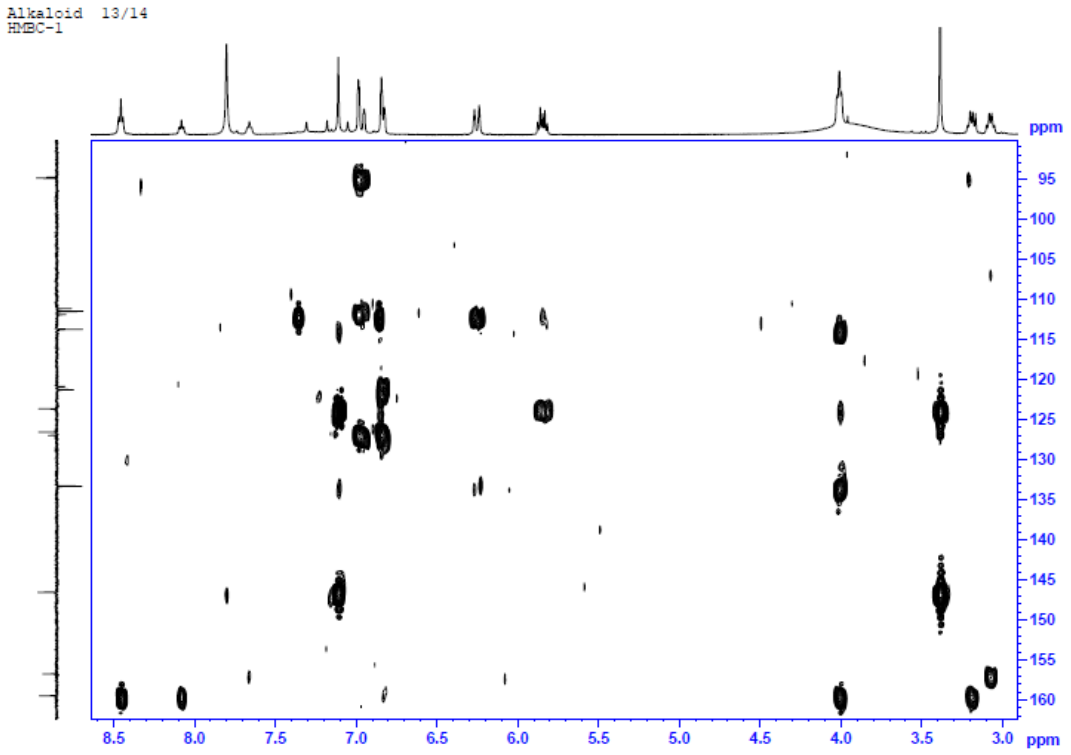
HSQC spectrum of **13/14** (DMSO-d_6, 400MHz), expansion-1



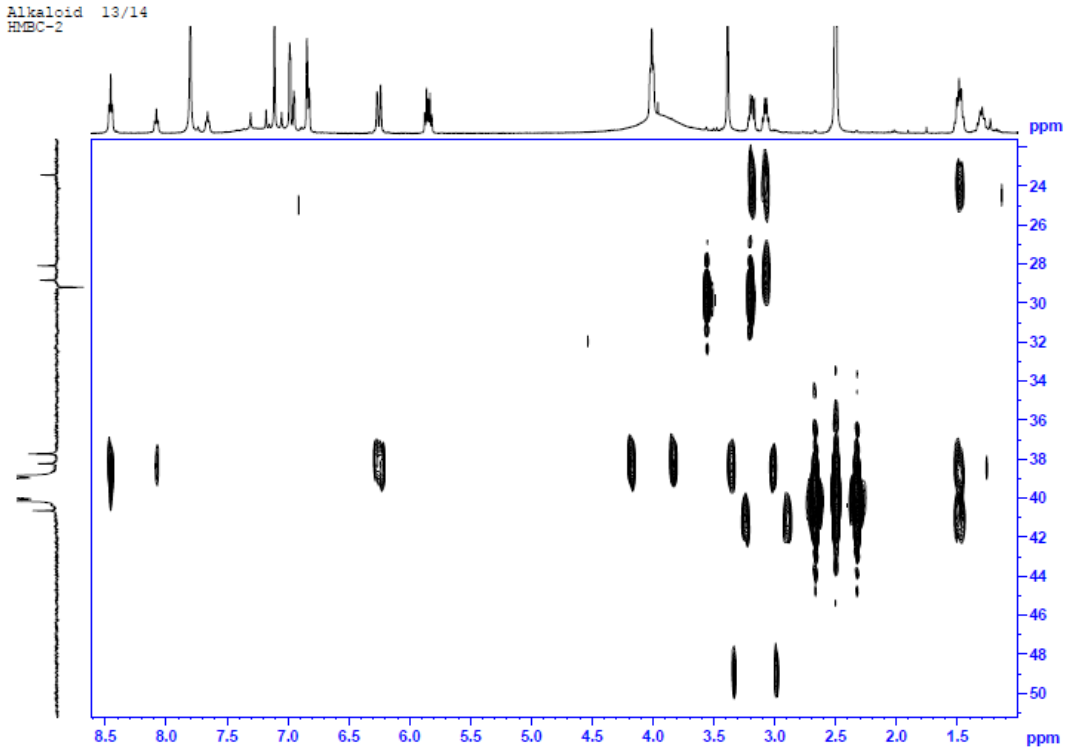
HSQC spectrum of **13/14** (DMSO-d_6, 400MHz), expansion-2



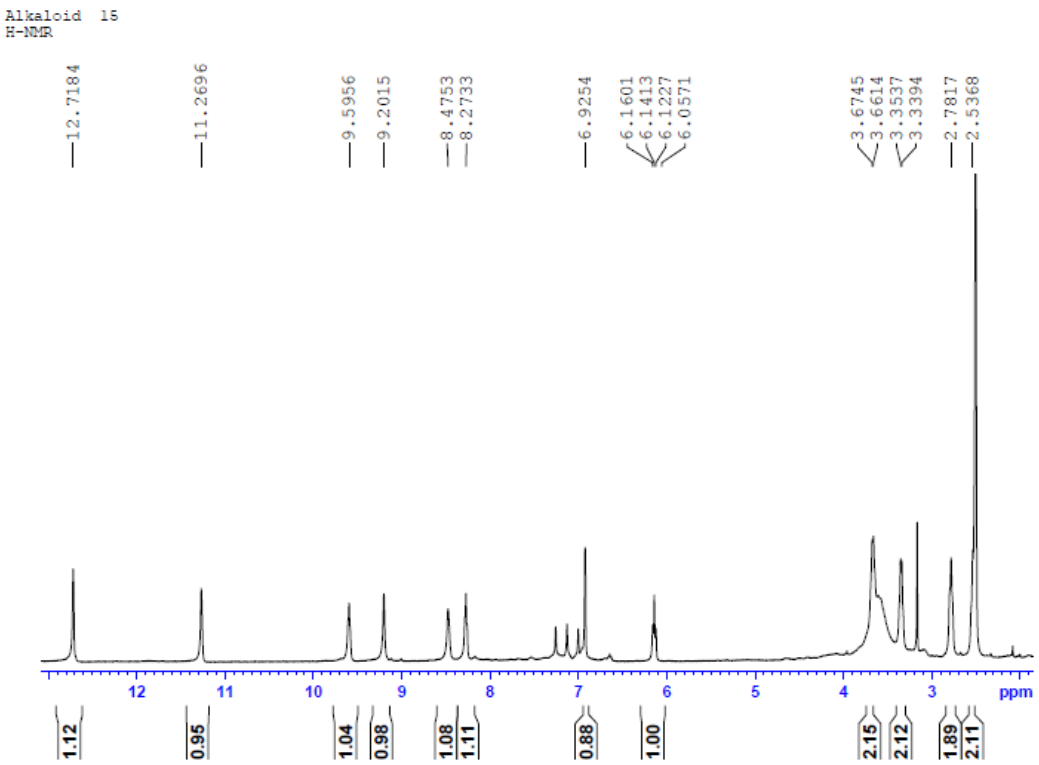
HMBC spectrum of **13/14** (DMSO-d_6, 400MHz)



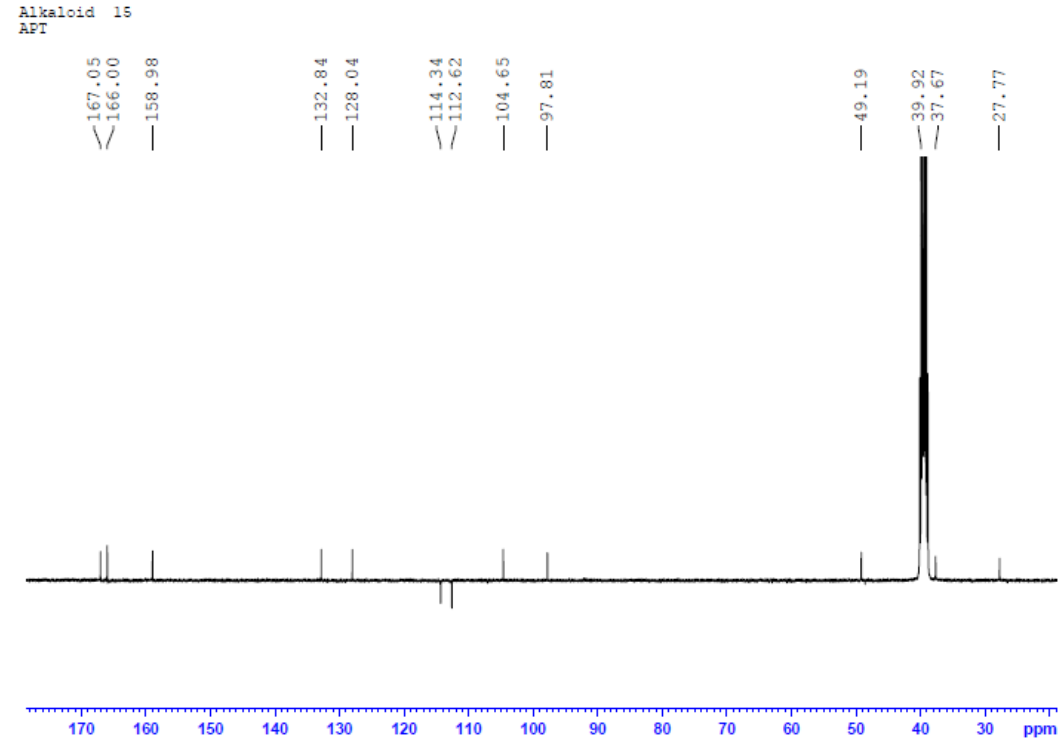
HMBC spectrum of **13/14** (DMSO-d_6, 400MHz), expansion-1



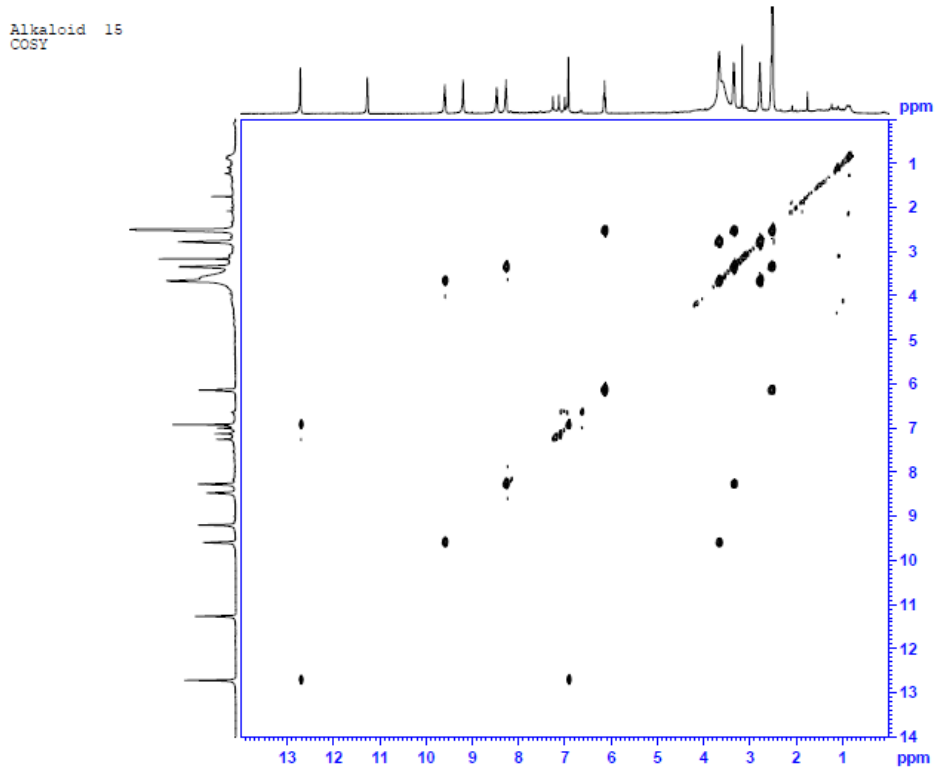
HMBC spectrum of **13/14** (DMSO-d_6, 400MHz), expansion-2



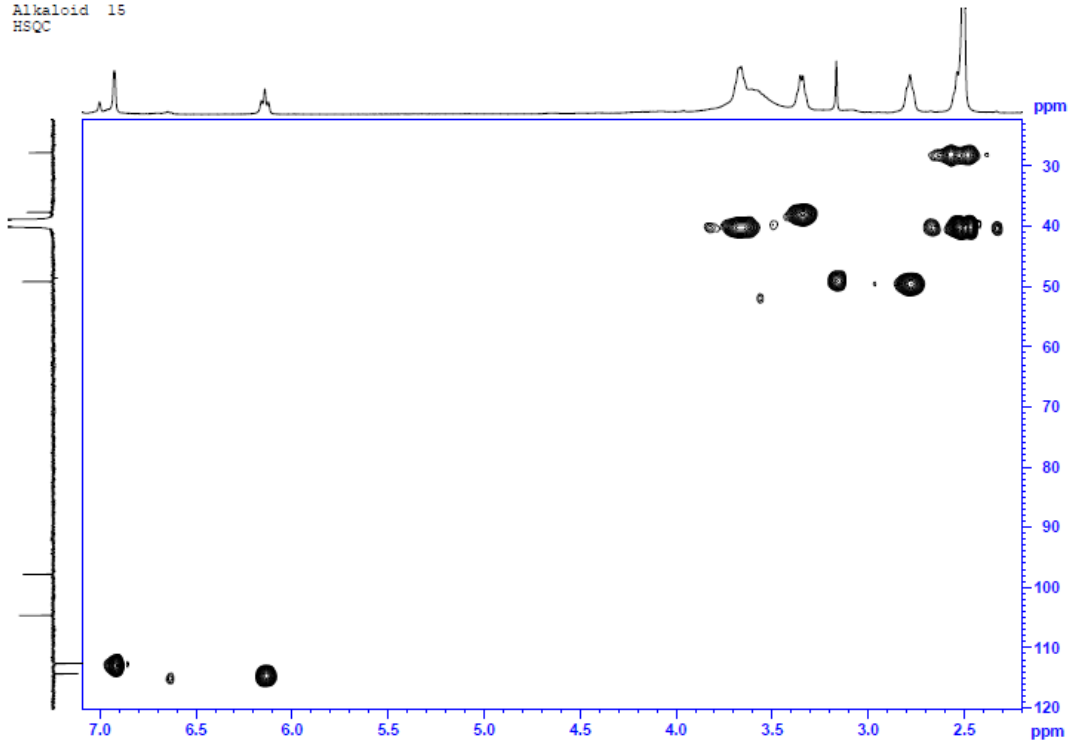
^{1}H-NMR spectrum of **15** (DMSO-d_6, 400MHz)



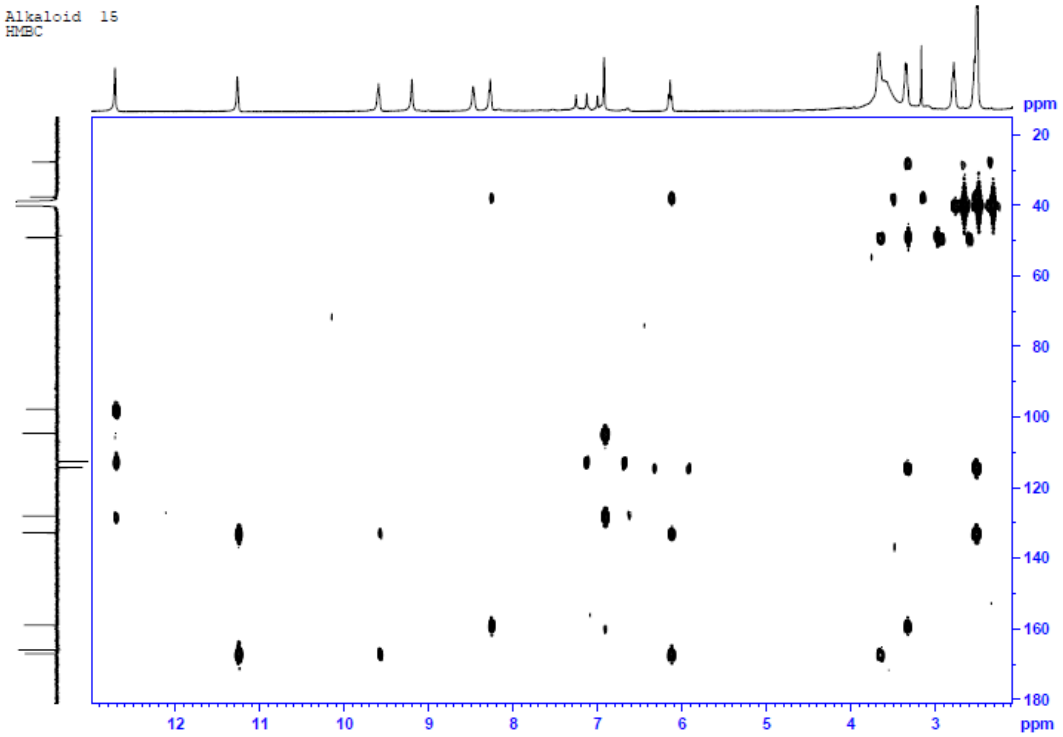
^{13}C-NMR spectrum of **15** (DMSO-d_6, 100MHz)



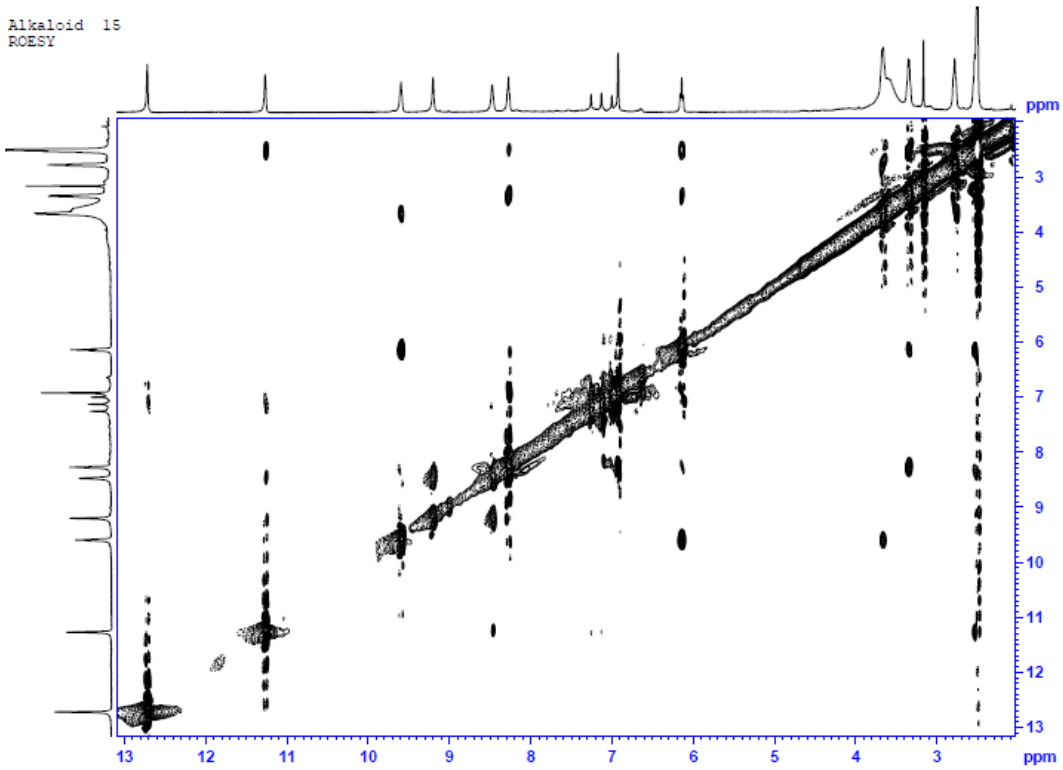
^{1}H-^{1}H COSY spectrum of **15** (DMSO-d_6, 400MHz)



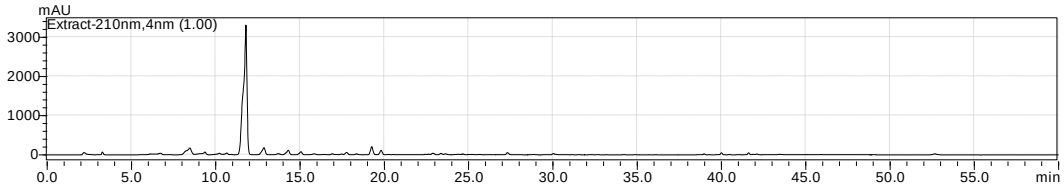
HSQC spectrum of **15** (DMSO-d_6, 400MHz)



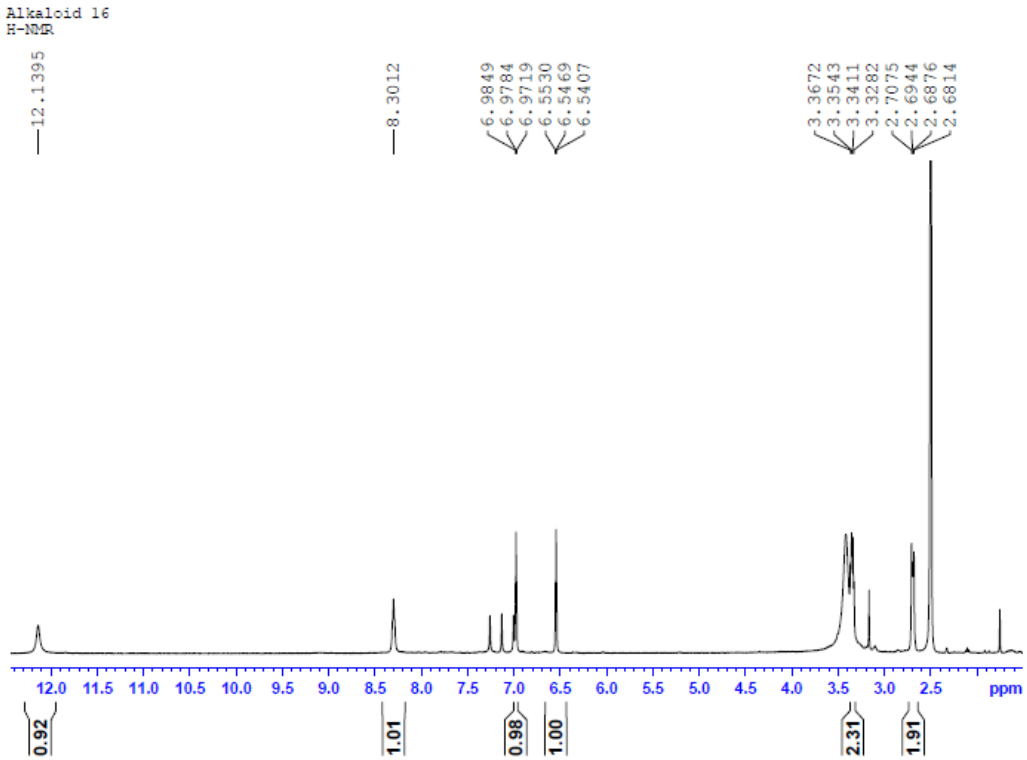
HMBC spectrum of **15** (DMSO-d_6, 400MHz)



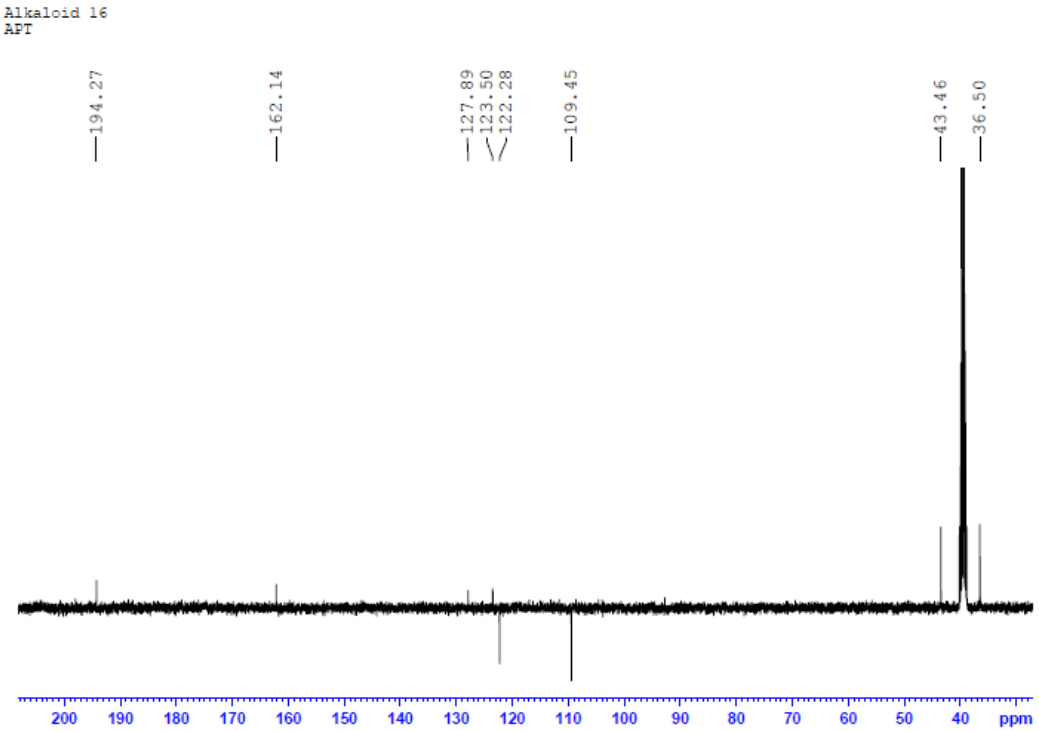
ROESY spectrum of **15** (DMSO-d_6, 400MHz)



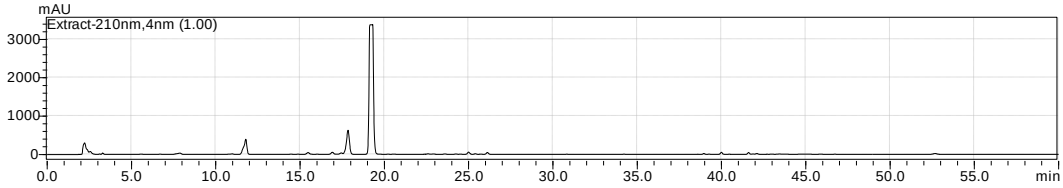
The DAD-HPLC of **16** (0-40min, 5%-100%MeOH-H_2O)



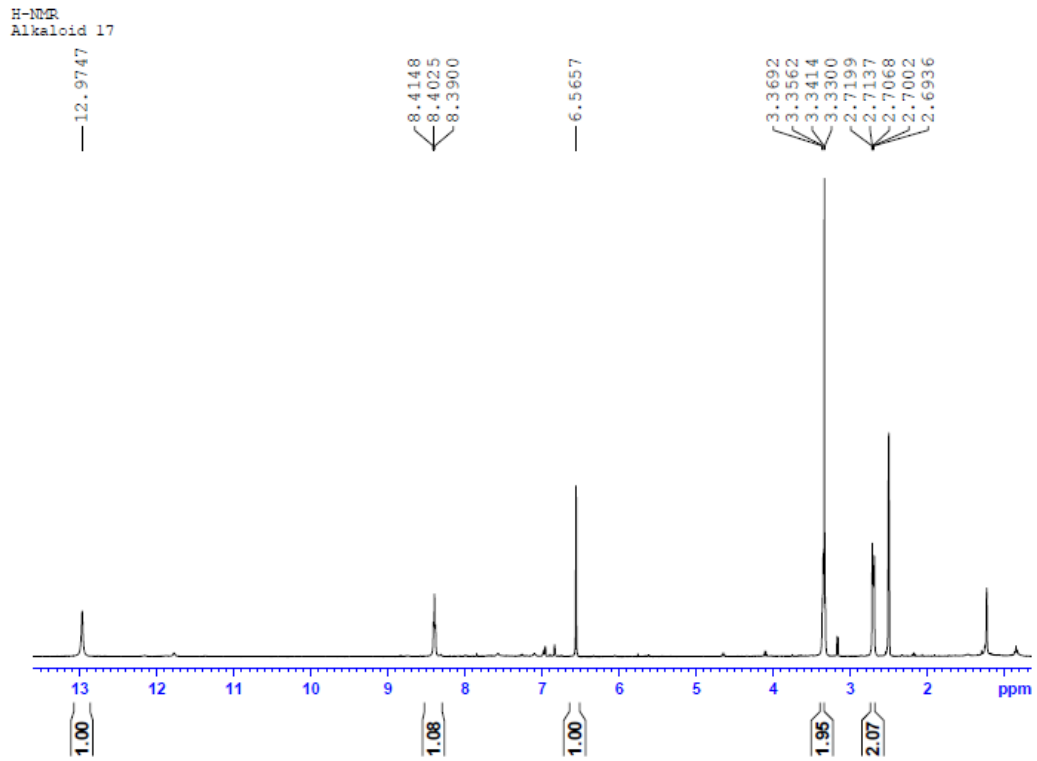
^{1}H-NMR spectrum of **16** (DMSO-d_6, 400MHz)



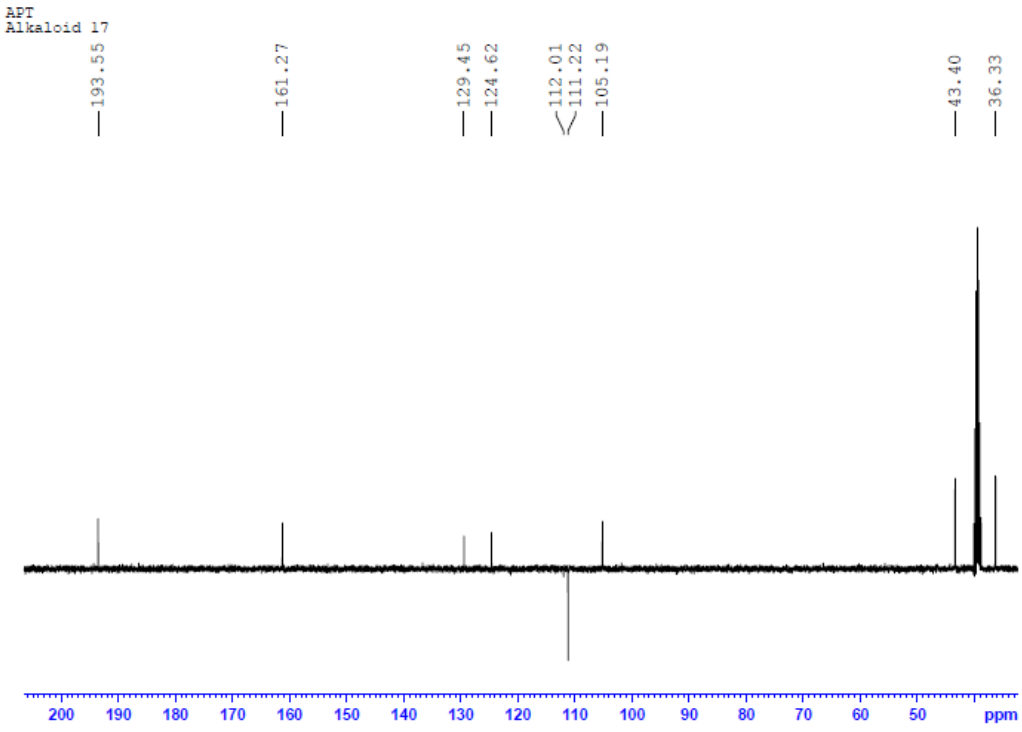
^{13}C-NMR spectrum of **16** (DMSO-d_6, 100MHz)



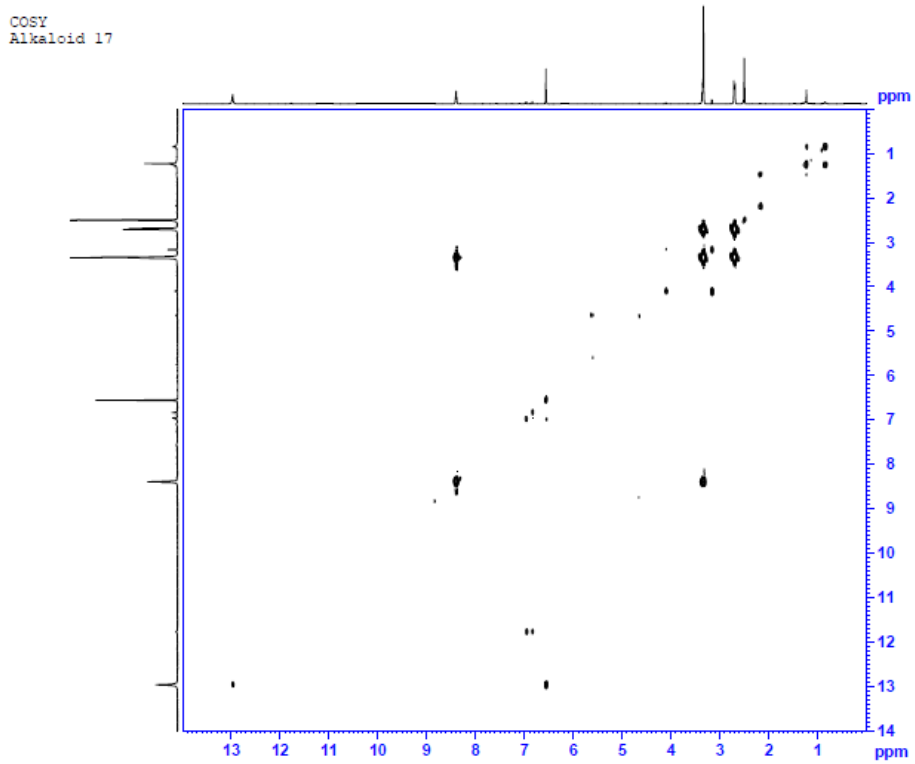
The DAD-HPLC of **17** (0-40min, 5%-100%MeOH-H_2O)



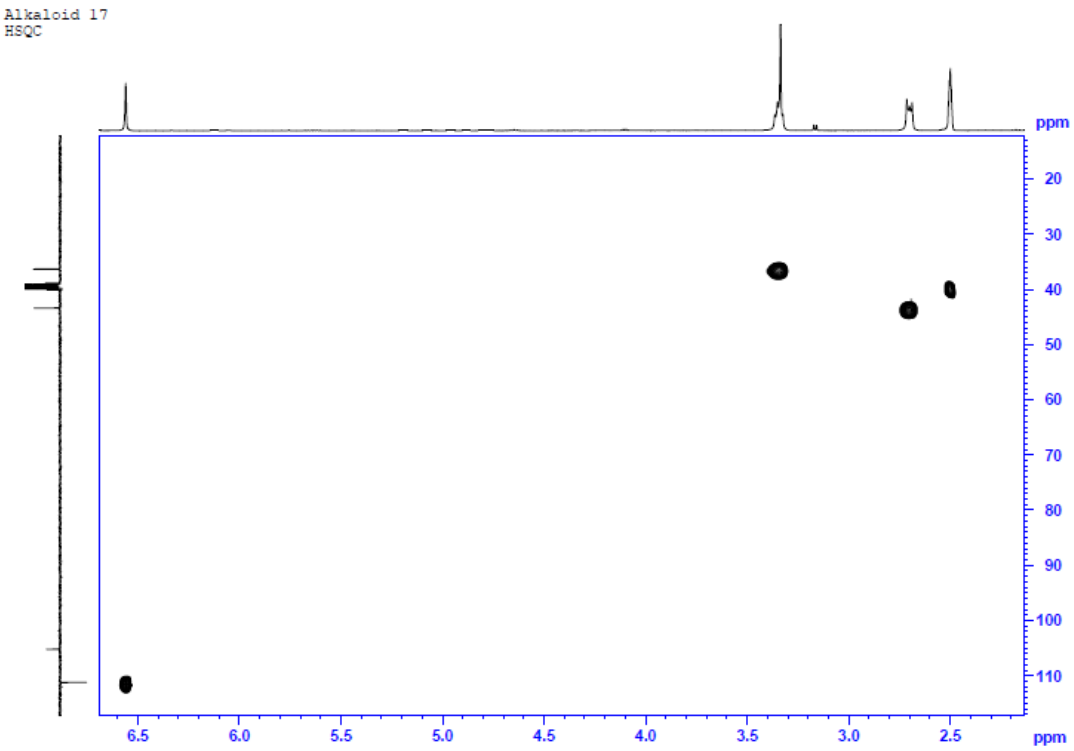
^{1}H-NMR spectrum of **17** (DMSO-d_6, 400MHz)



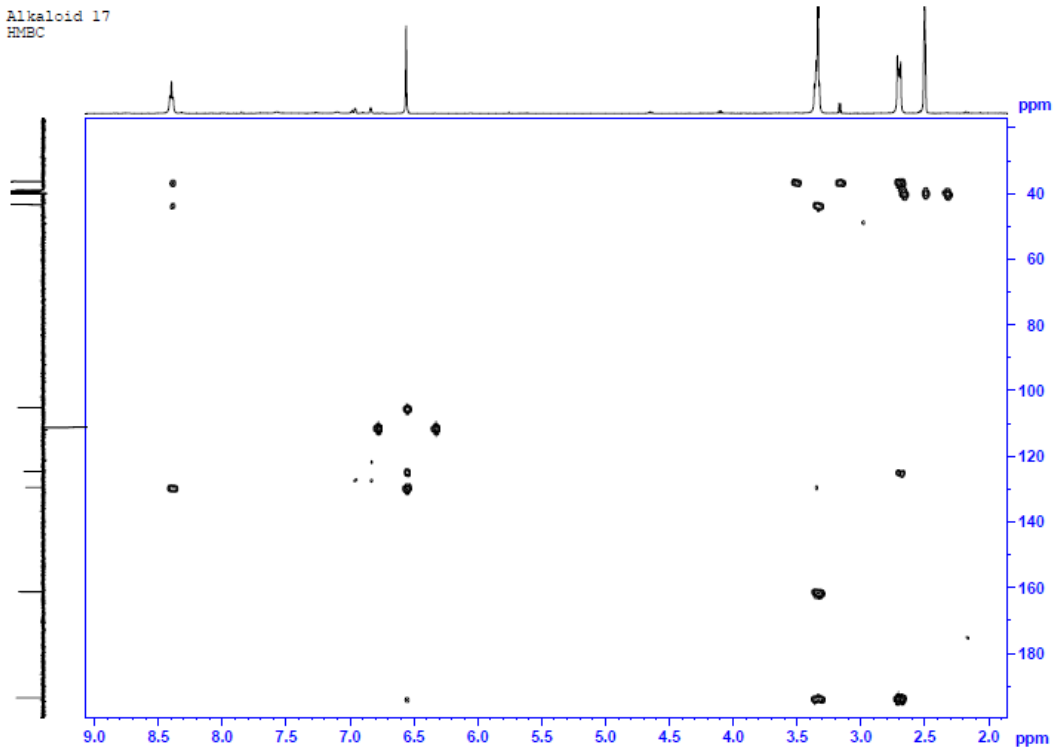
^{13}C-NMR spectrum of **17** (DMSO-d_6, 100MHz)



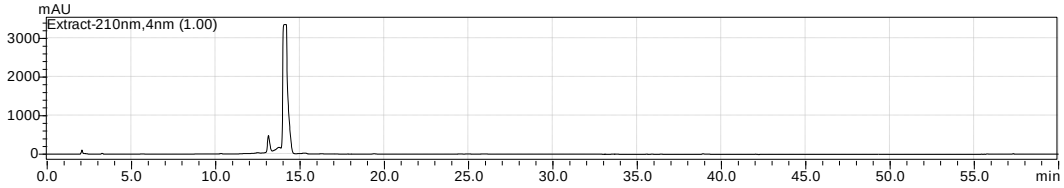
^{1}H-^{1}H COSY spectrum of **17** (DMSO-d_6, 400MHz)



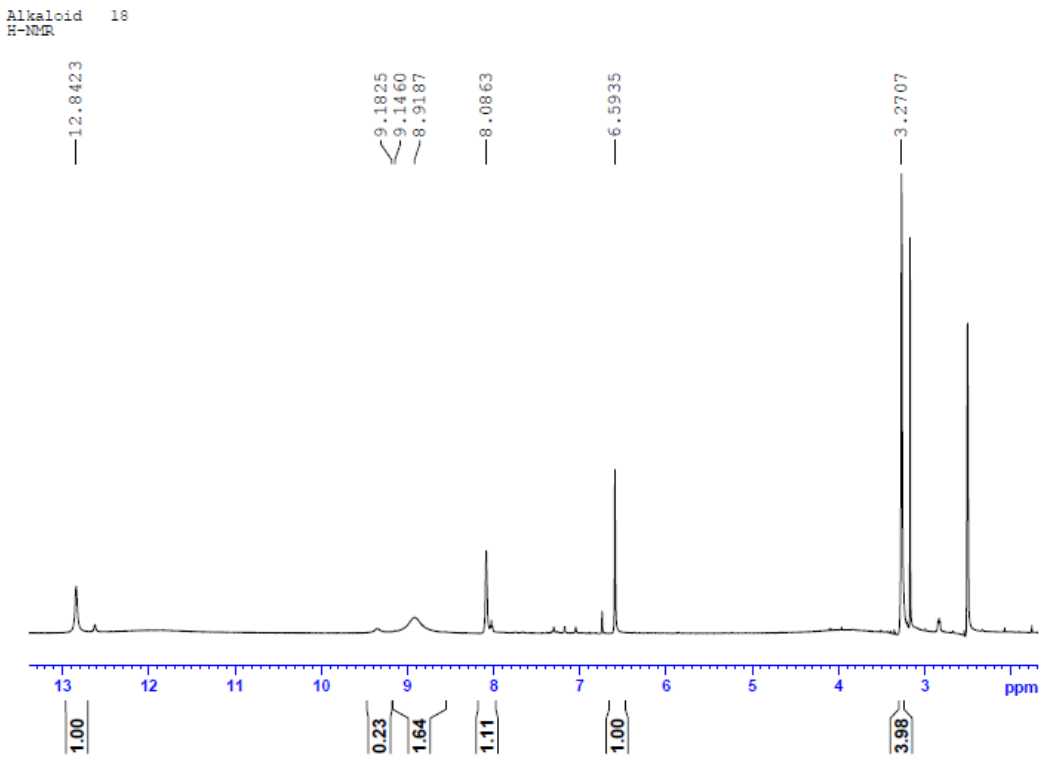
HSQC spectrum of **17** (DMSO-d_6, 400MHz)



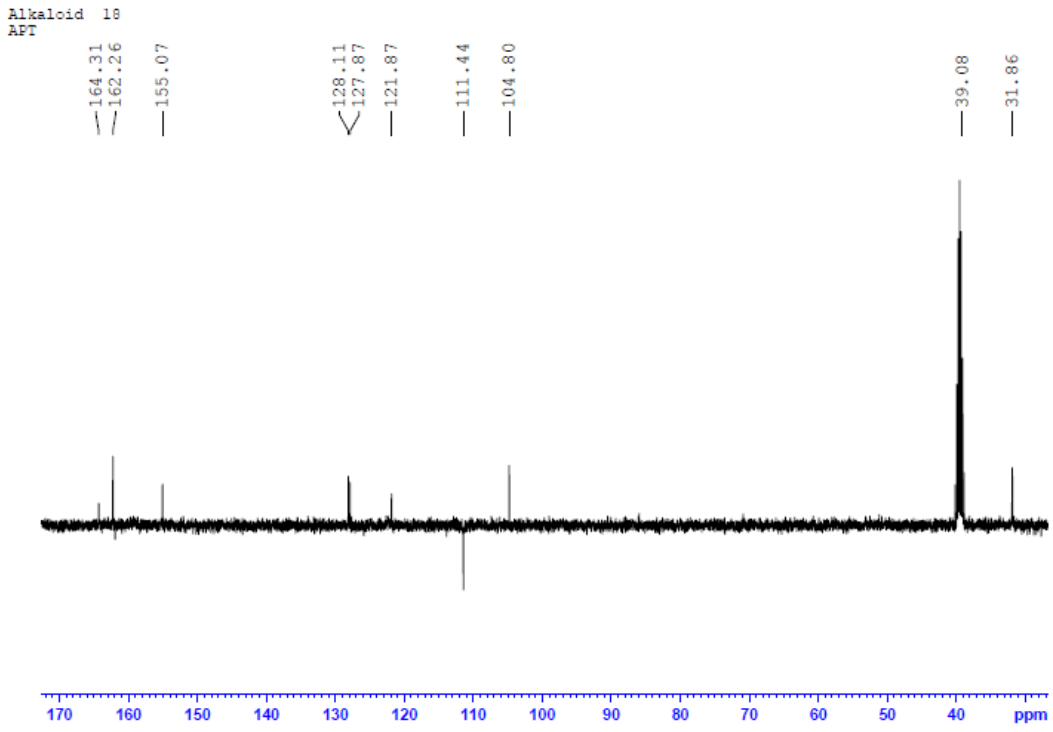
HMBC spectrum of **17** (DMSO-d_6, 400MHz)



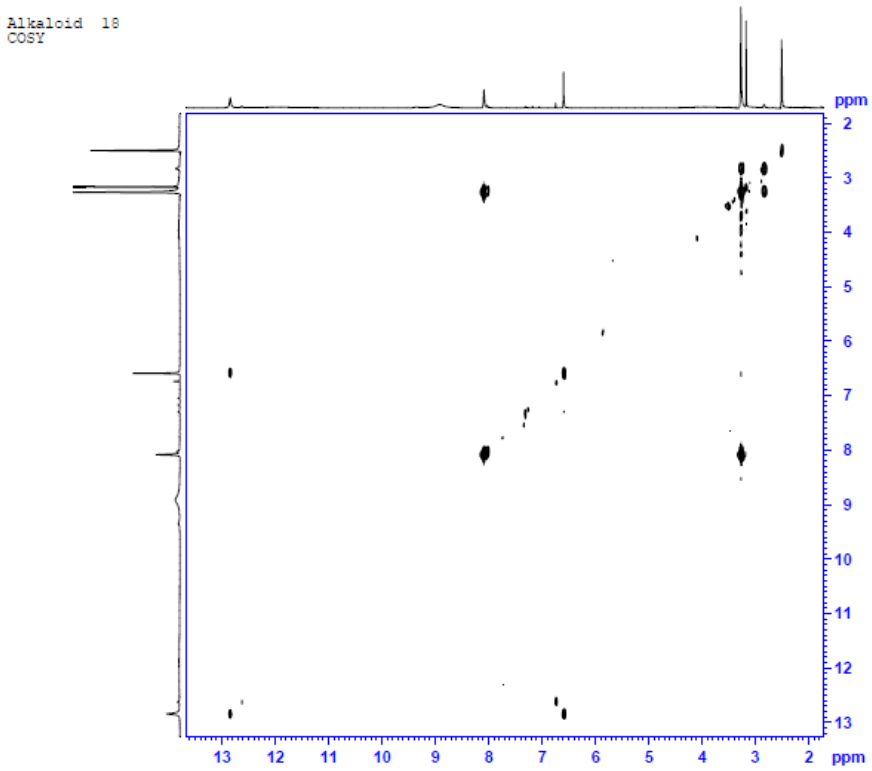
The DAD-HPLC of **18** (0-40min, 5%-100%MeOH-H_2O)



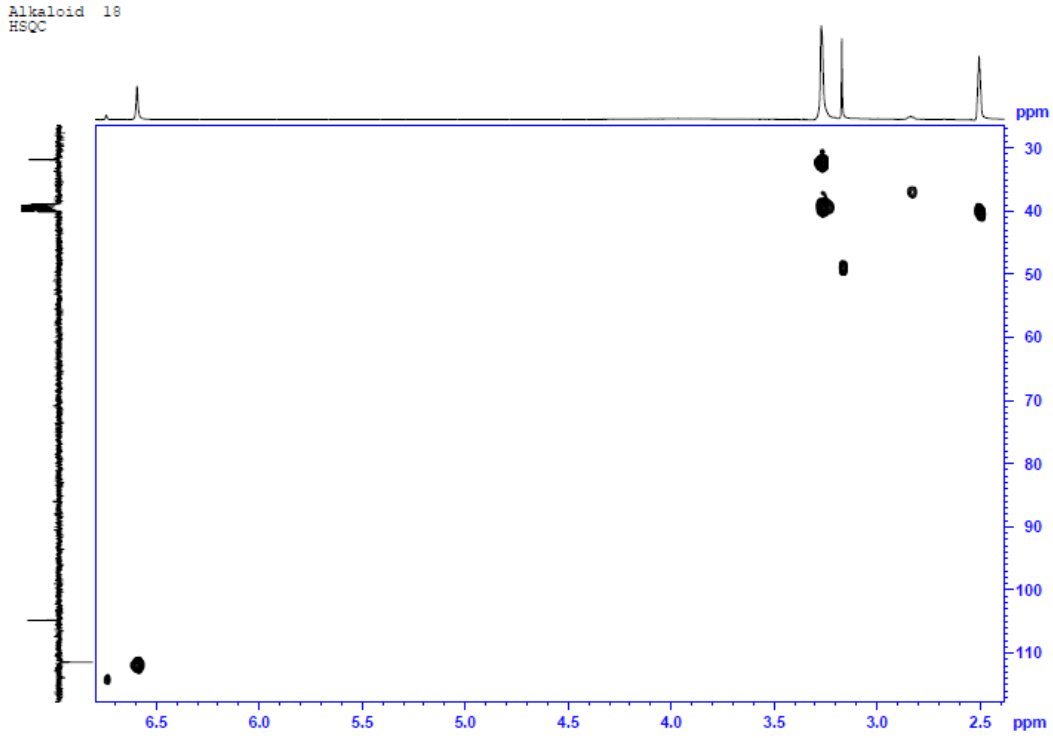
^{1}H-NMR spectrum of **18** (DMSO-d_6, 400MHz)



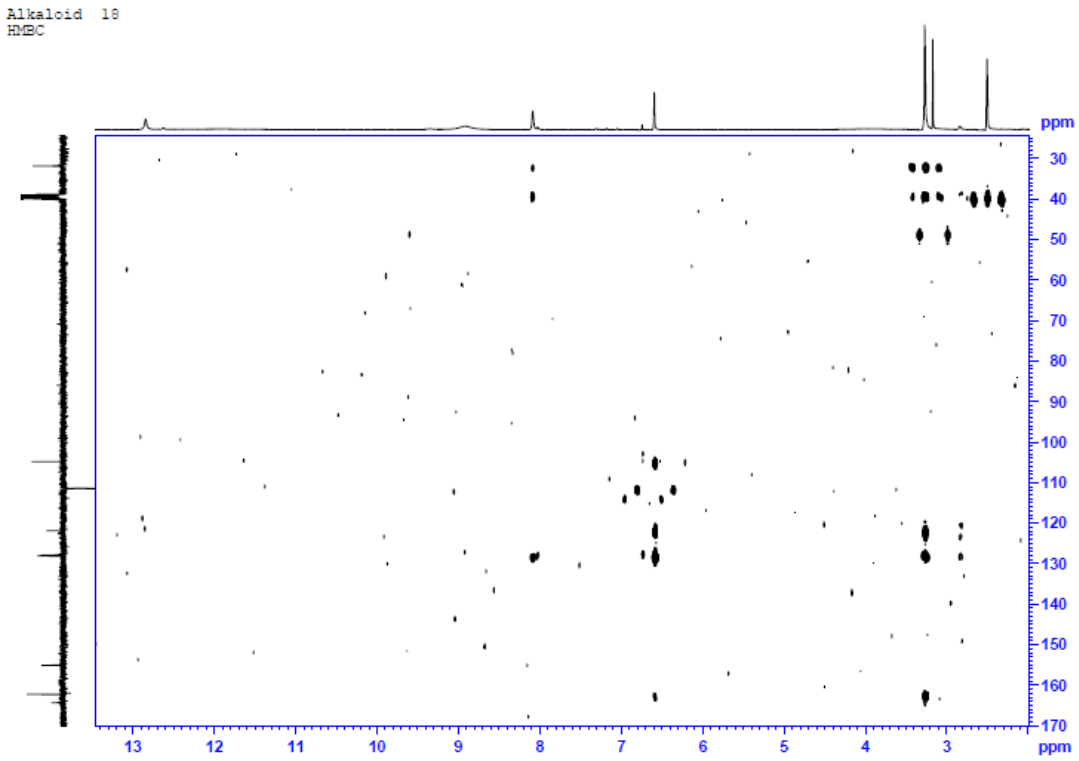
^{13}C-NMR spectrum of **18** (DMSO-d_6, 100MHz)



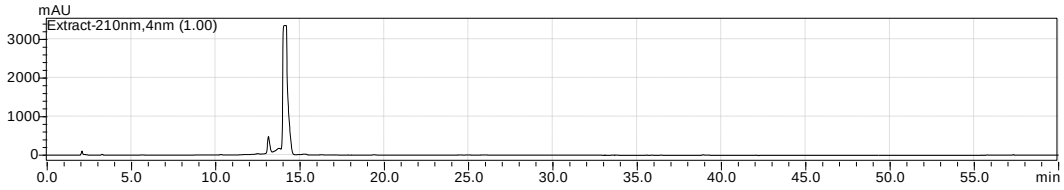
^{1}H-^{1}H COSY spectrum of **18** (DMSO-d_6, 400MHz)



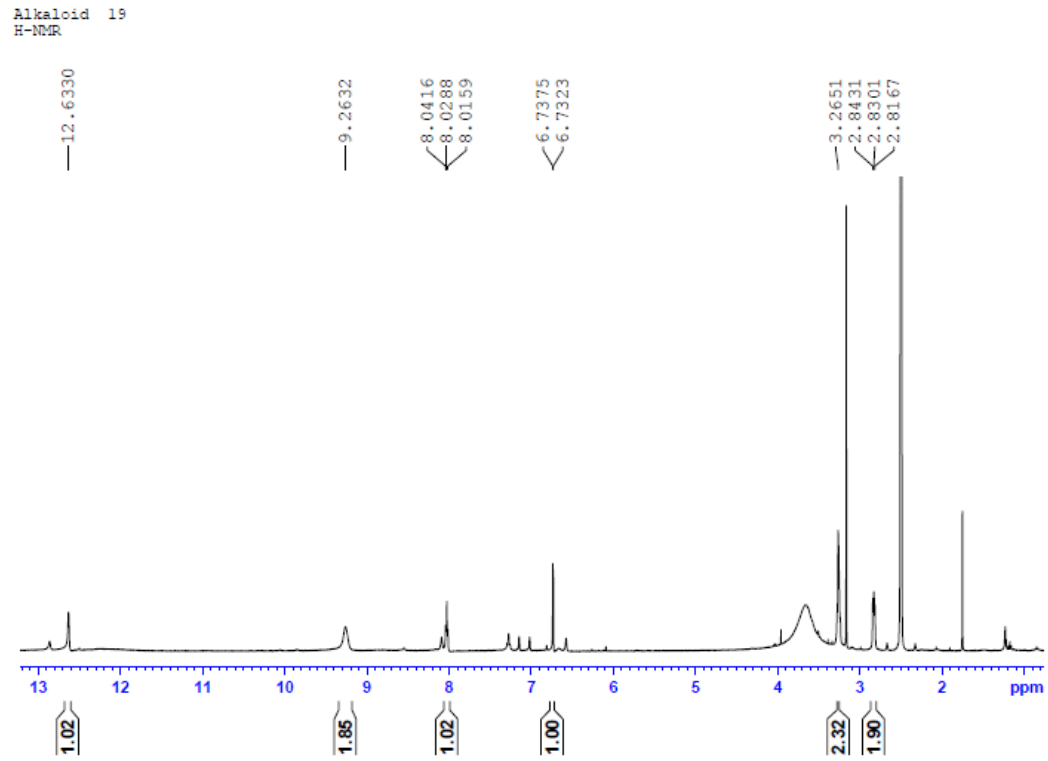
HSQC spectrum of **18** (DMSO-d_6, 400MHz)



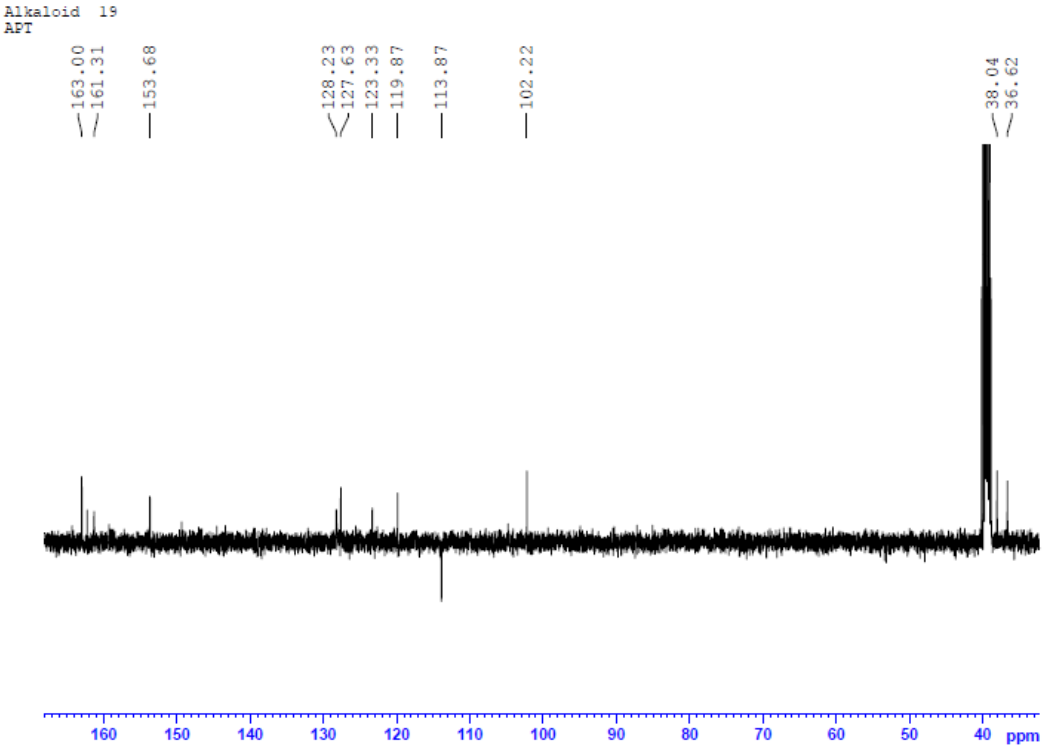
HMBC spectrum of **18** (DMSO-d_6, 400MHz)



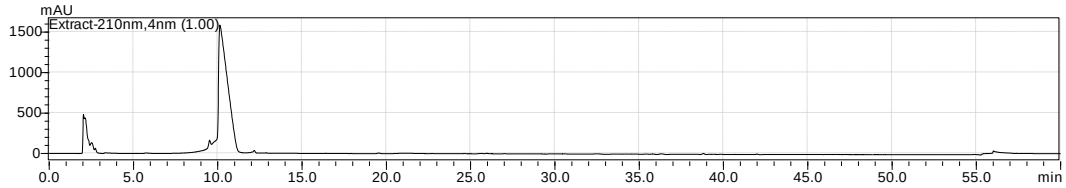
The DAD-HPLC of **19** (0-40min, 5%-100%MeOH-H_2O)



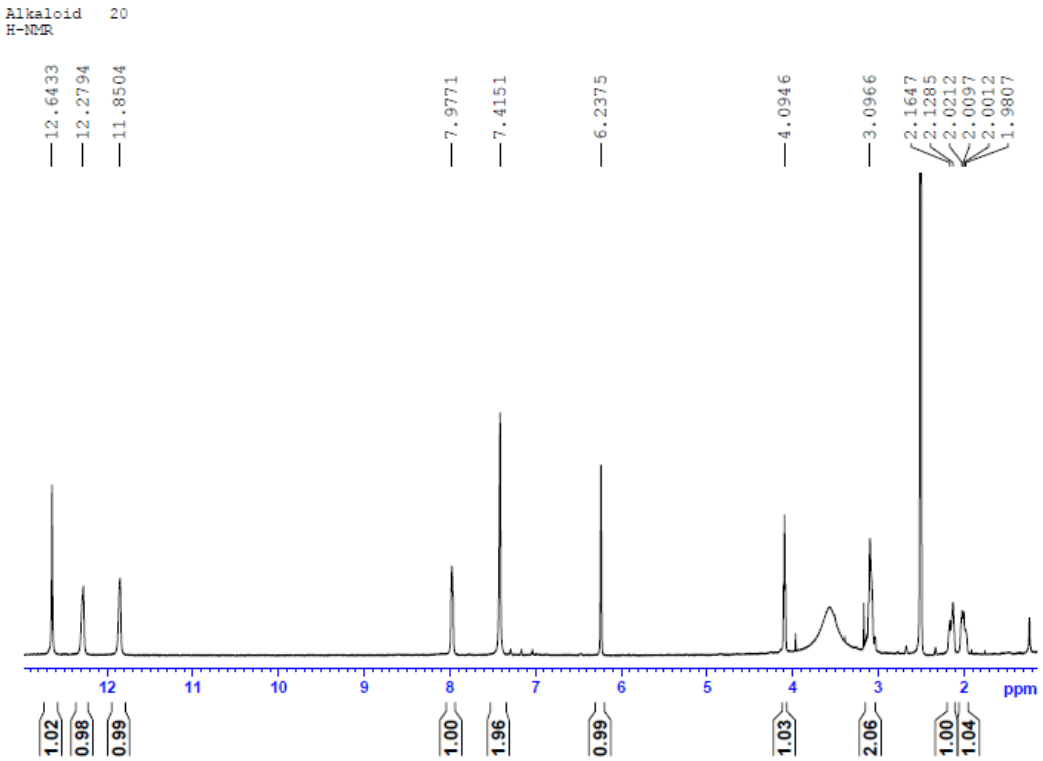
^{1}H-NMR spectrum of **19** (DMSO-d_6, 400MHz)



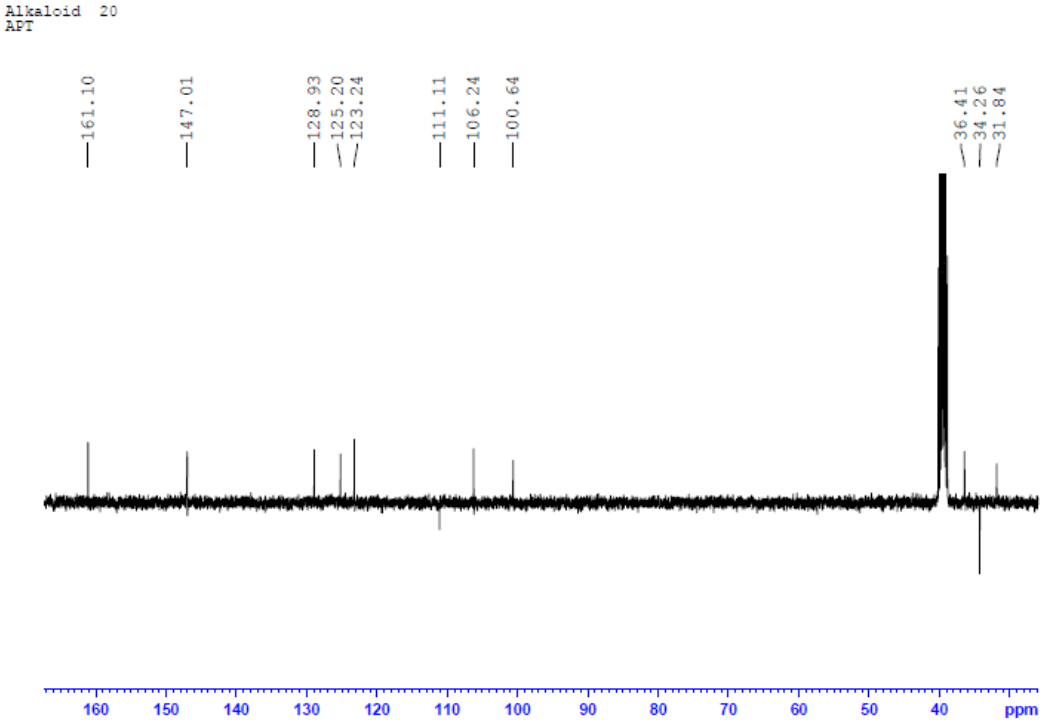
^{13}C-NMR spectrum of **19** (DMSO-d_6, 100MHz)



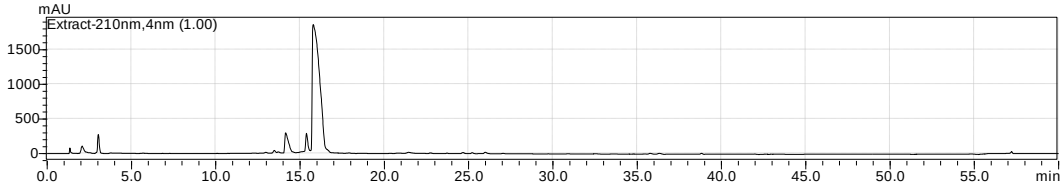
The DAD-HPLC of **20** (0-40min, 5%-100%MeOH-H_2O)



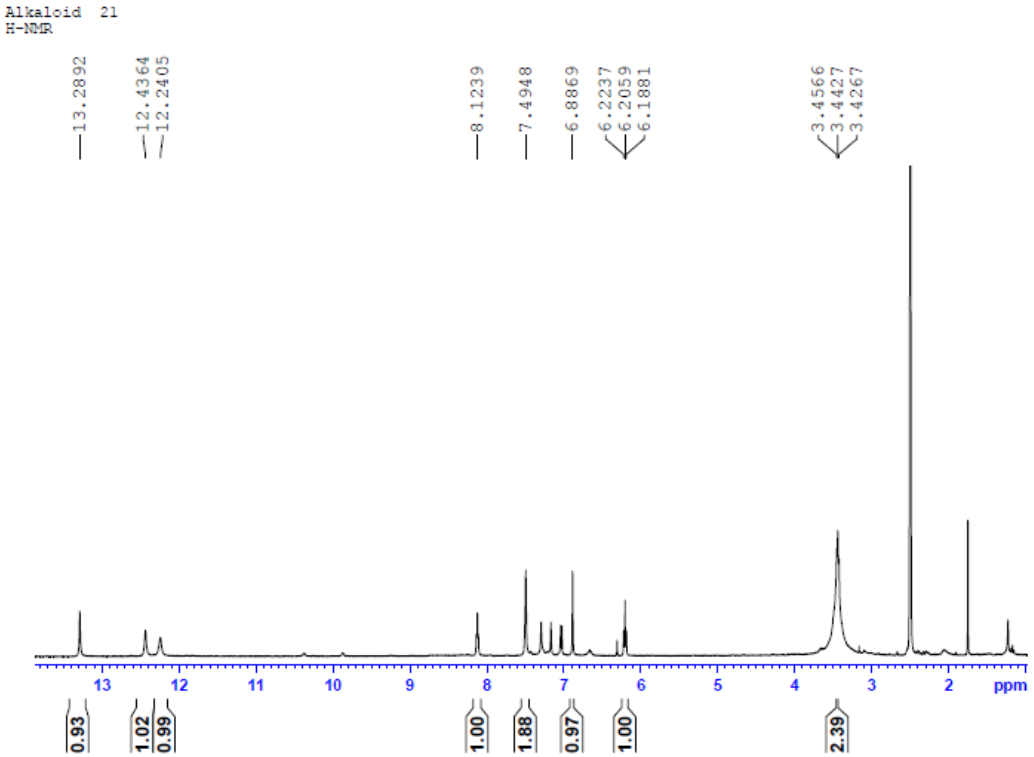
^{1}H-NMR spectrum of **20** (DMSO-d_6, 400MHz)



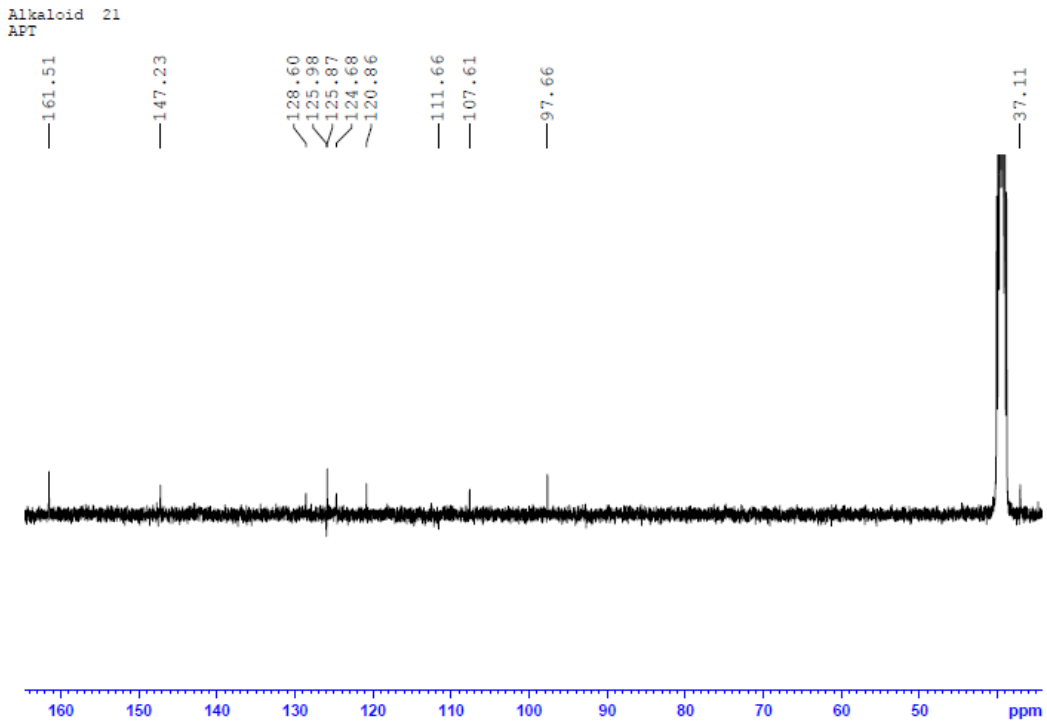
^{13}C-NMR spectrum of **20** (DMSO-d_6, 100MHz)



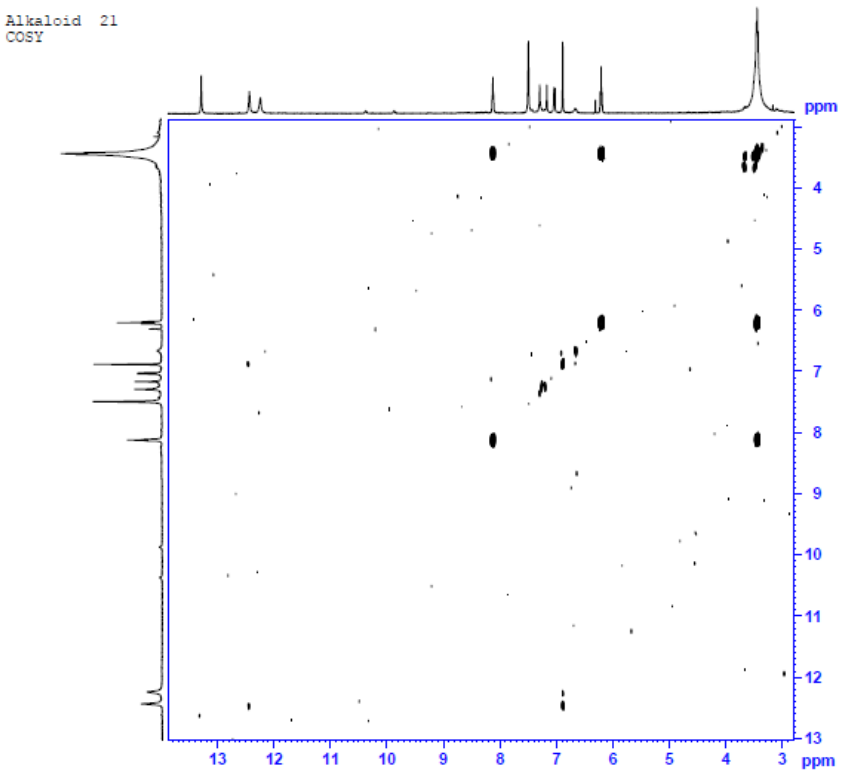
The DAD-HPLC of **21** (0-40min, 5%-100%MeOH-H_2O)



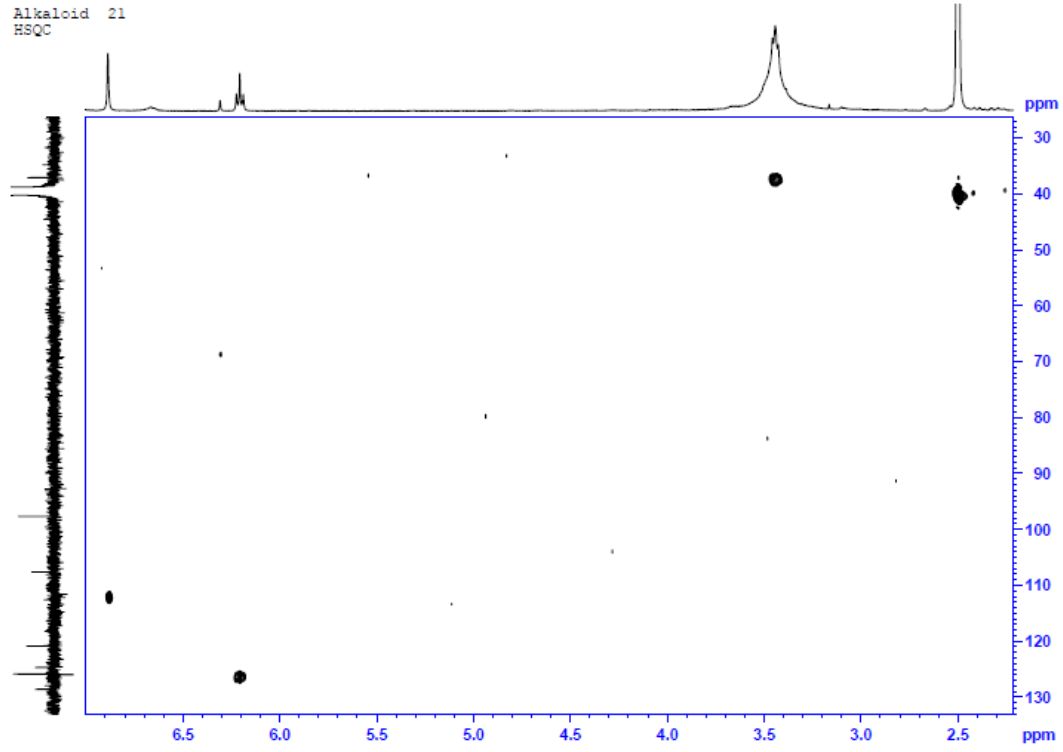
^{1}H-NMR spectrum of **21** (DMSO-d_6, 400MHz)



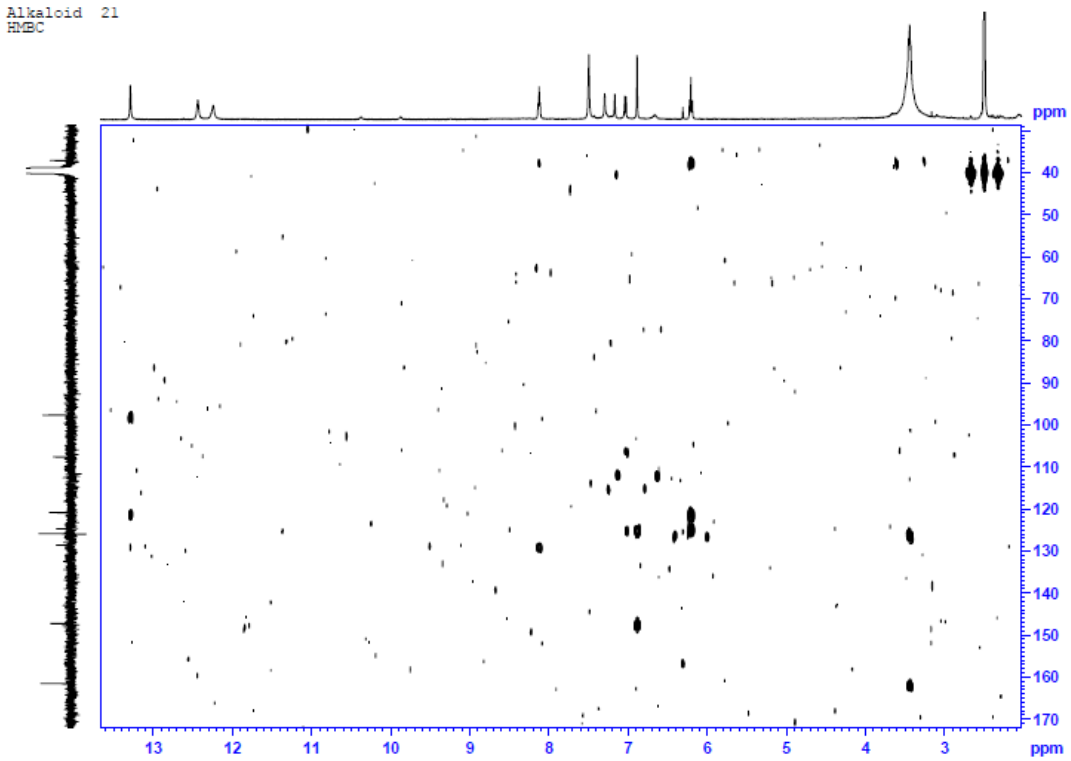
^{13}C-NMR spectrum of **21** (DMSO-d_6, 100MHz)



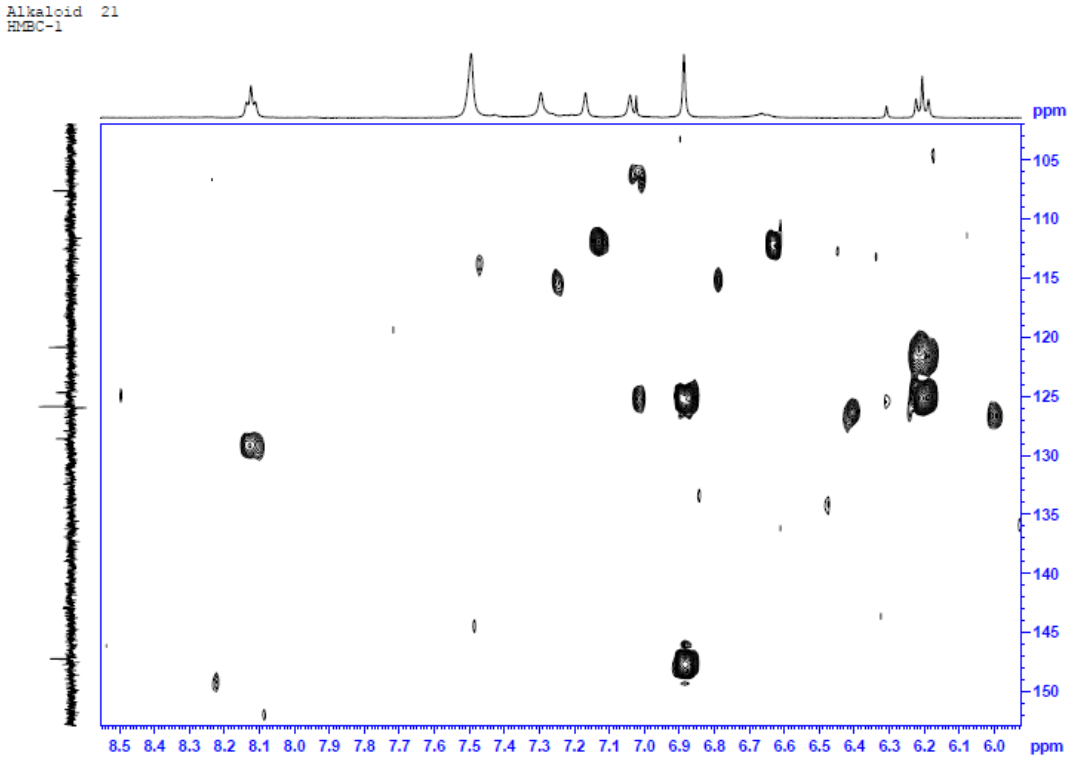
^{1}H-^{1}H COSY spectrum of **21** (DMSO-d_6, 400MHz)



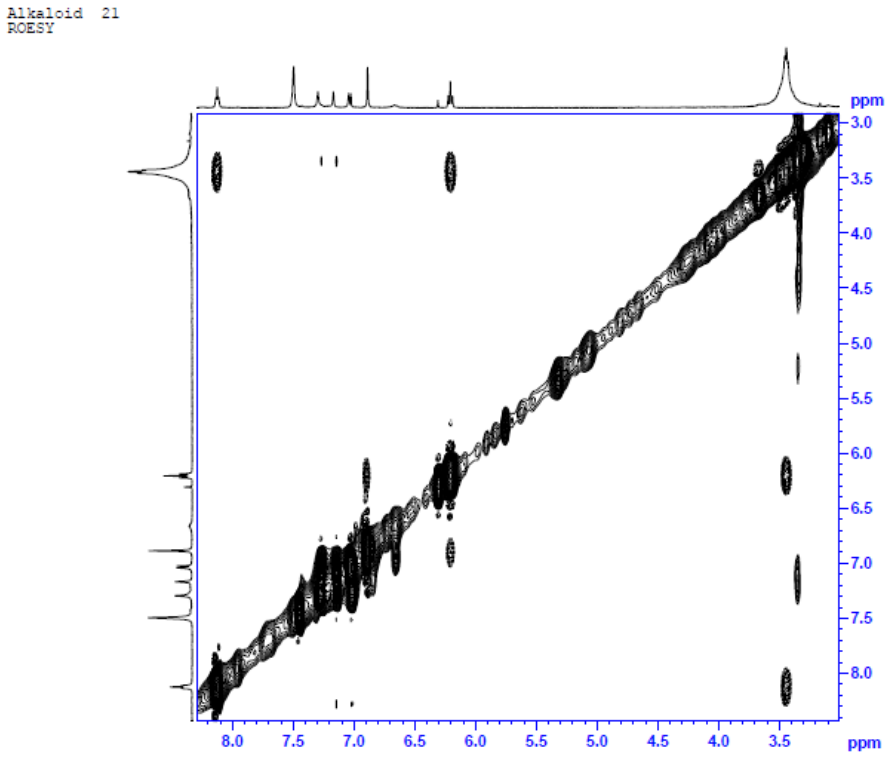
HSQC spectrum of **21** (DMSO-d_6, 400MHz)



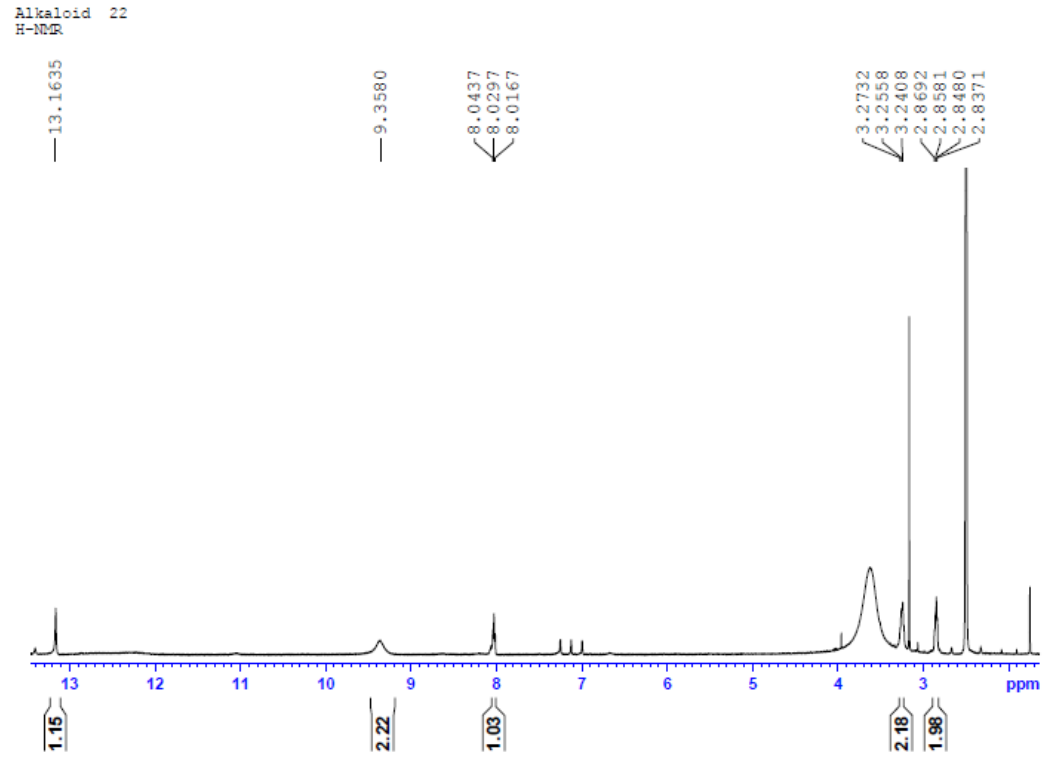
HMBC spectrum of **21** (DMSO-d_6, 400MHz)



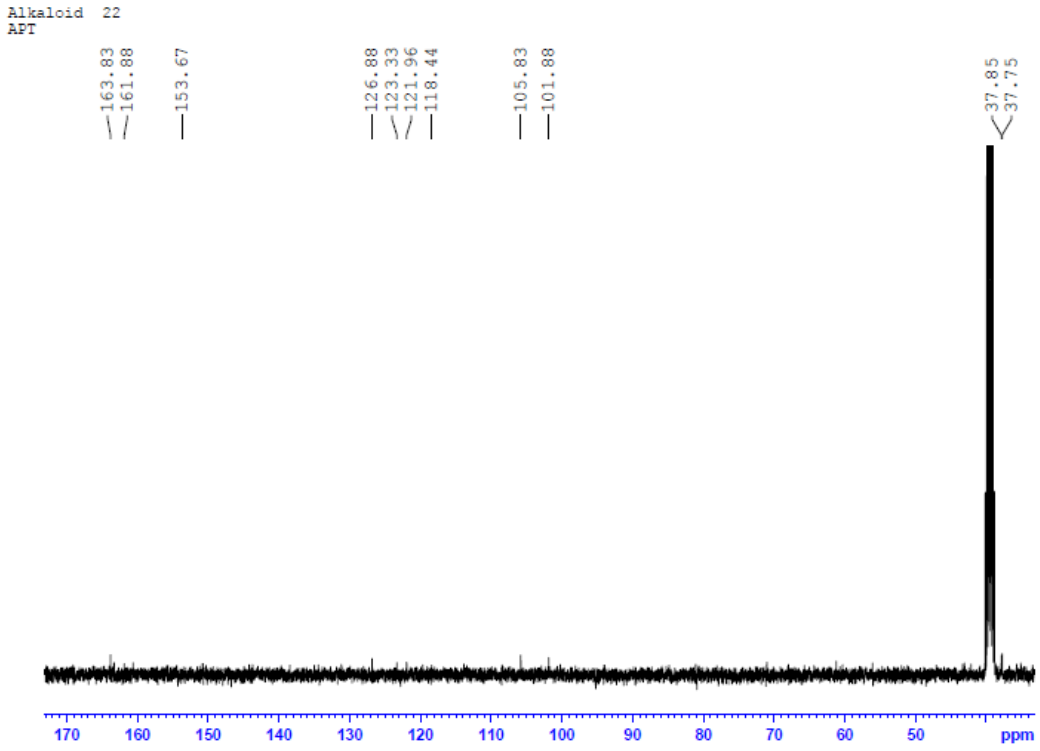
HMBC spectrum of **21** (DMSO-d_6, 400MHz), expansion-1



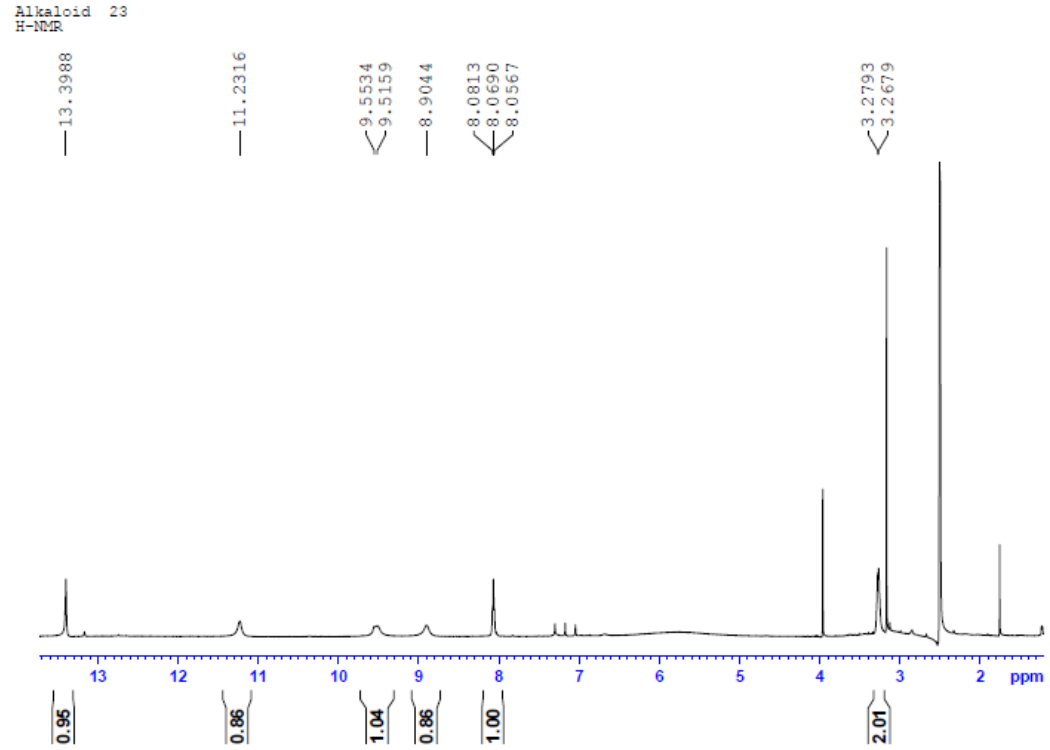
ROESY spectrum of **21** (DMSO-d_6, 400MHz)



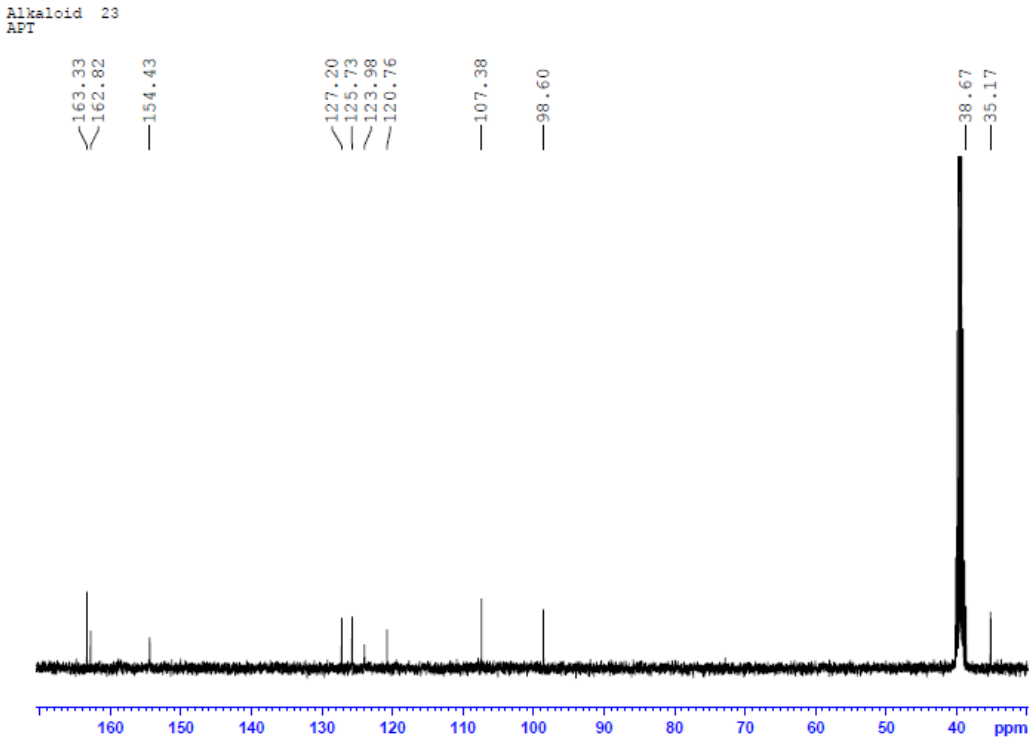
^{1}H-NMR spectrum of **22** (DMSO-d_6, 400MHz)



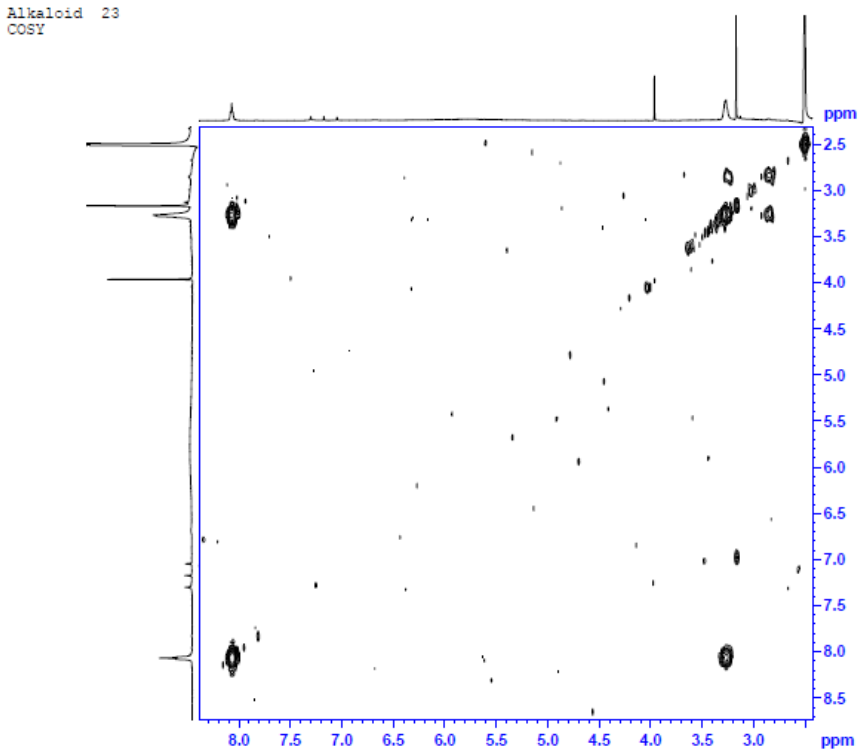
^{13}C-NMR spectrum of **22** (DMSO-d_6, 100MHz)



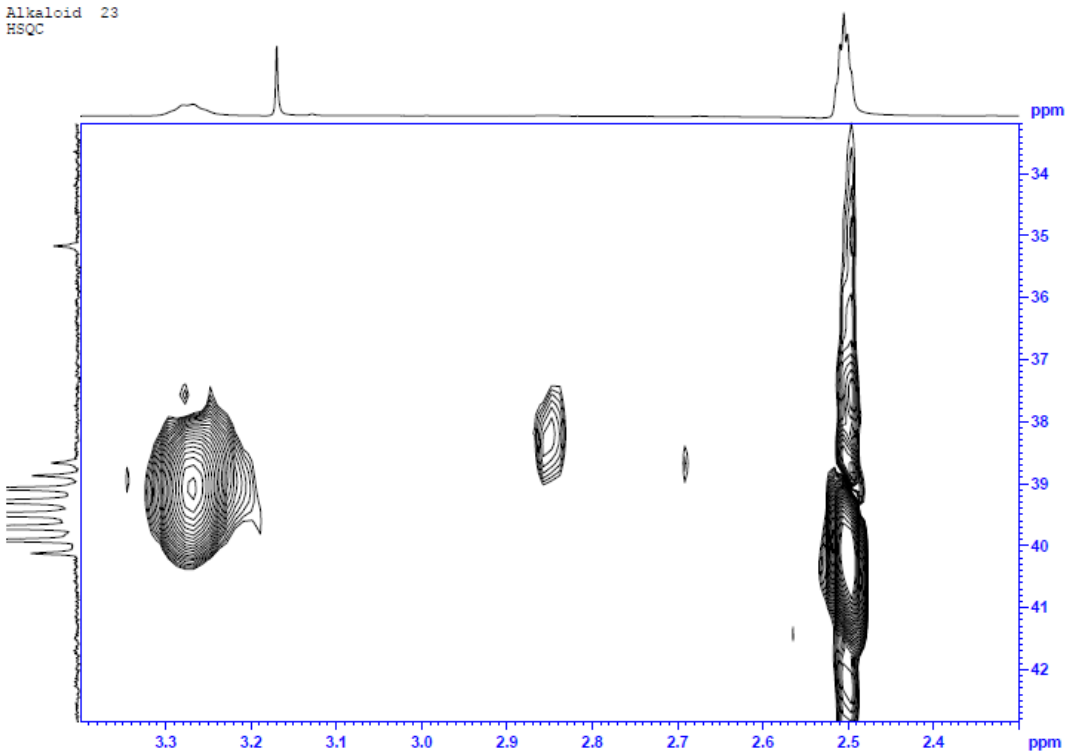
^{1}H-NMR spectrum of **23** (DMSO-d_6, 400MHz)



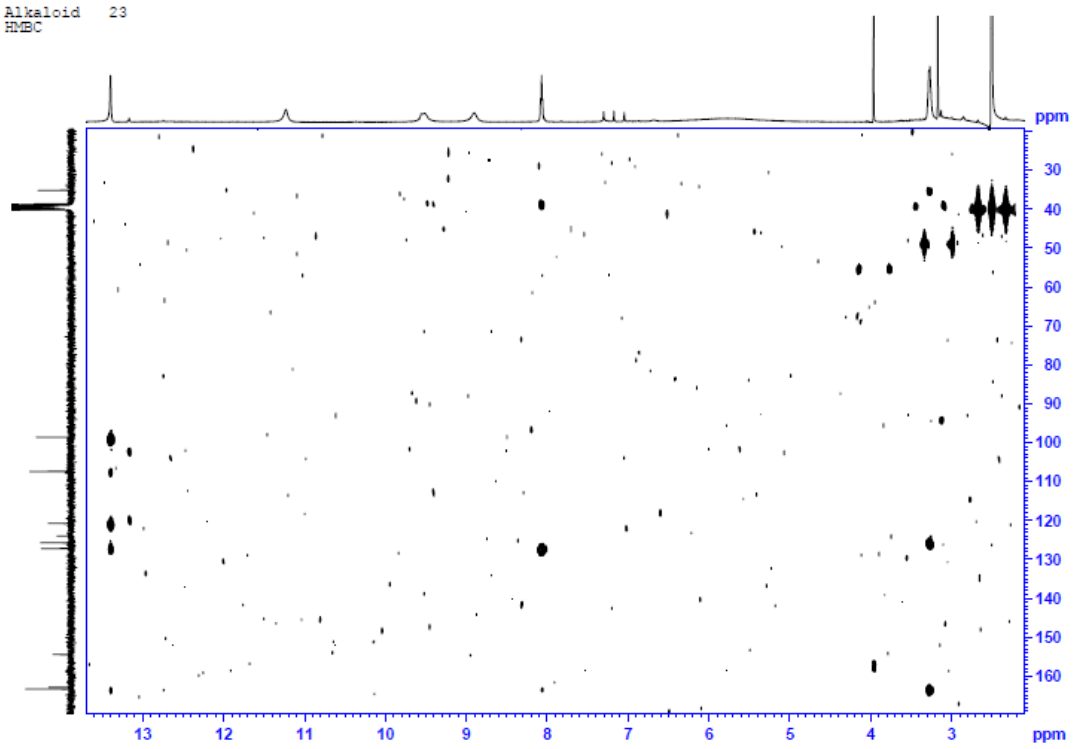
^{13}C-NMR spectrum of **23** (DMSO-d_6, 100MHz)



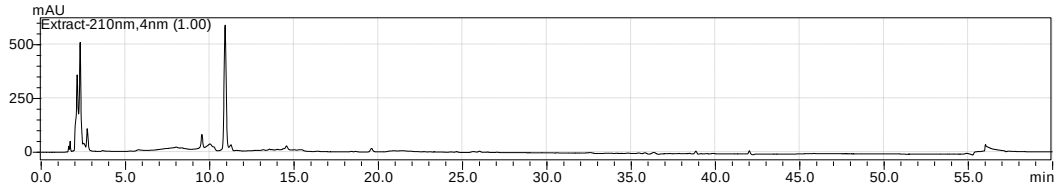
^{1}H-^{1}H COSY spectrum of **23** (DMSO-d_6, 400MHz)



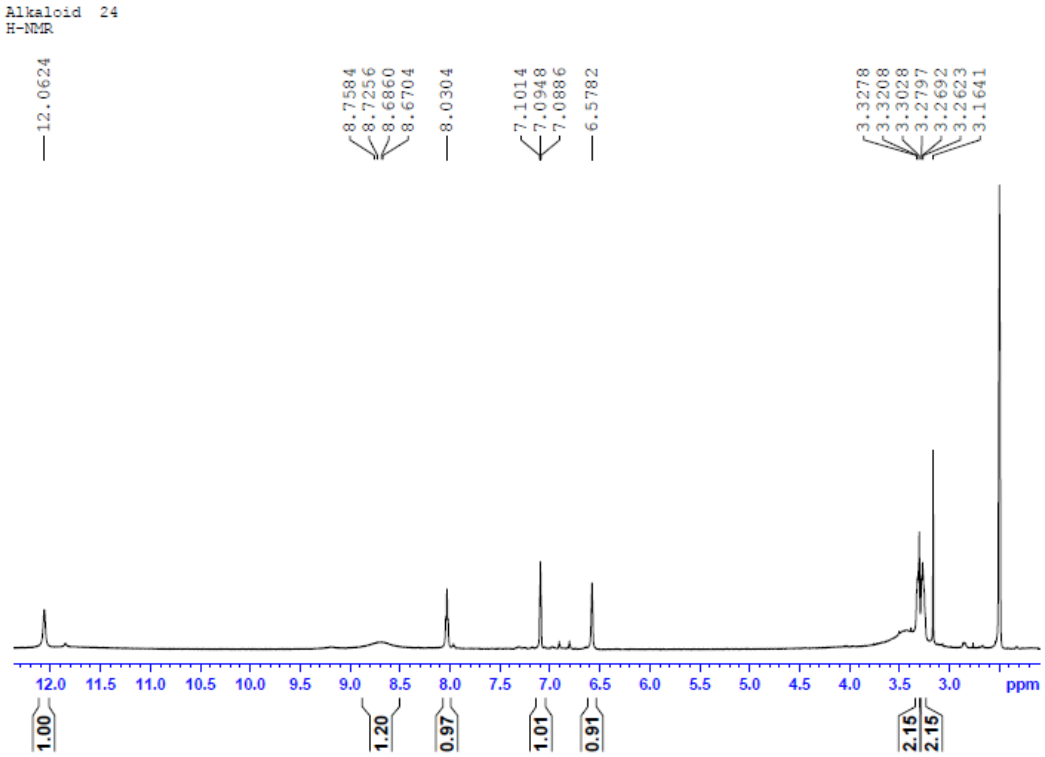
HSQC spectrum of **23** (DMSO-d_6, 400MHz)



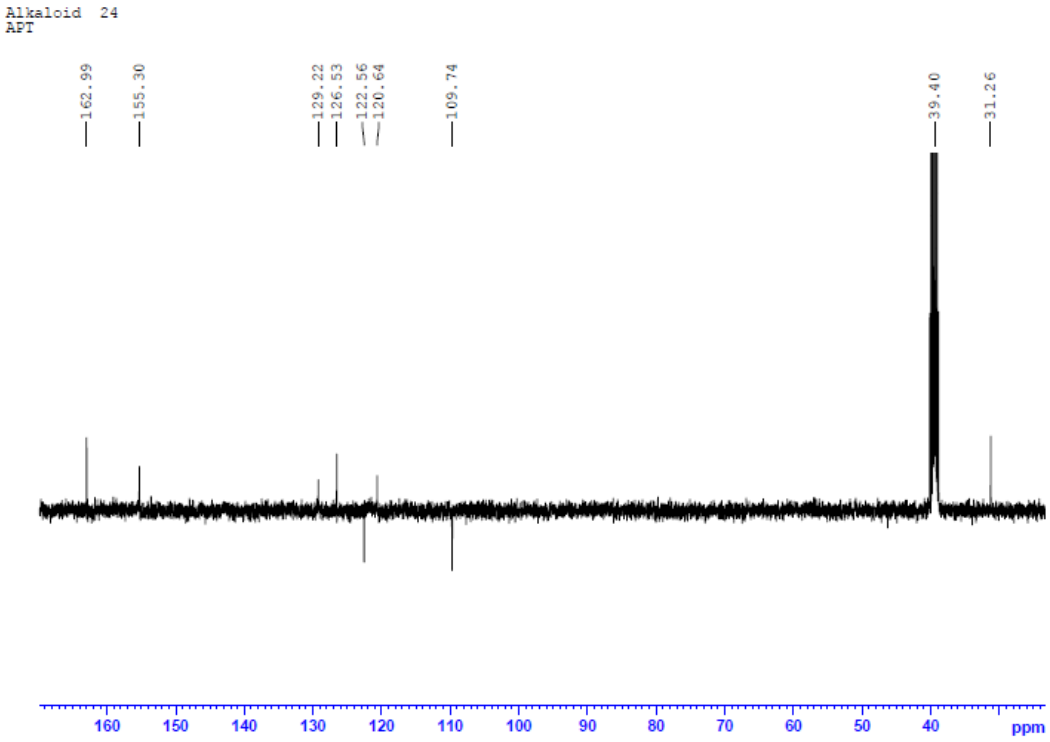
HMBC spectrum of **23** (DMSO-d_6, 400MHz)



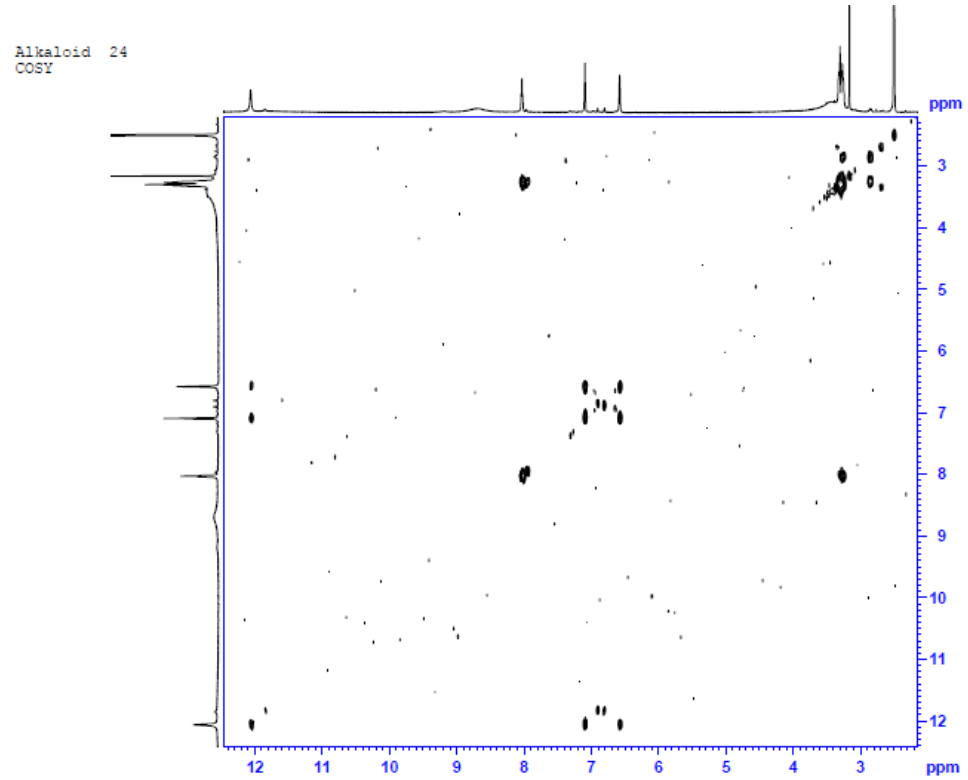
The DAD-HPLC of **24** (0-40min, 5%-100%MeOH-H_2O)



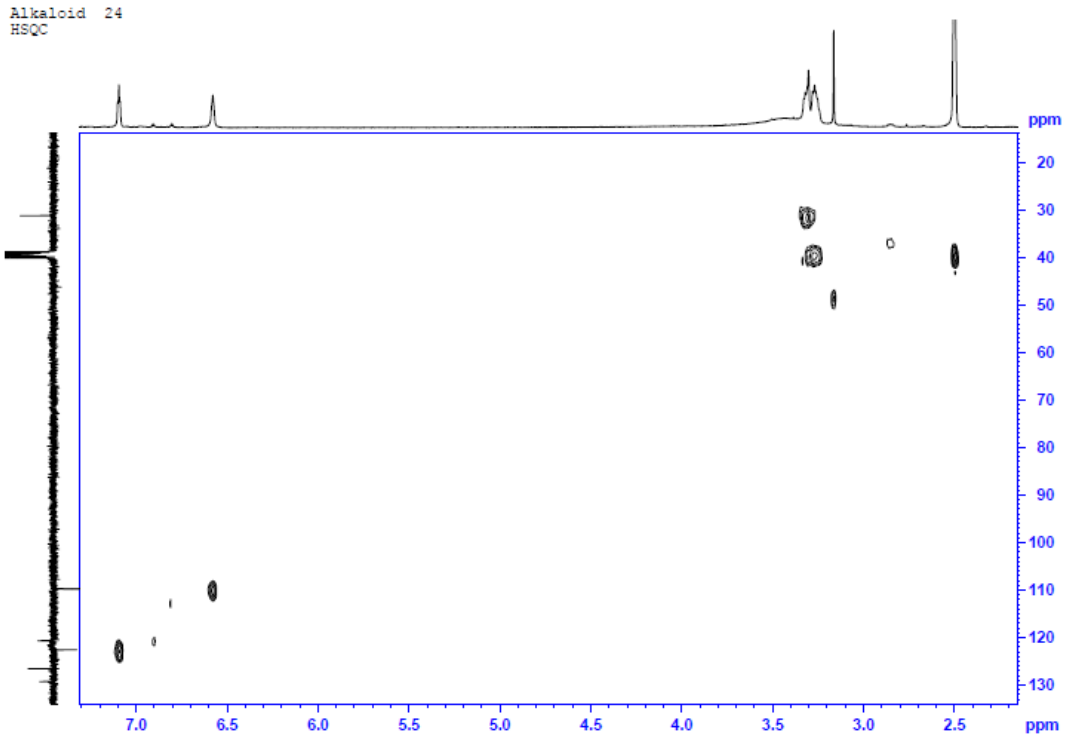
^{1}H-NMR spectrum of **24** (DMSO-d_6, 400MHz)



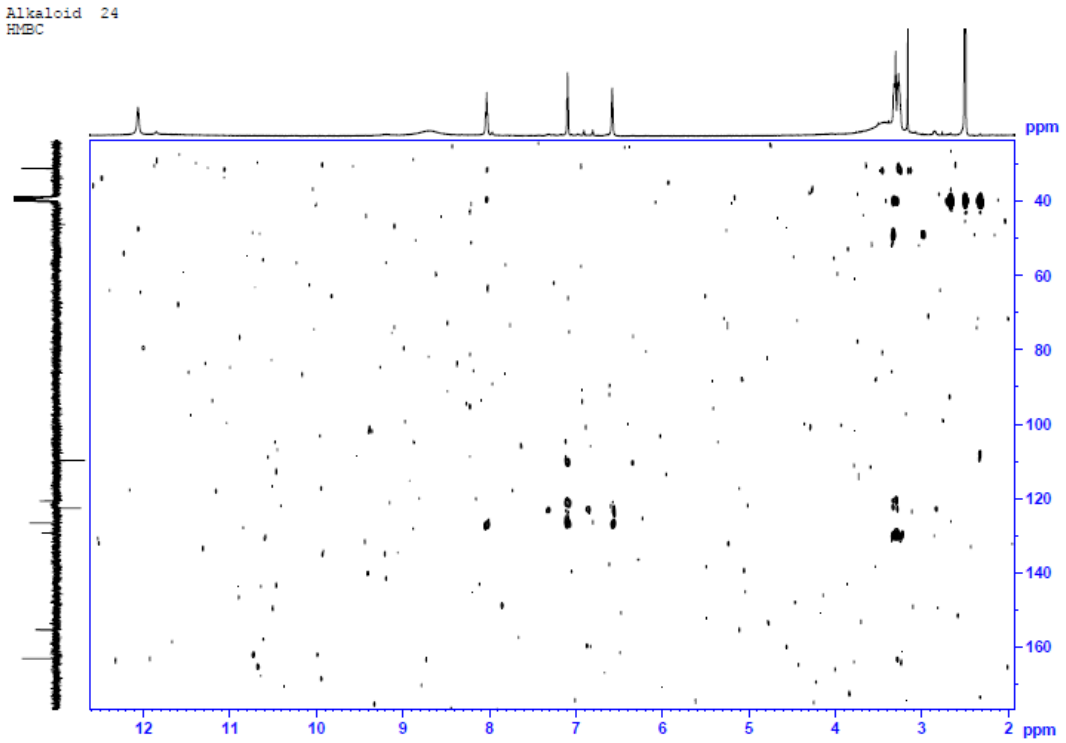
^{13}C-NMR spectrum of **24** (DMSO-d_6, 100MHz)



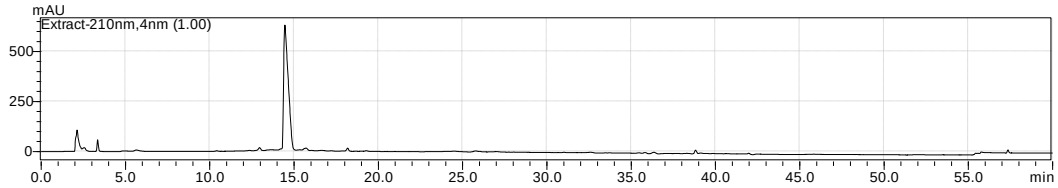
^{1}H-^{1}H COSY spectrum of **24** (DMSO-d_6, 400MHz)



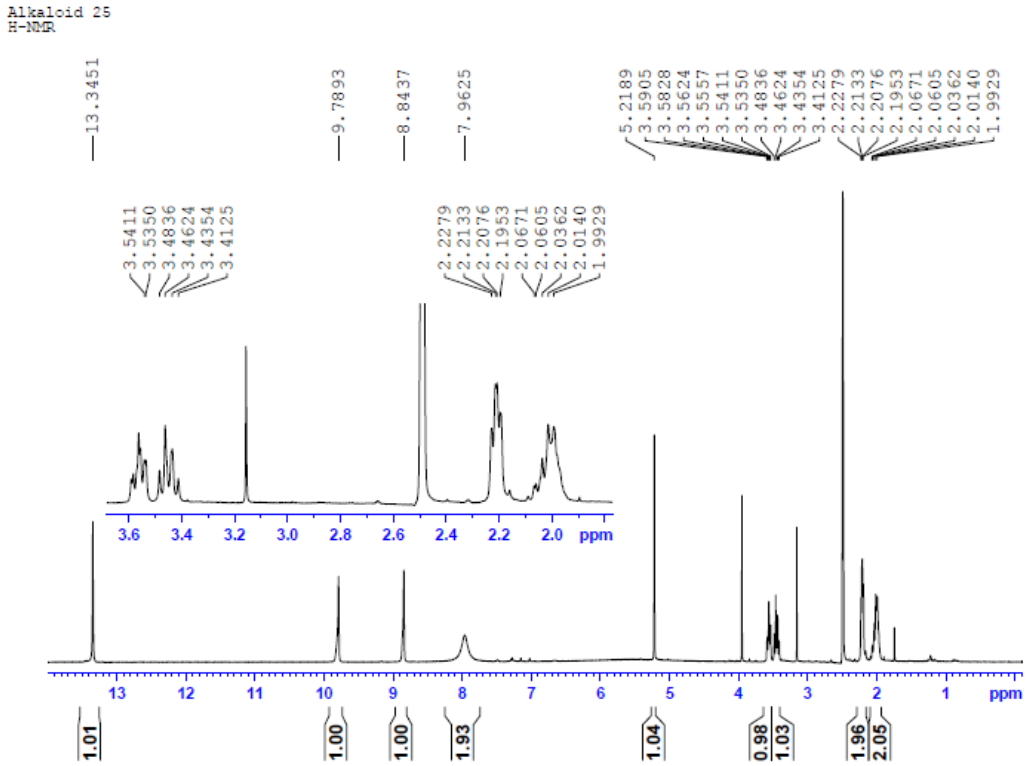
HSQC spectrum of **24** (DMSO-d_6, 400MHz)



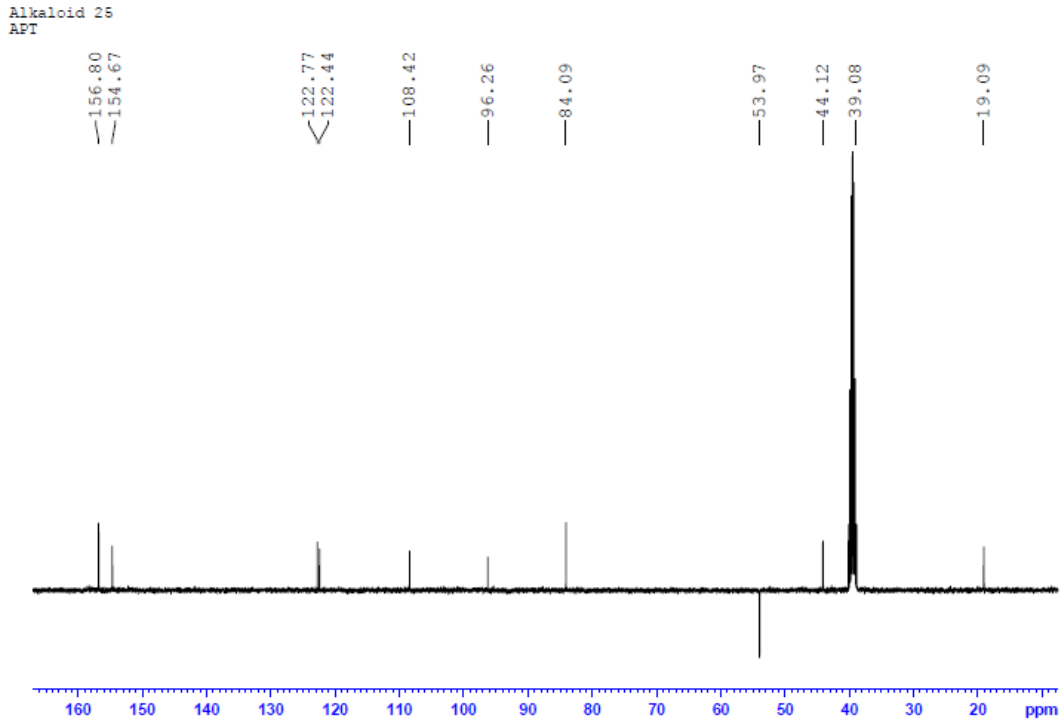
HMBC spectrum of **24** (DMSO-d_6, 400MHz)



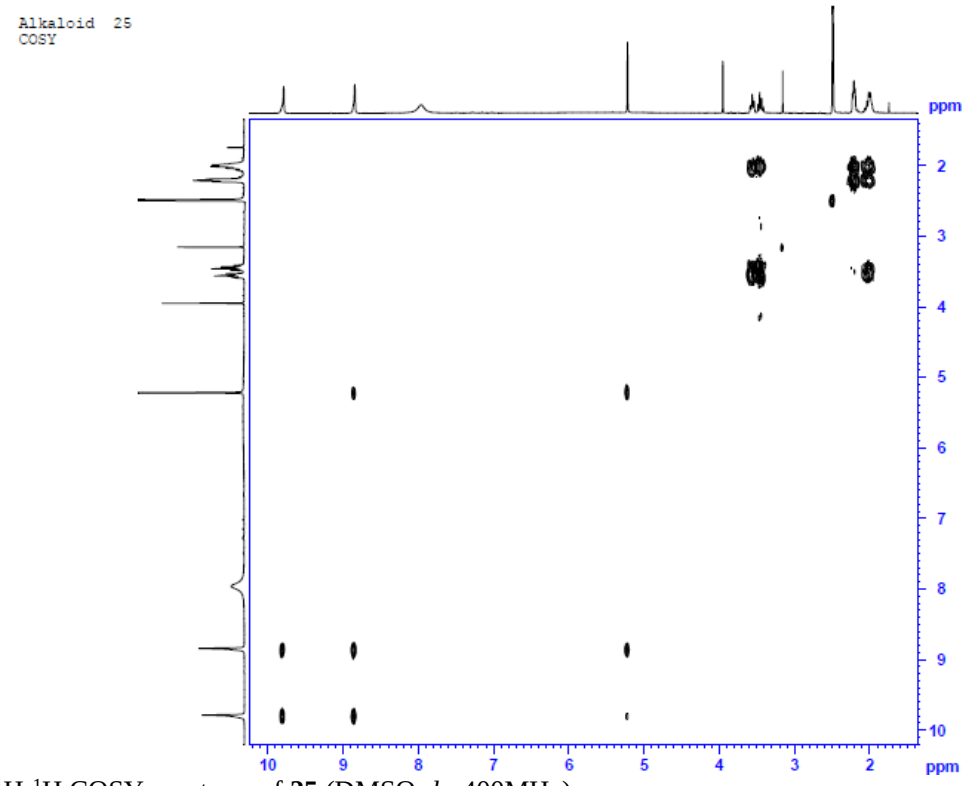
The DAD-HPLC of **25** (0-40min, 5%-100%MeOH-H_2O)



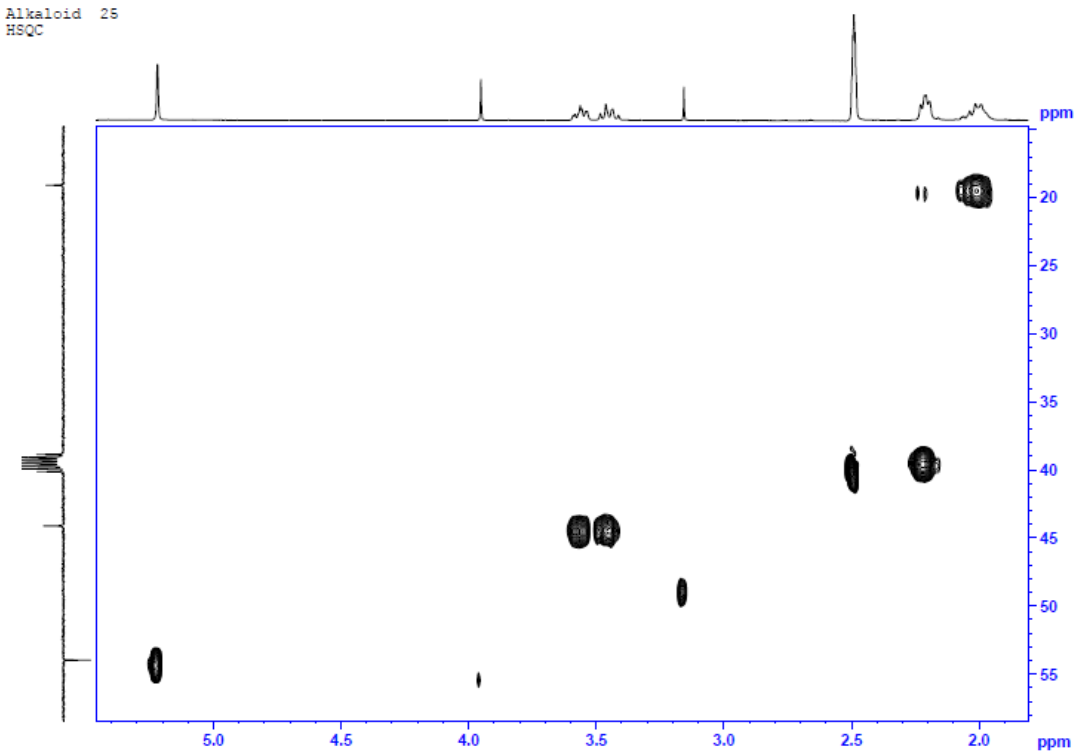
^{1}H-NMR spectrum of **25** (DMSO-d_6, 400MHz)



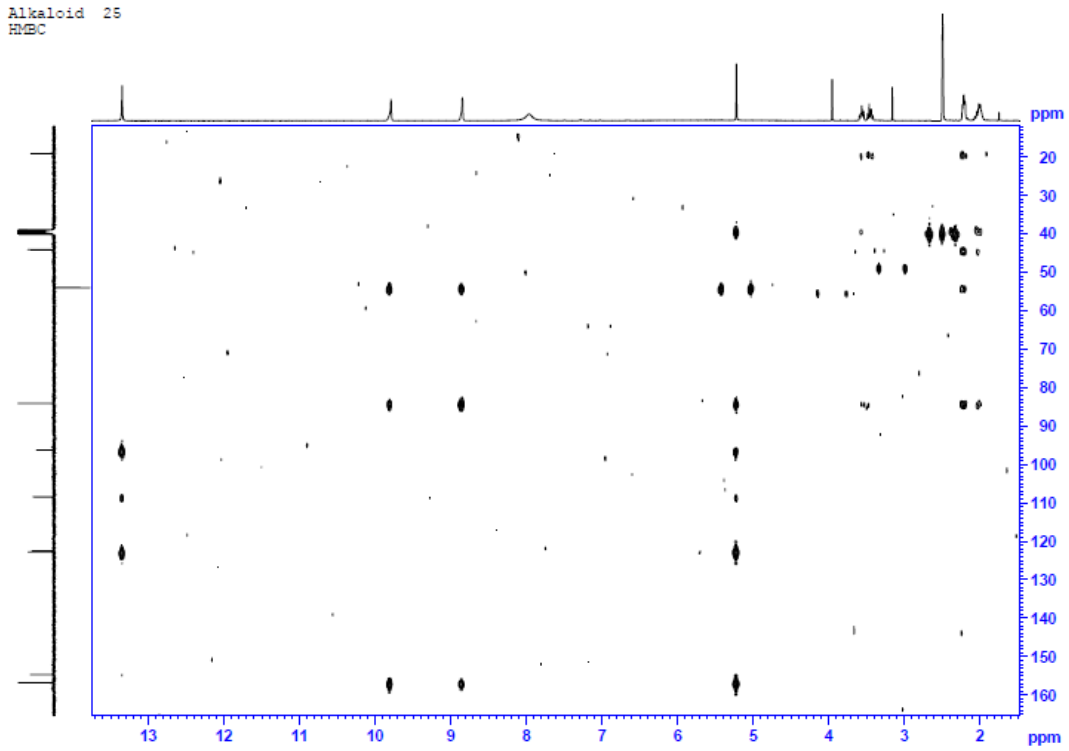
^{13}C-NMR spectrum of **25** (DMSO-d_6, 100MHz)



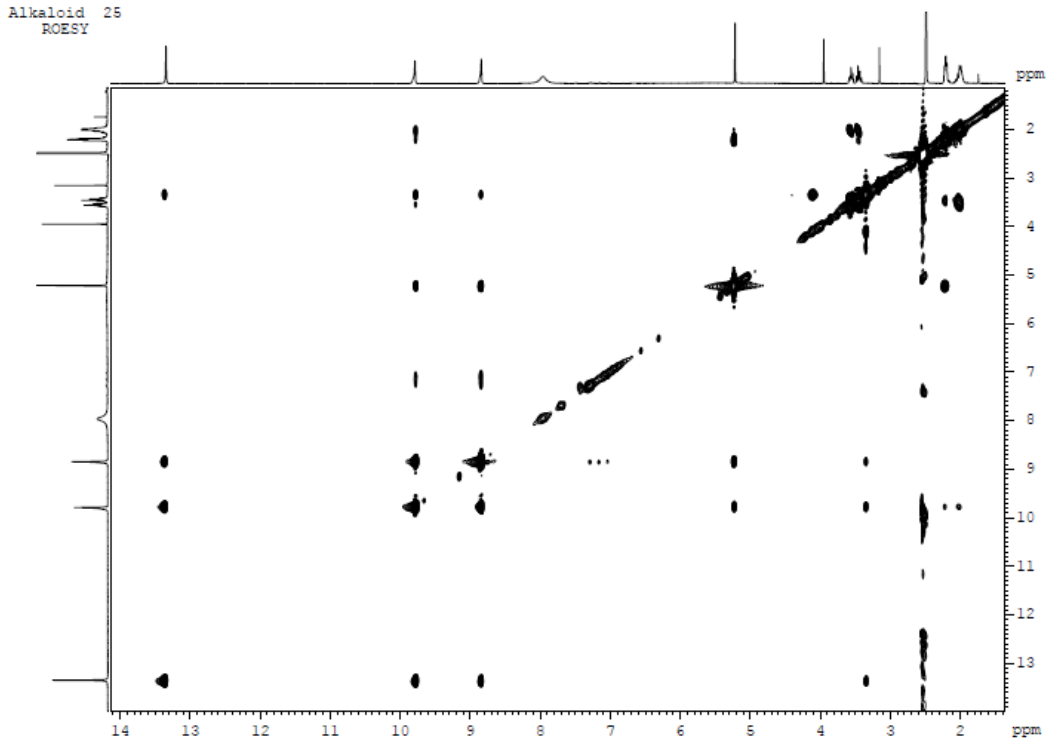
^{1}H-^{1}H COSY spectrum of **25** (DMSO-d_6, 400MHz)



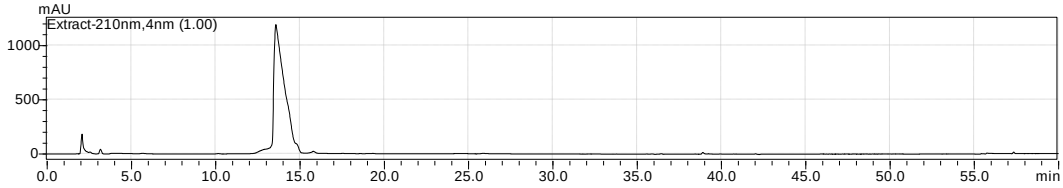
HSQC spectrum of **25** (DMSO-d_6, 400MHz)



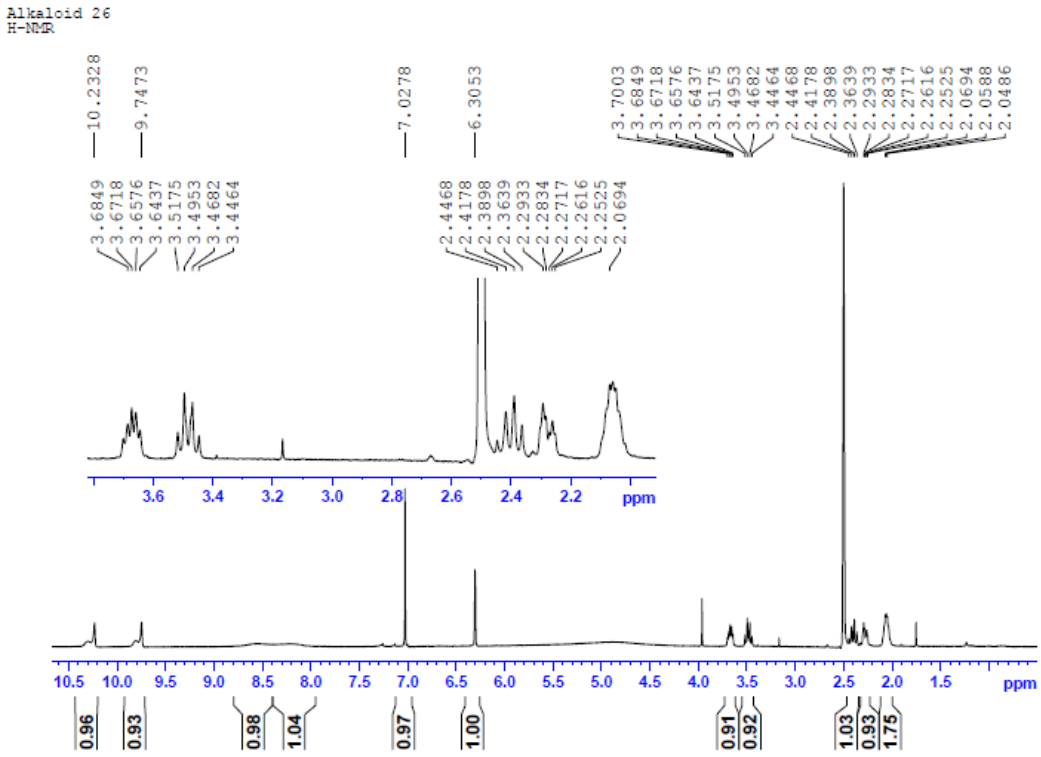
HMBC spectrum of **25** (DMSO-d_6, 400MHz)



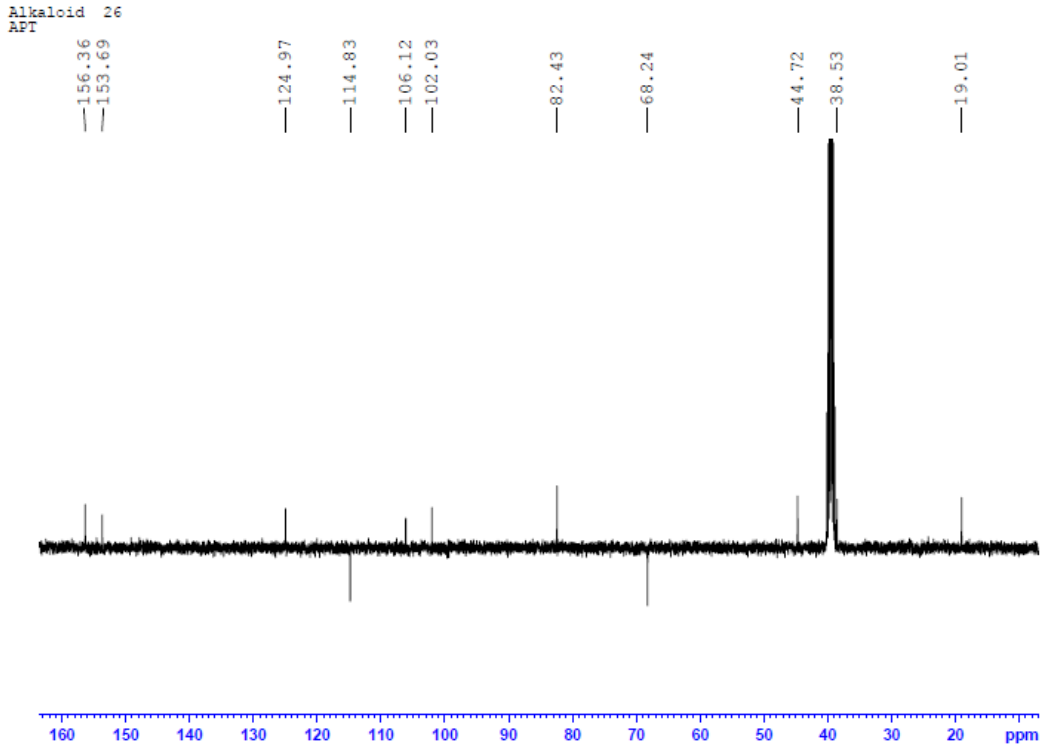
ROESY spectrum of **25** (DMSO-d_6, 400MHz)



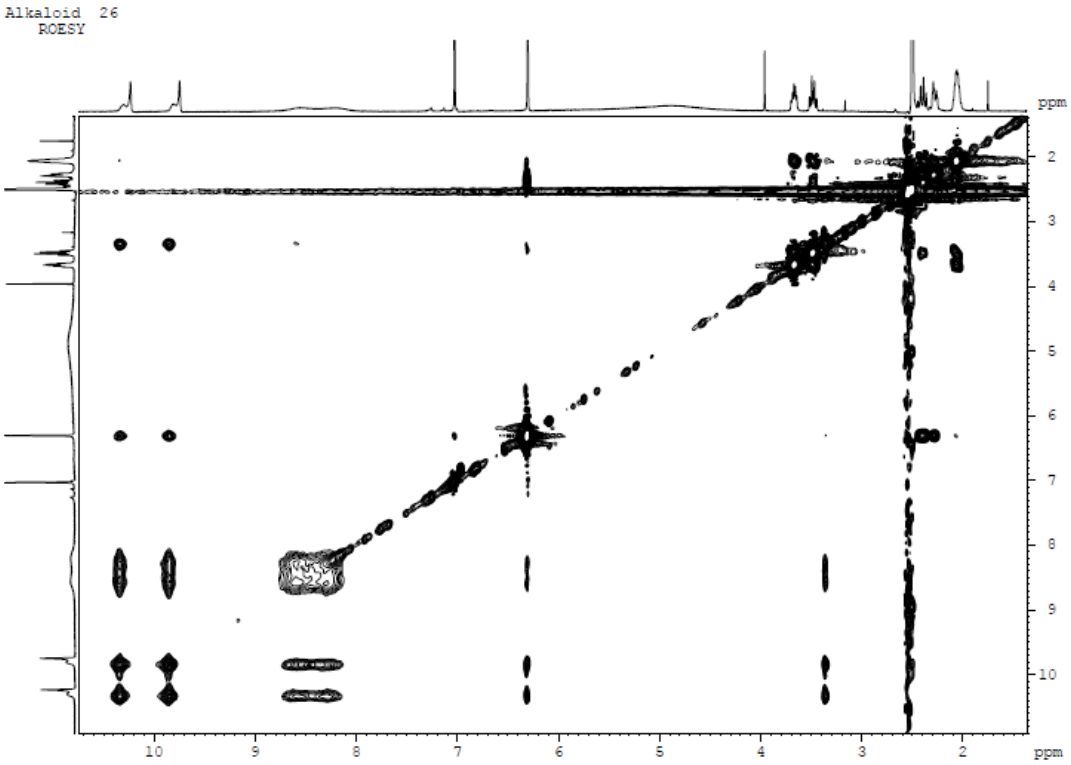
The DAD-HPLC of **26** (0-40min, 5%-100%MeOH-H_2O)



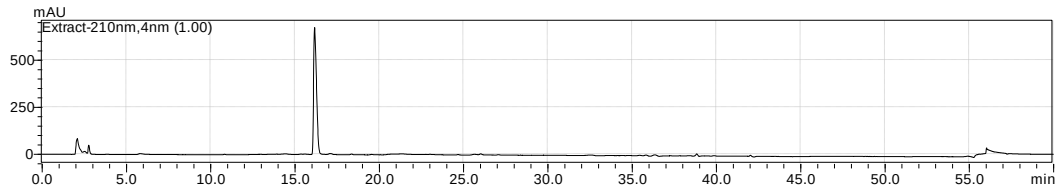
[1]H-NMR spectrum of **26** (DMSO-d_6, 400MHz)



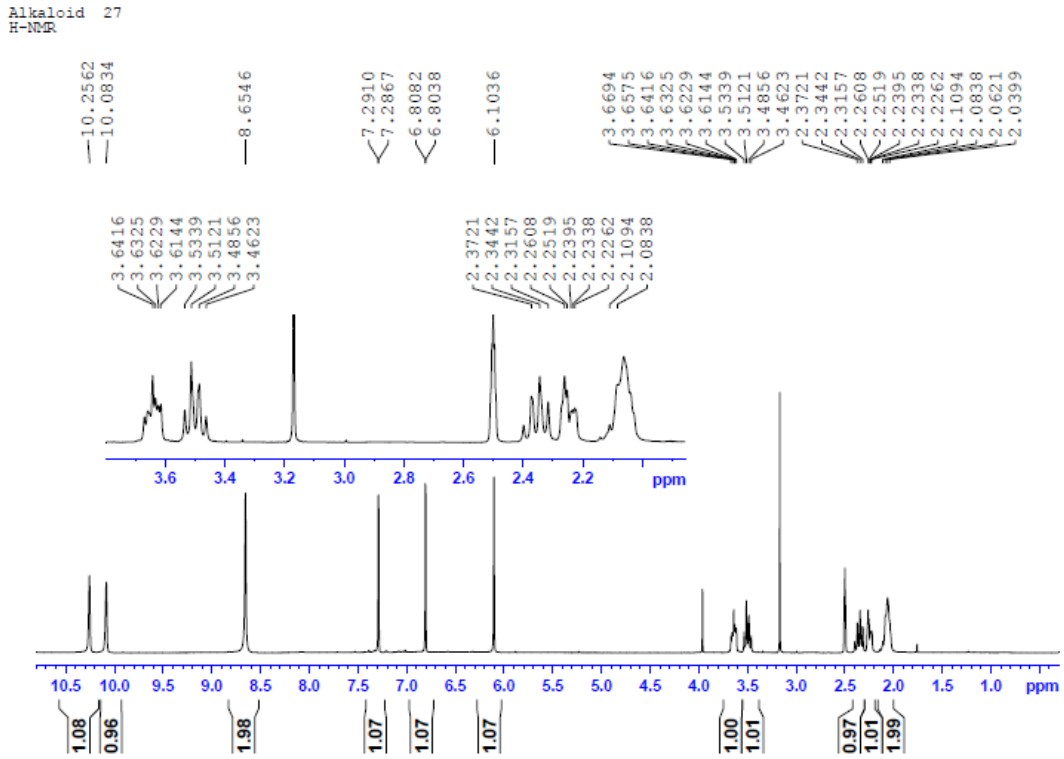
[13]C-NMR spectrum of **26** (DMSO-d_6, 100MHz)



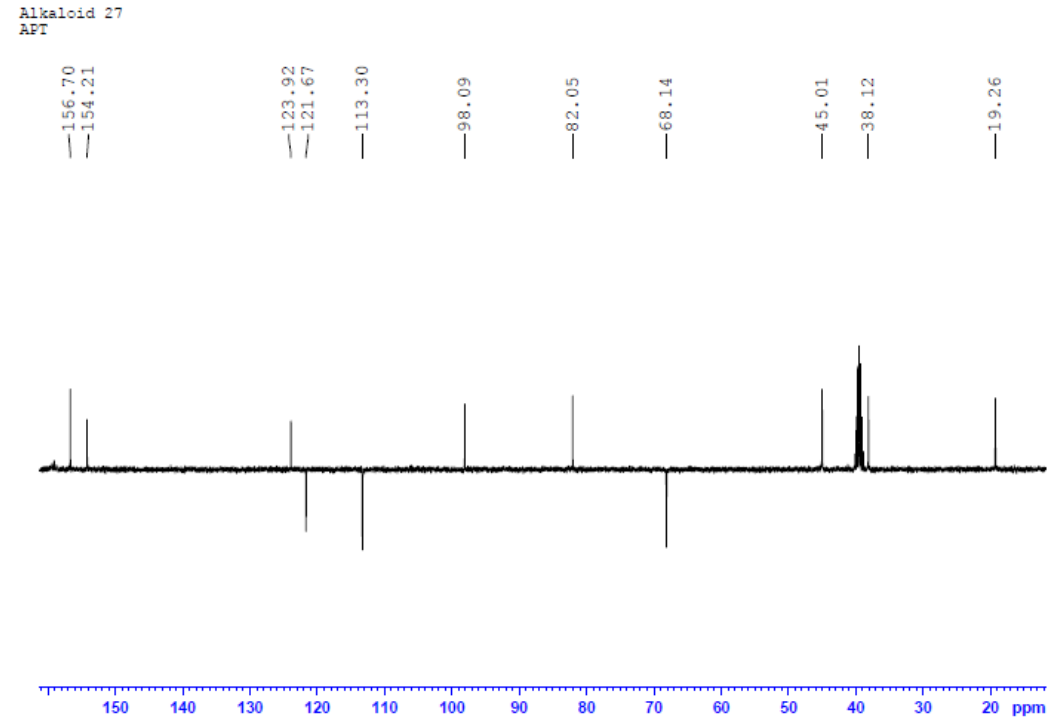
ROESY spectrum of **26** (DMSO-d_6, 400MHz)



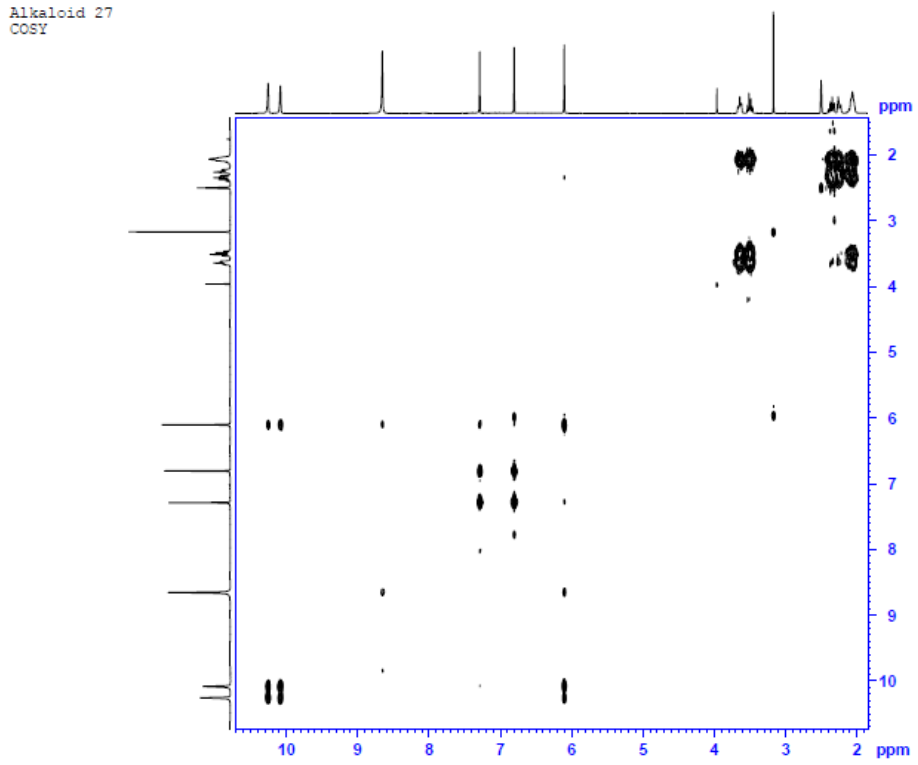
The DAD-HPLC of **27** (0-40min, 5%-100%MeOH-H_2O)



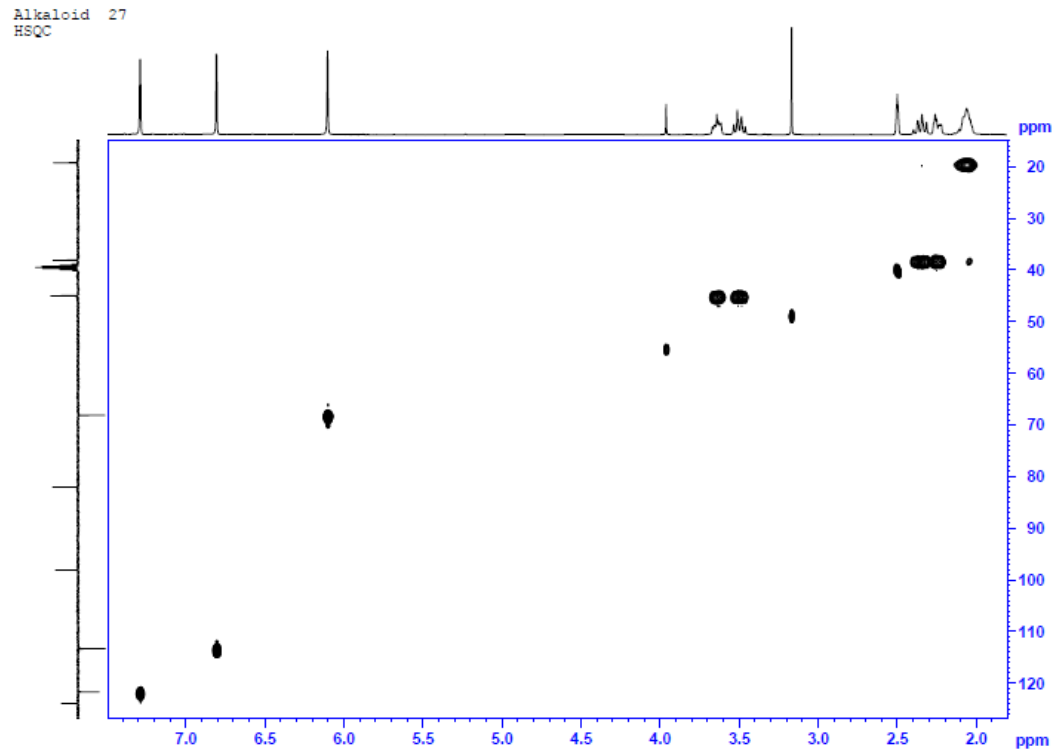
^{1}H-NMR spectrum of **27** (DMSO-d_6, 400MHz)



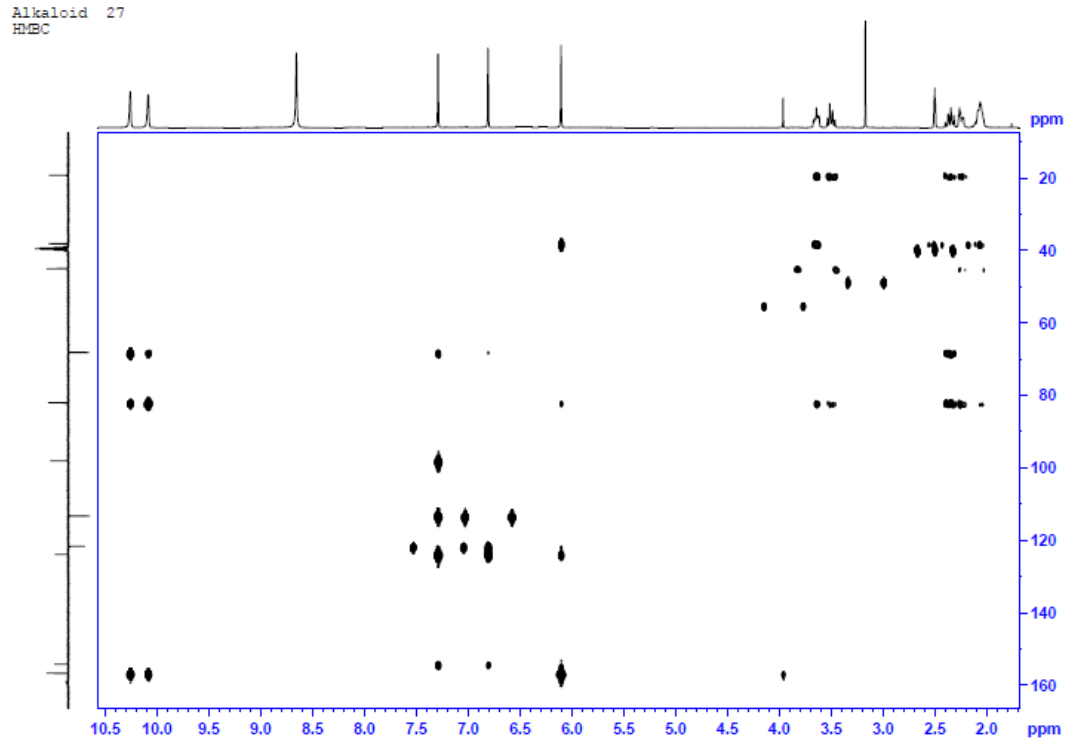
^{13}C-NMR spectrum of **27** (DMSO-d_6, 100MHz)



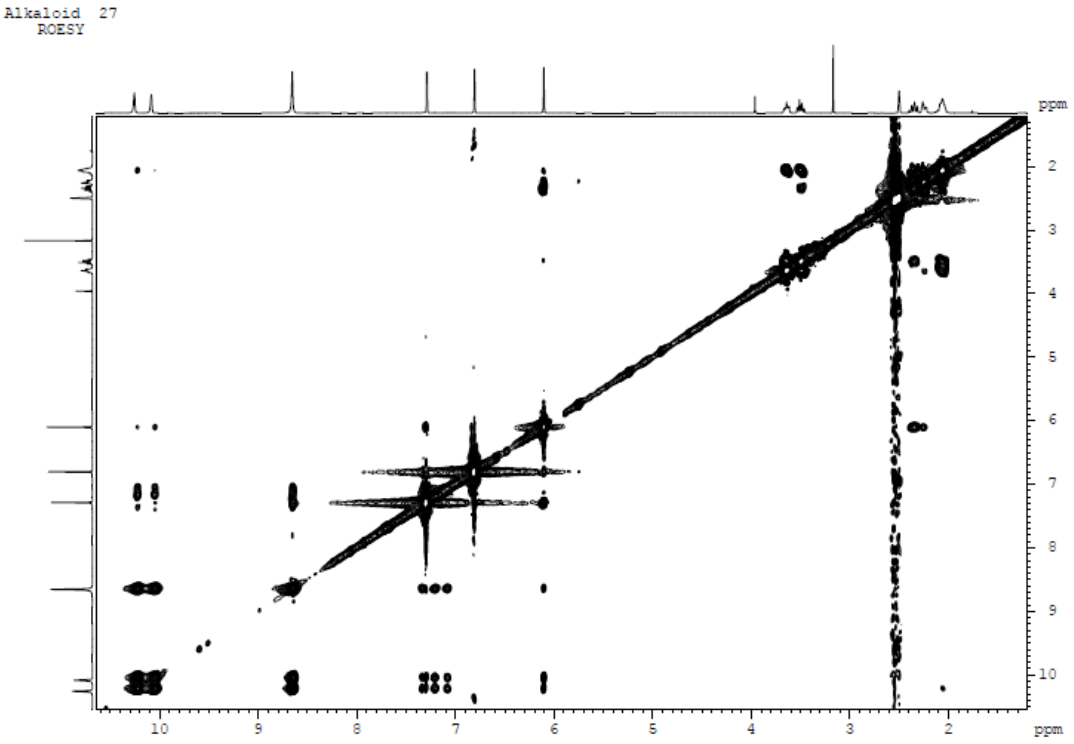
^{1}H-^{1}H COSY spectrum of **27** (DMSO-d_6, 400MHz)



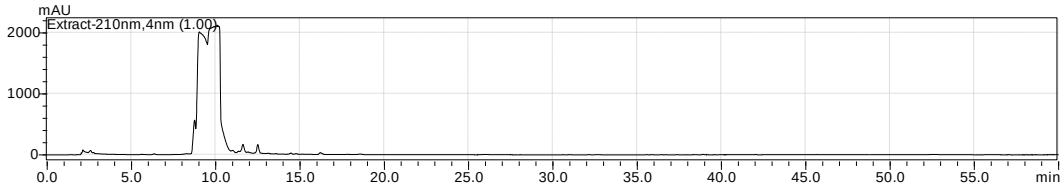
HSQC spectrum of **27** (DMSO-d_6, 400MHz)



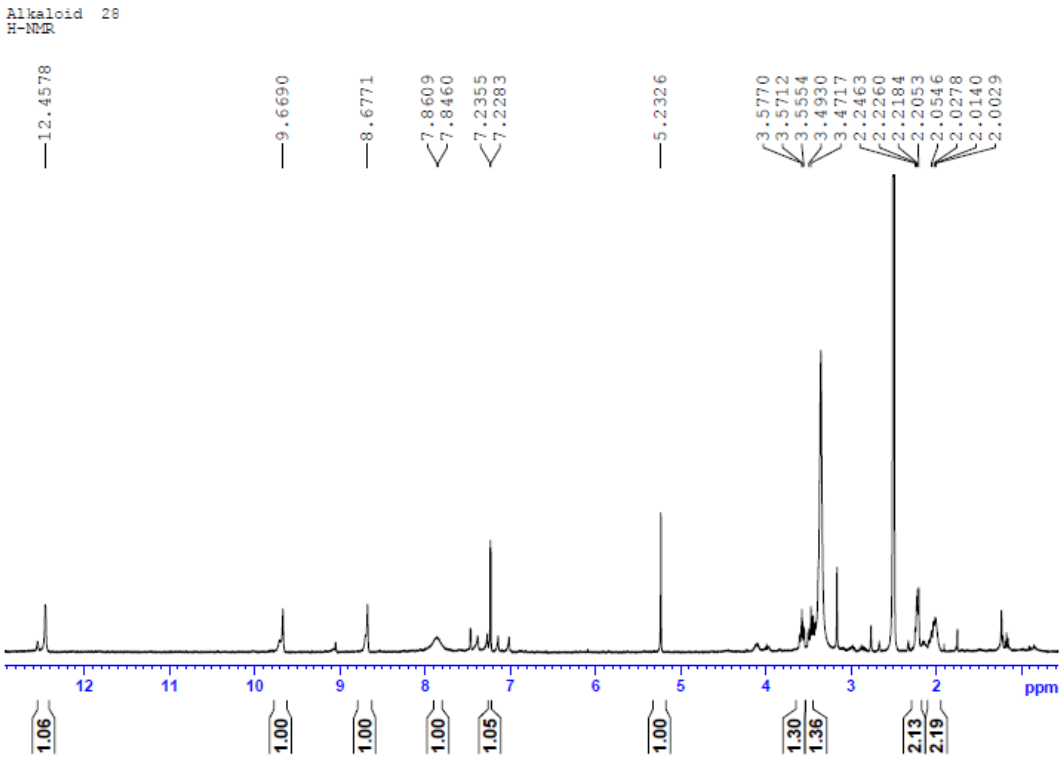
HMBC spectrum of **27** (DMSO-d_6, 400MHz)



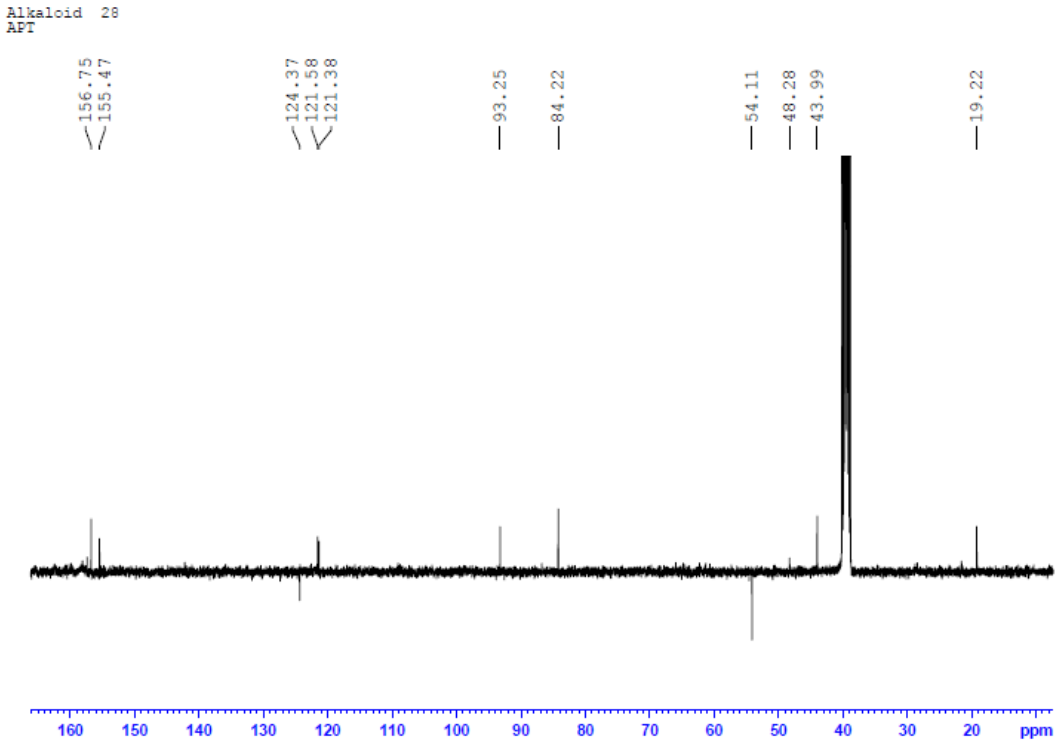
ROESY spectrum of **27** (DMSO-d_6, 400MHz)



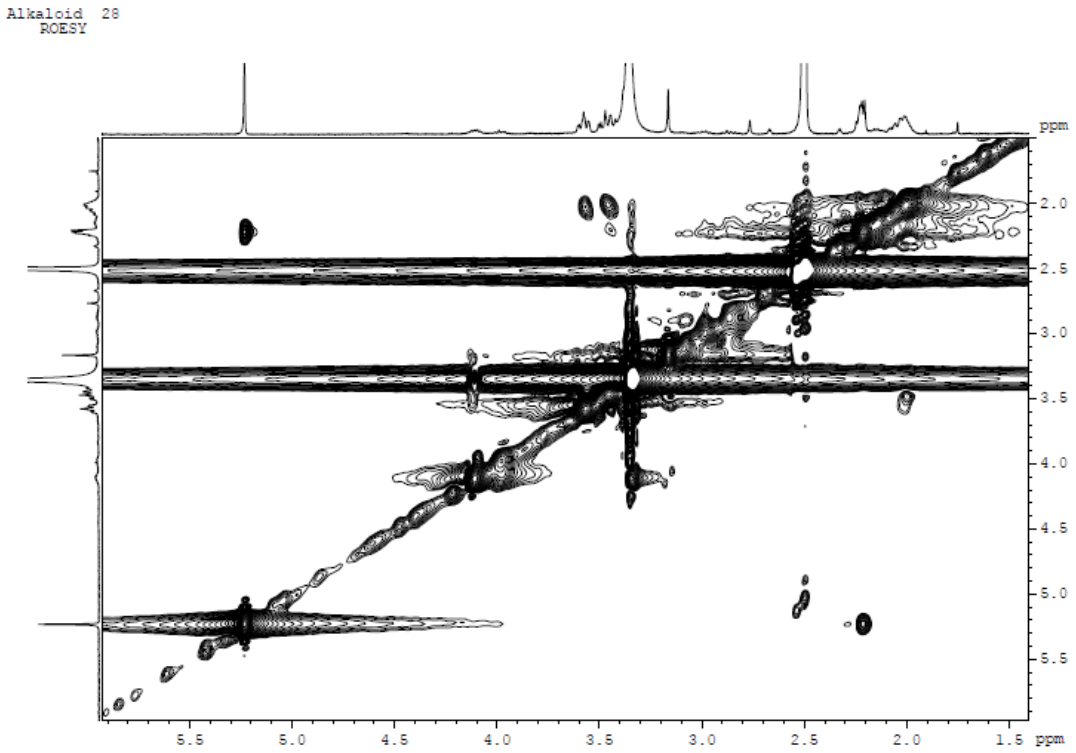
The DAD-HPLC of **28** (0-40min, 5%-100%MeOH-H_2O)



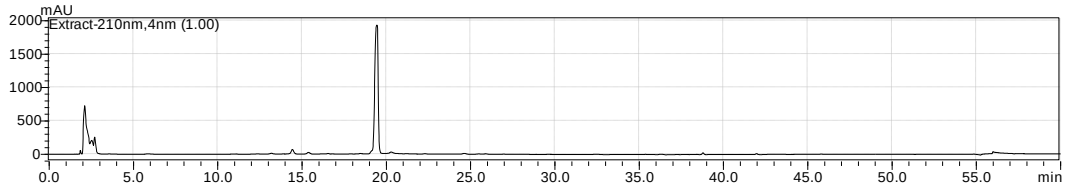
^{1}H-NMR spectrum of **28** (DMSO-d_6, 400MHz)



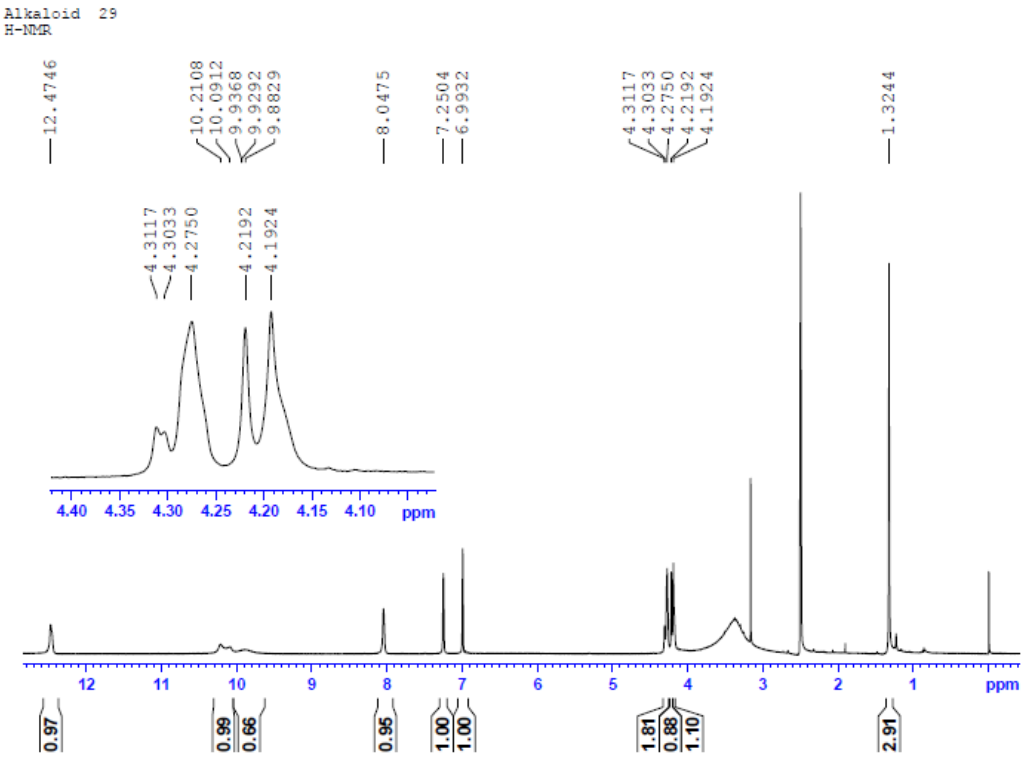
^{13}C-NMR spectrum of **28** (DMSO-d_6, 100MHz)



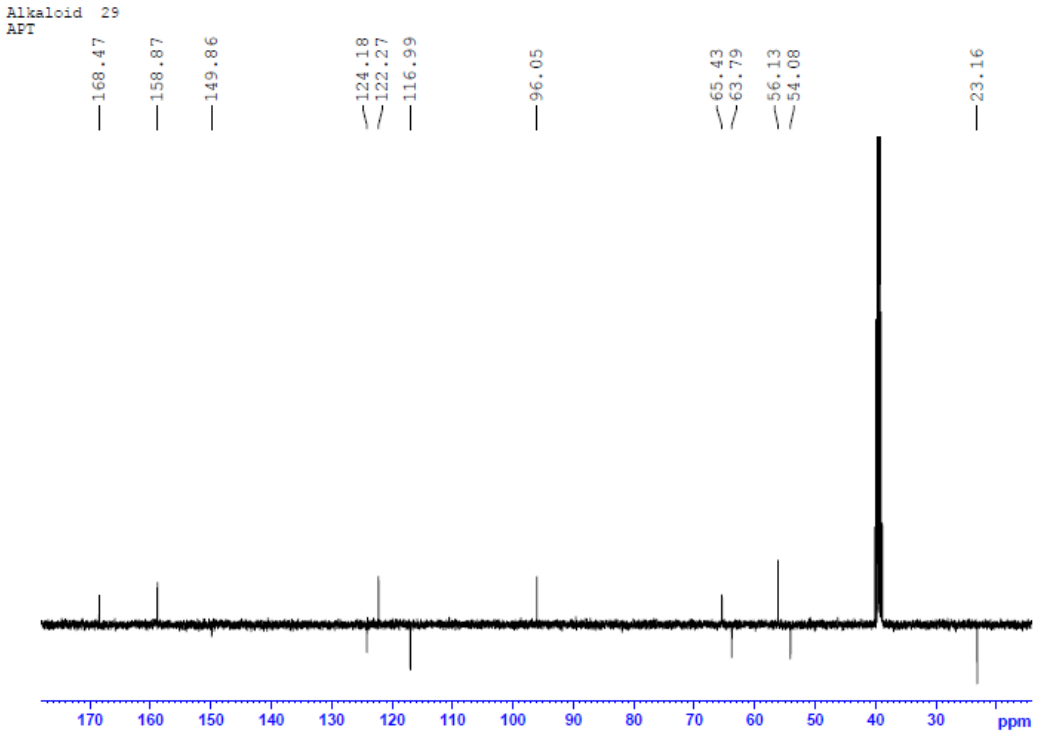
ROESY spectrum of **28** (DMSO-d_6, 400MHz)



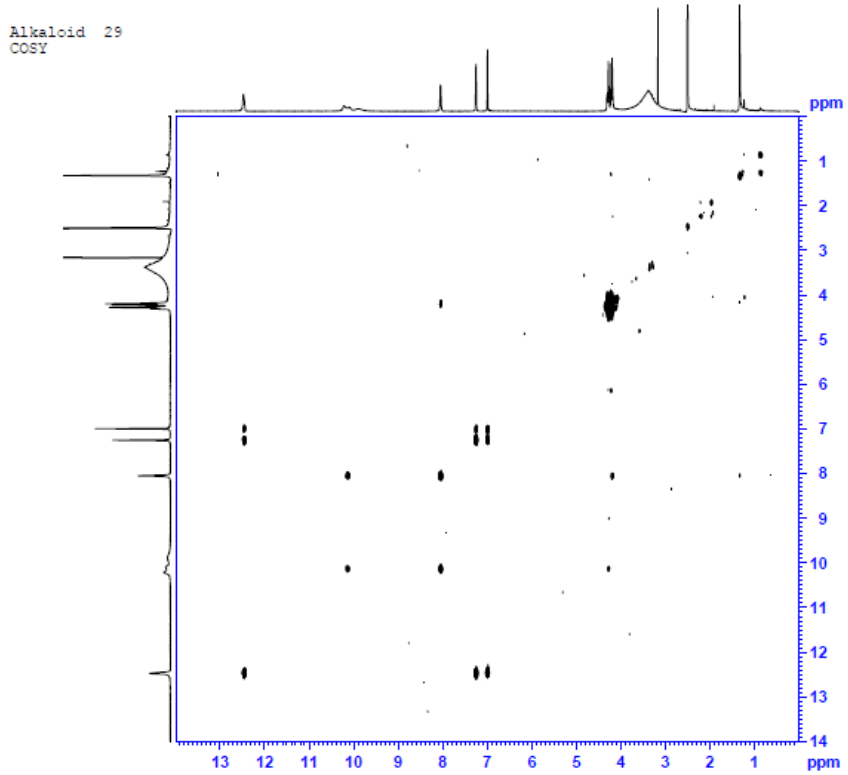
The DAD-HPLC of **29** (0-40min, 5%-100%MeOH-H_2O)



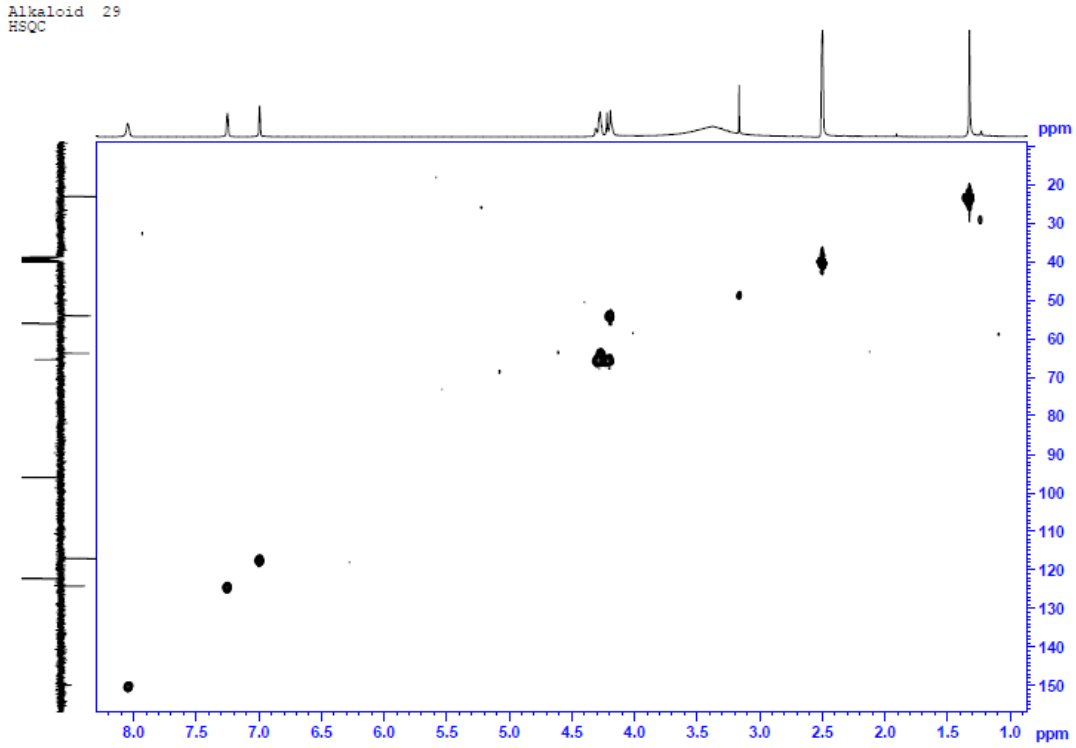
^{1}H-NMR spectrum of **29** (DMSO-d_6, 400MHz)



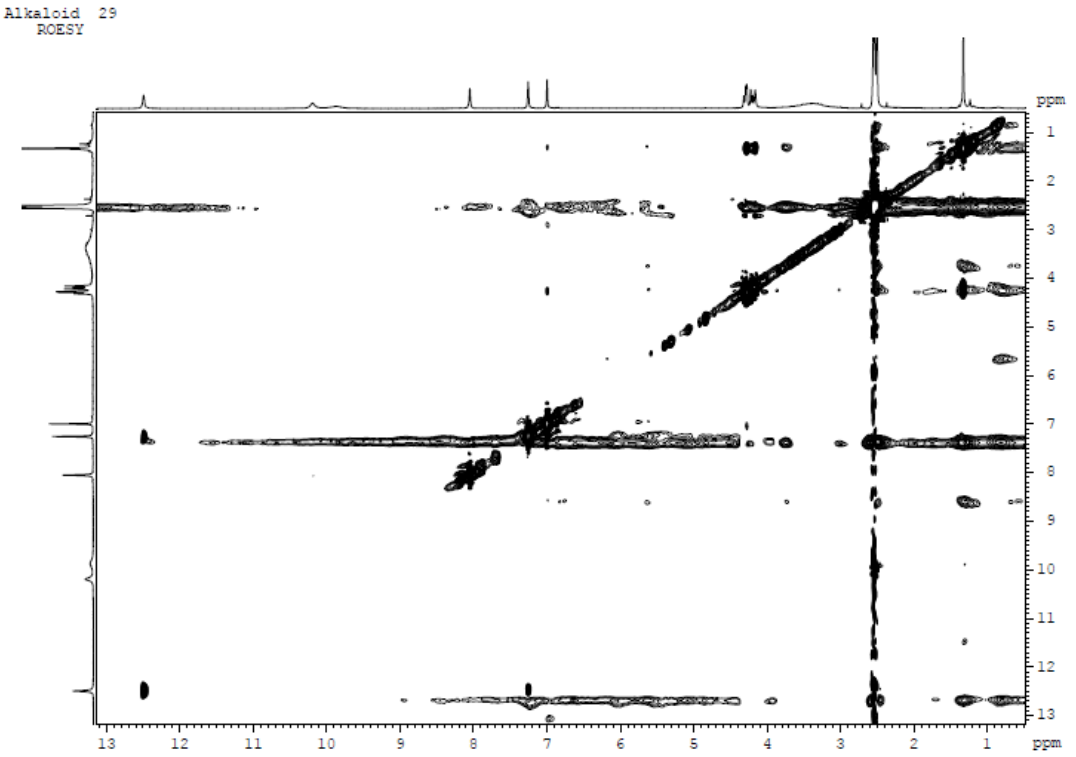
^{13}C-NMR spectrum of **29** (DMSO-d_6, 100MHz)



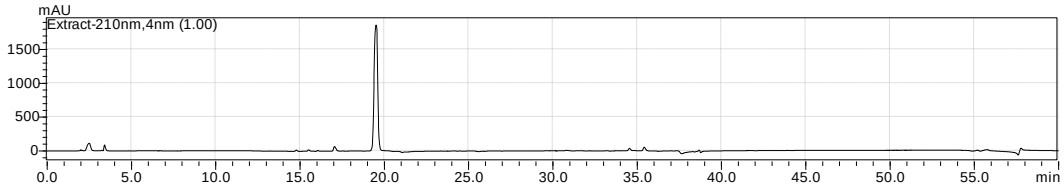
^{1}H-^{1}H COSY spectrum of **29** (DMSO-d_6, 400MHz)



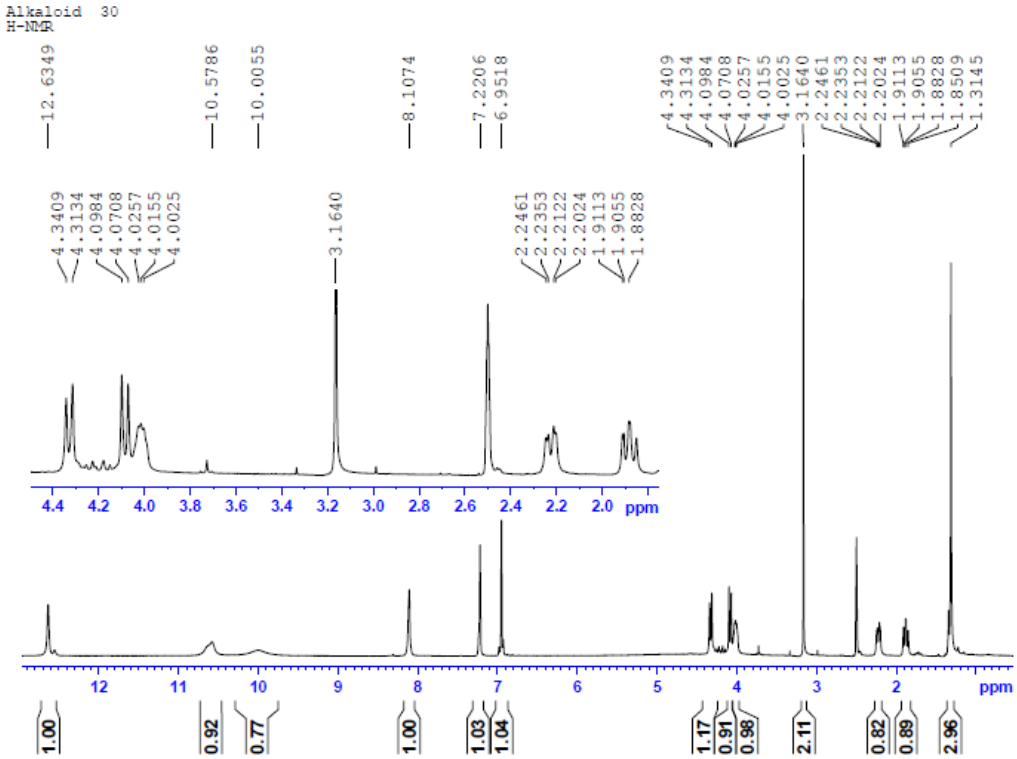
HSQC spectrum of **29** (DMSO-d_6, 400MHz)



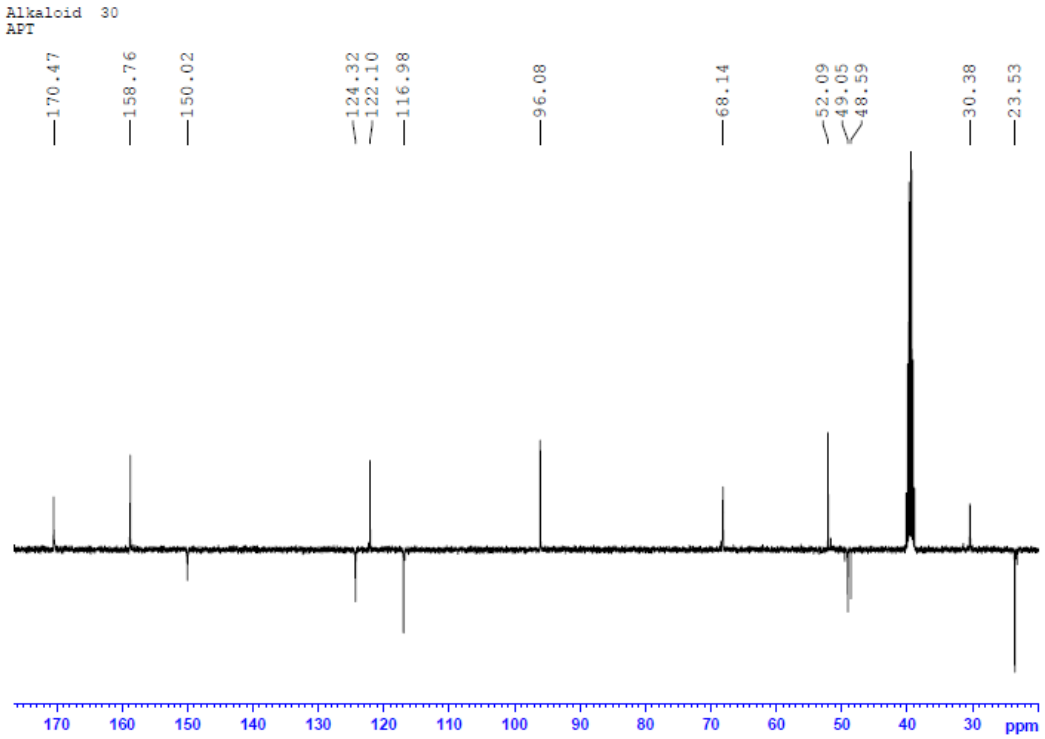
ROESY spectrum of **29** (DMSO-d_6, 400MHz)



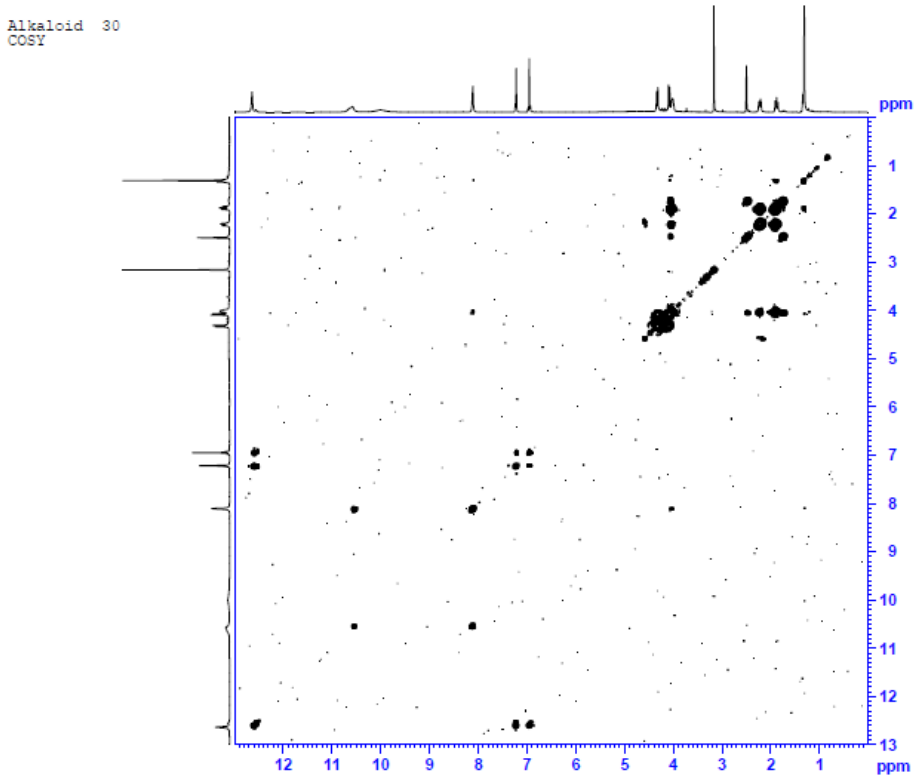
The DAD-HPLC of **30** (0-40min, 5%-100%MeOH-H_2O)



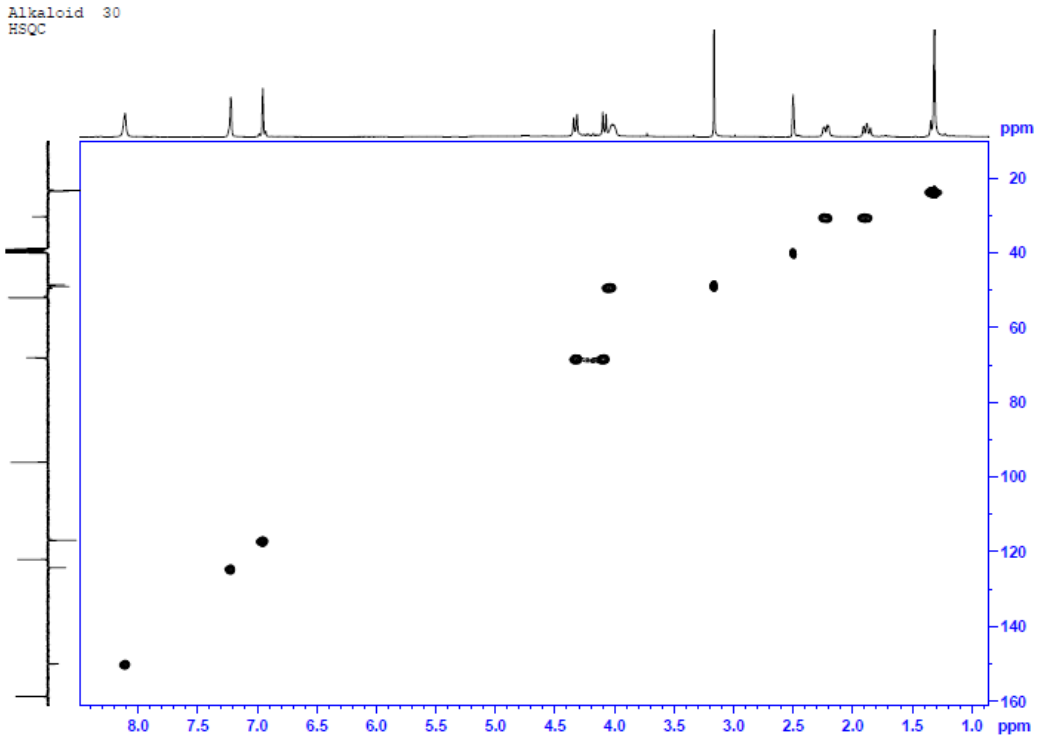
^{1}H-NMR spectrum of **30** (DMSO-d_6, 400MHz)



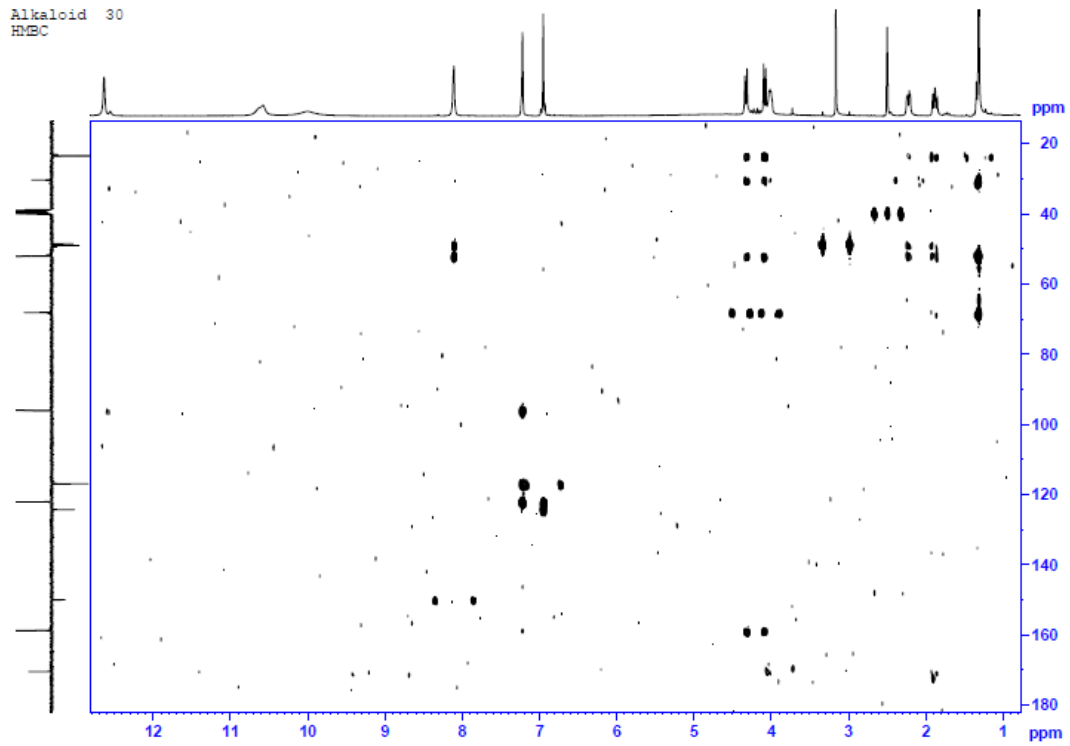
^{13}C-NMR spectrum of **30** (DMSO-d_6, 100MHz)



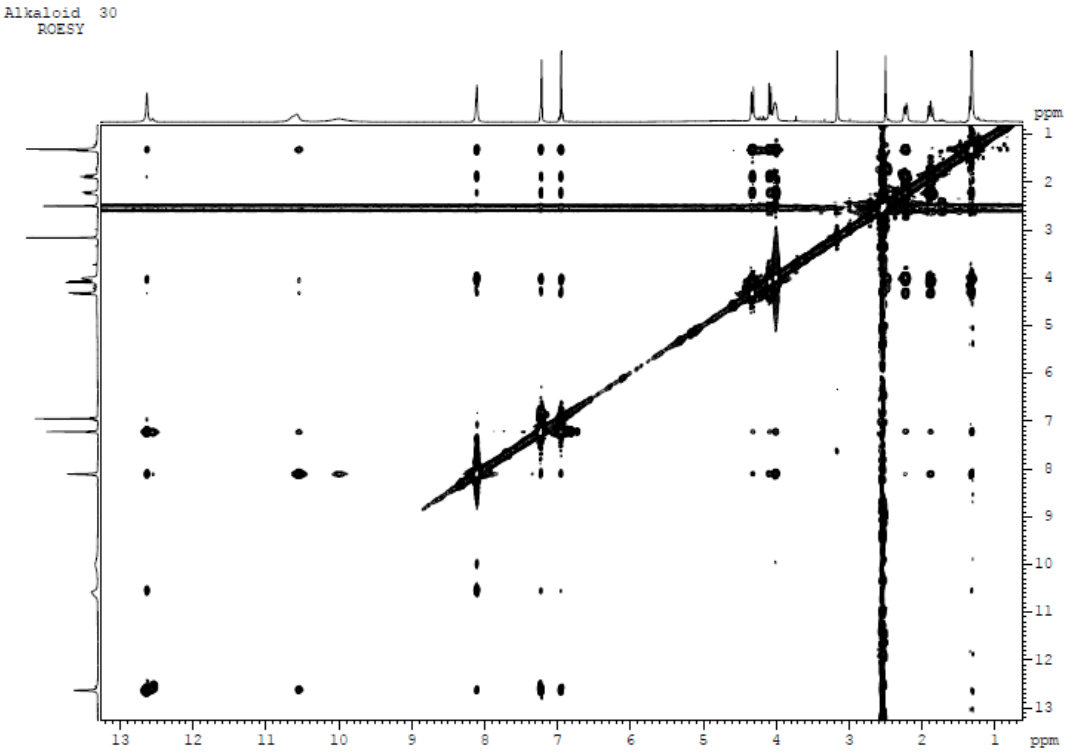
^{1}H-^{1}H COSY spectrum of **30** (DMSO-d_6, 400MHz)



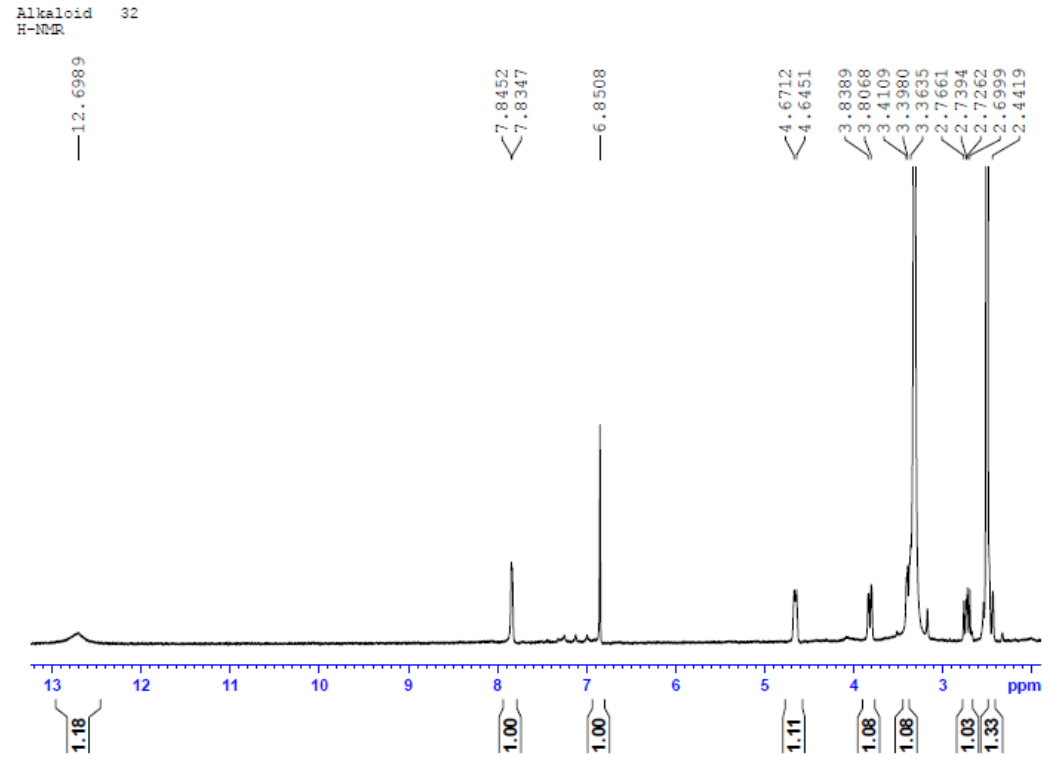
HSQC spectrum of **30** (DMSO-d_6, 400MHz)



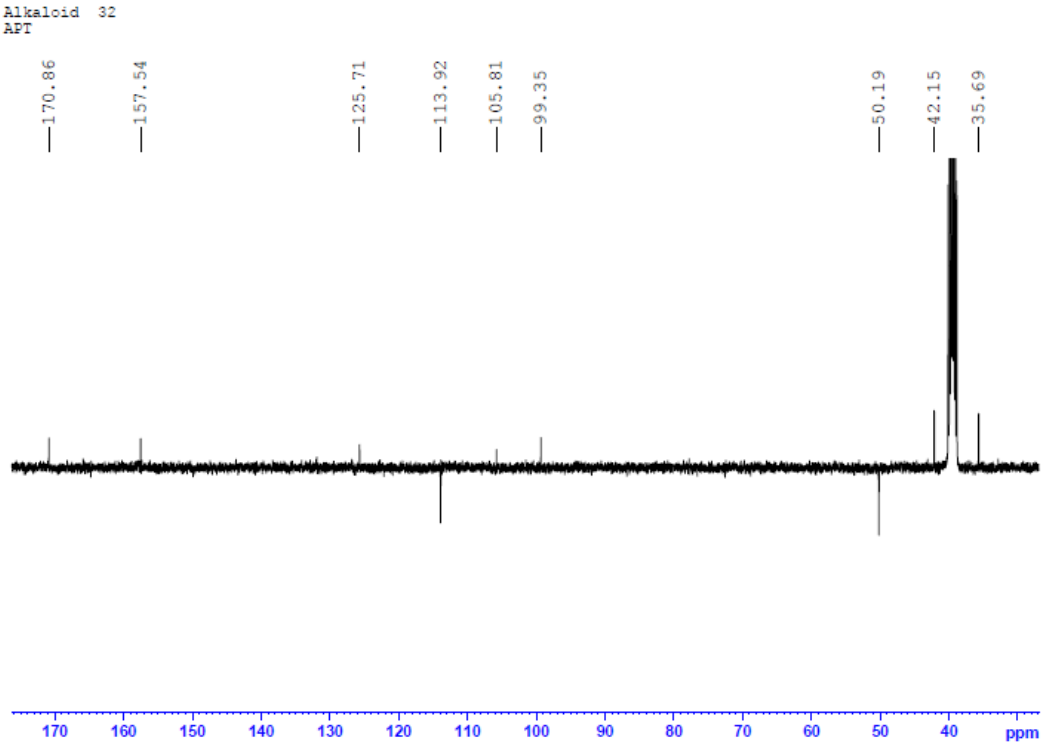
HMBC spectrum of **30** (DMSO-d_6, 400MHz)



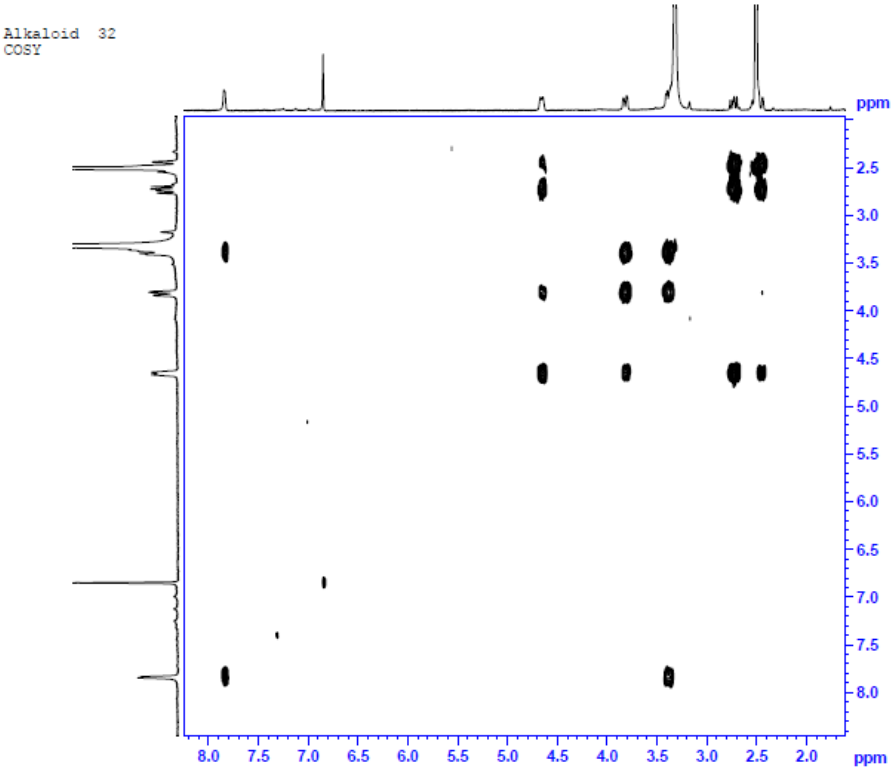
ROESY spectrum of **30** (DMSO-d_6, 400MHz)



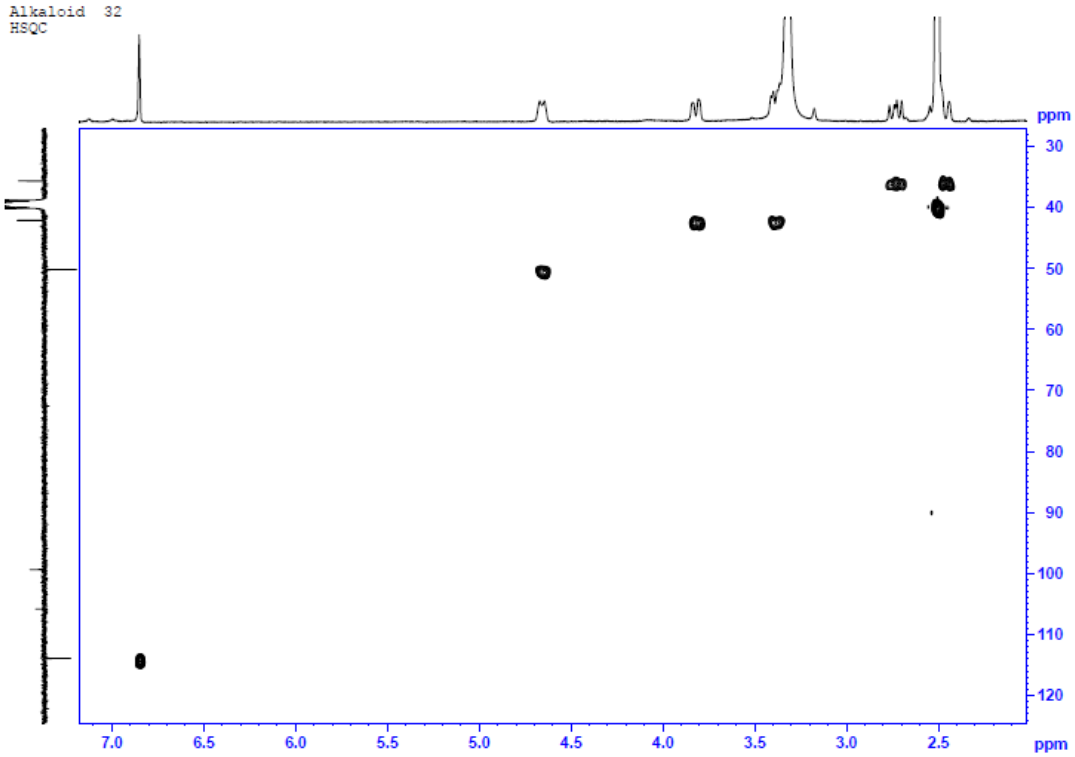
^{1}H-NMR spectrum of **32** (DMSO-d_6, 400MHz)



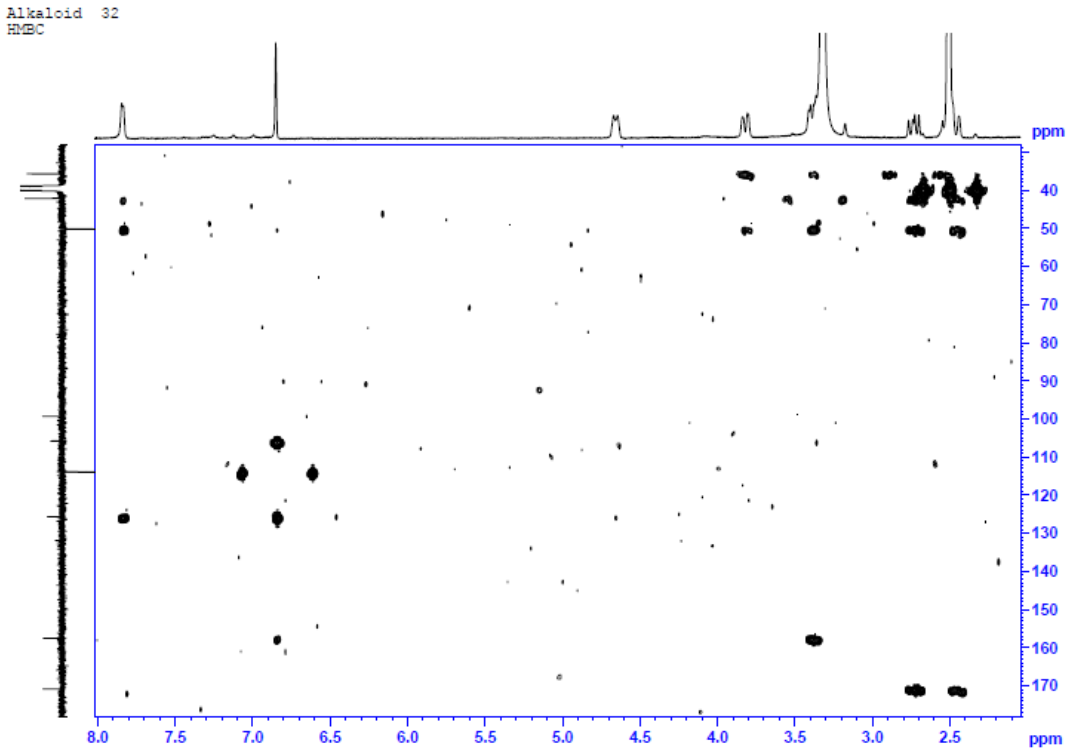
^{13}C-NMR spectrum of **32** (DMSO-d_6, 100MHz)



^{1}H-^{1}H COSY spectrum of **32** (DMSO-d_6, 400MHz)



HSQC spectrum of **32** (DMSO-d_6, 400MHz)



HMBC spectrum of **32** (DMSO-d_6, 400MHz)

Table S1. Antimicrobial effects of alkaloids

No.	MIC (μg/mL)						
	S. aureus ATCC 25923	*S. haemolyticus* ATCC 29970	*B. subtilis* ATCC 11562	*X. vesicatoria* ATCC 11633	*P. lachrymans* ATCC 11633	*A. tumefaciens* ATCC 11158	*R. solanacearum* ATCC 11696
1	>128	>128	>128	>128	>128	>128	>128
2/3	>128	>128	>128	>128	>128	>128	>128
4/5	>128	>128	>128	>128	>128	>128	>128
6	>128	>128	>128	>128	>128	>128	>128
7	>128	>128	>128	>128	>128	>128	>128
8	>128	>128	>128	>128	>128	>128	>128
9	>128	>128	>128	>128	128	>128	128
10	32	128	64	128	64	128	64
11	>128	>128	>128	128	>128	128	>128
12	32	>128	>128	>128	128	>128	>128
13	>128	>128	>128	>128	>128	>128	>128
14	>128	>128	>128	>128	>128	>128	>128
15	>128	>128	>128	>128	>128	>128	>128
16	>128	>128	>128	>128	128	128	128
17	>128	>128	>128	>128	>128	>128	>128
18	>128	>128	>128	>128	>128	>128	>128
19	>128	>128	>128	>128	>128	>128	>128
20	>128	>128	>128	>128	>128	>128	>128
21	>128	>128	>128	>128	>128	>128	>128
22	>128	>128	>128	>128	>128	>128	>128
23	>128	>128	>128	>128	>128	>128	>128
24	>128	>128	>128	>128	>128	>128	>128
25	>128	>128	>128	>128	>128	>128	>128
26	>128	>128	>128	>128	>128	>128	>128
27	>128	>128	>128	>128	>128	>128	>128
28	>128	>128	>128	>128	>128	>128	>128
29	>128	>128	>128	>128	>128	>128	>128
30	>128	>128	>128	>128	>128	>128	>128
31	>128	>128	>128	>128	>128	>128	>128
32	>128	>128	>128	>128	>128	>128	>128

Gram positive strains: *S. aureus*; *S. haemolyticus*; *B. subtilis*; Gram negative strains: *X. vesicatoria*, *P. lachrymans*, *A. tumefaciens*, *R. solanacearum.*