

Supporting Information

First Natural Analogs of the Cytotoxic Thiodepsipeptide Thiocoraline A from a Marine *Verrucosisspora* sp.

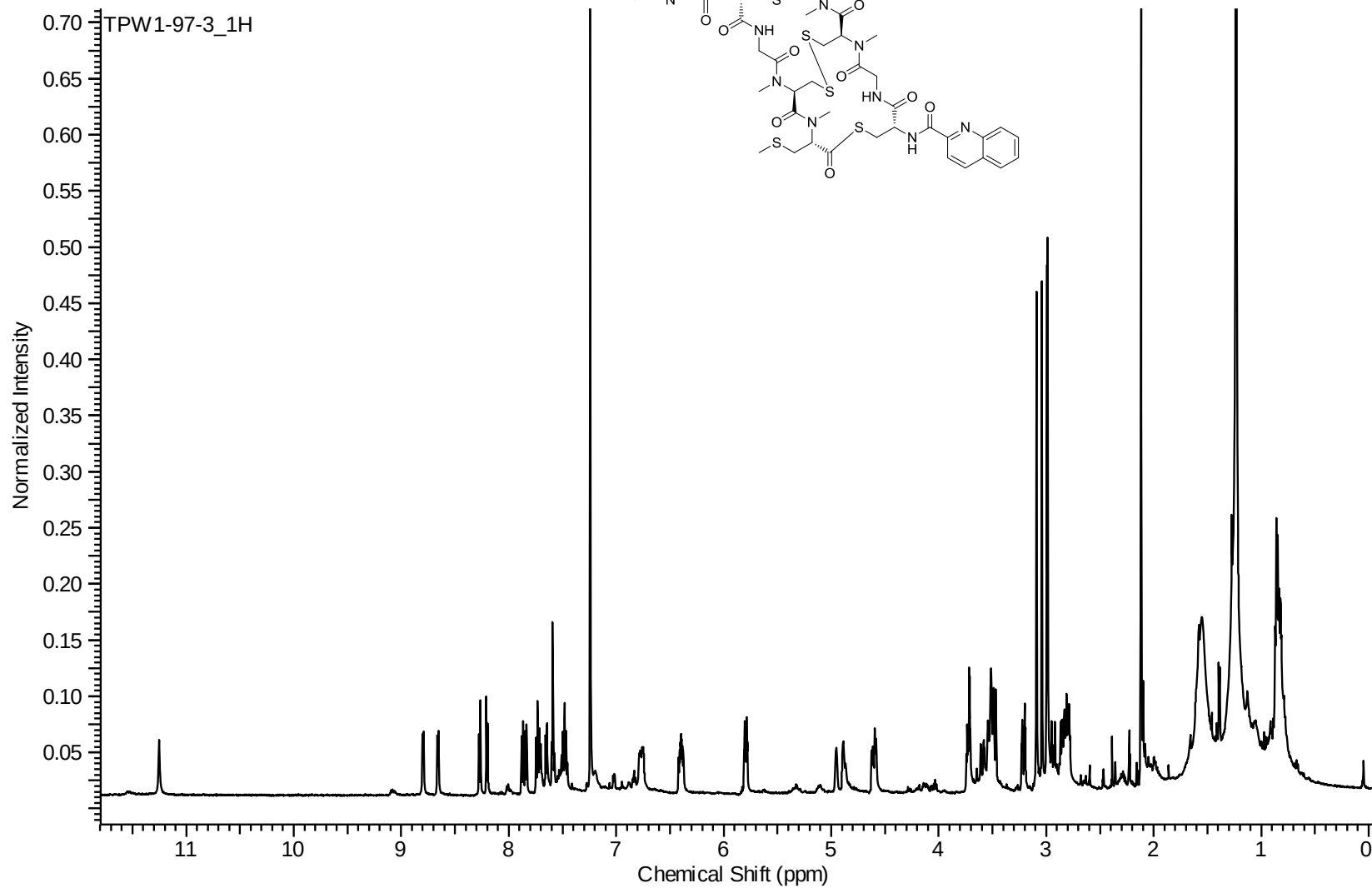
Thomas P. Wyche, Yanpeng Hou, Doug Braun, Hannah C. Cohen, May P. Xiong, Tim S. Bugni*

Division of Pharmaceutical Sciences, University of Wisconsin-Madison, 777 Highland Avenue, Madison, WI, 53705, USA

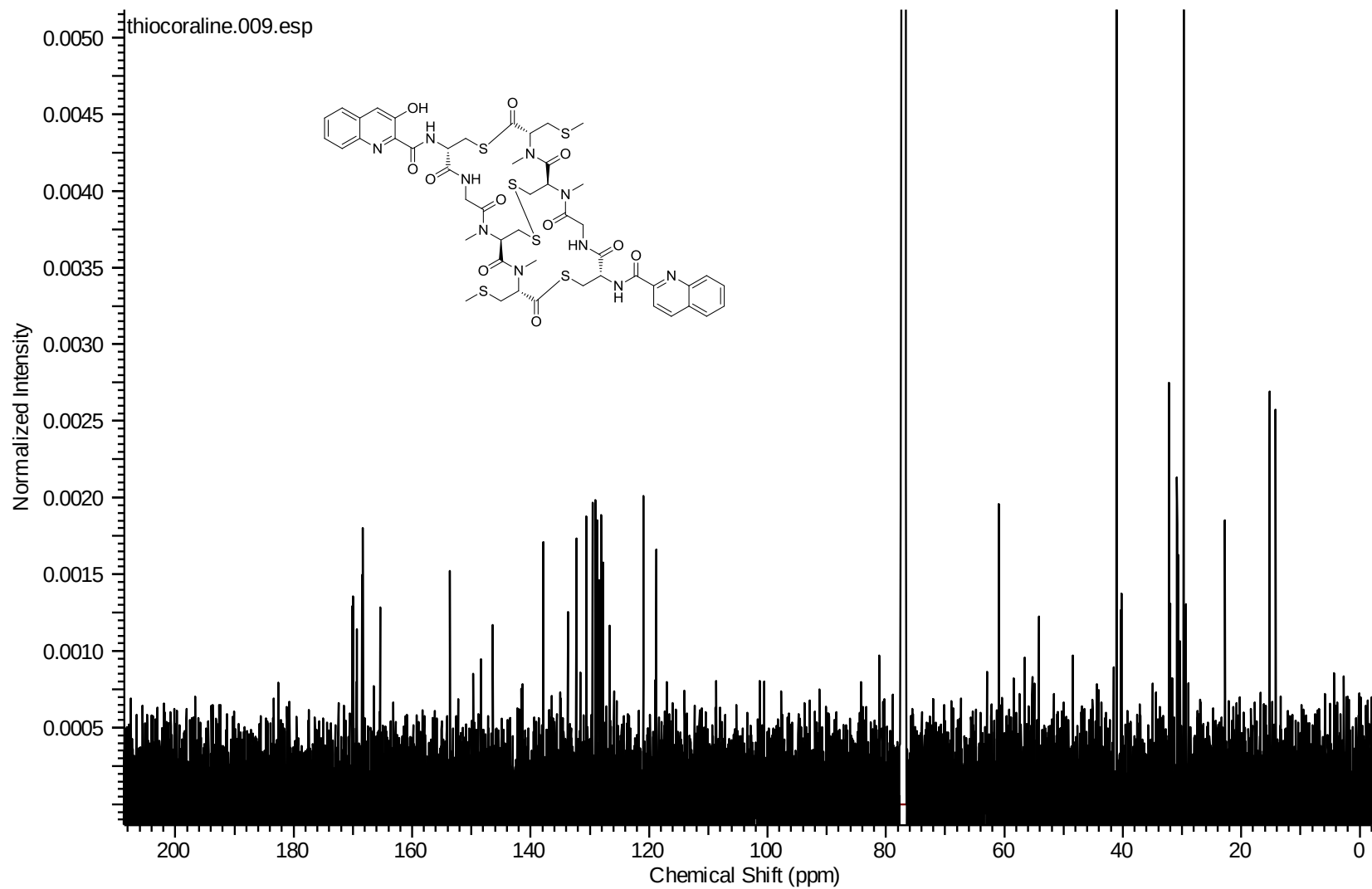
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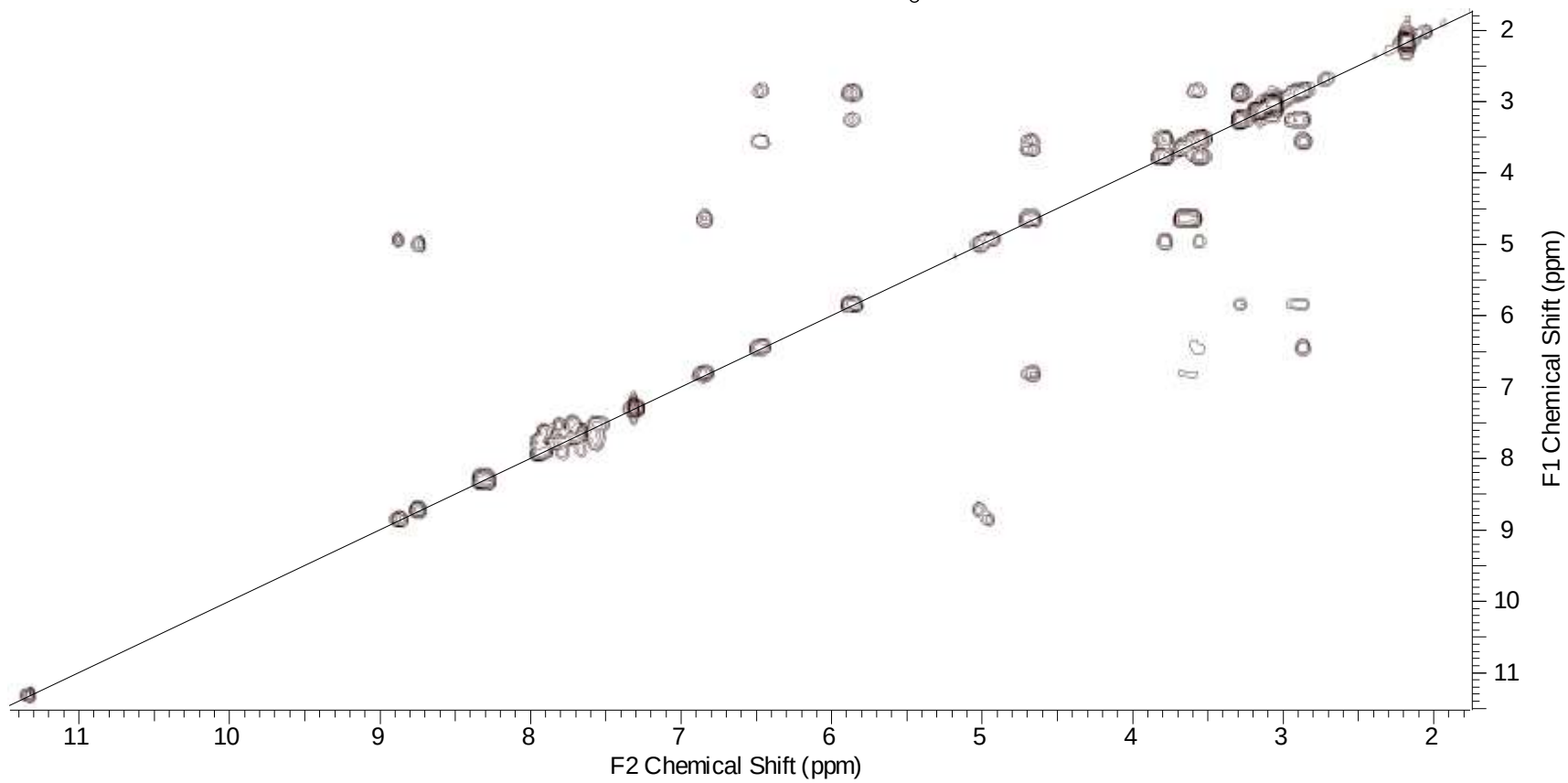
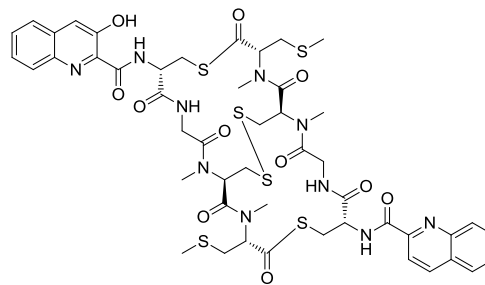
S2. ^1H NMR (600 MHz, CDCl_3) of **2**



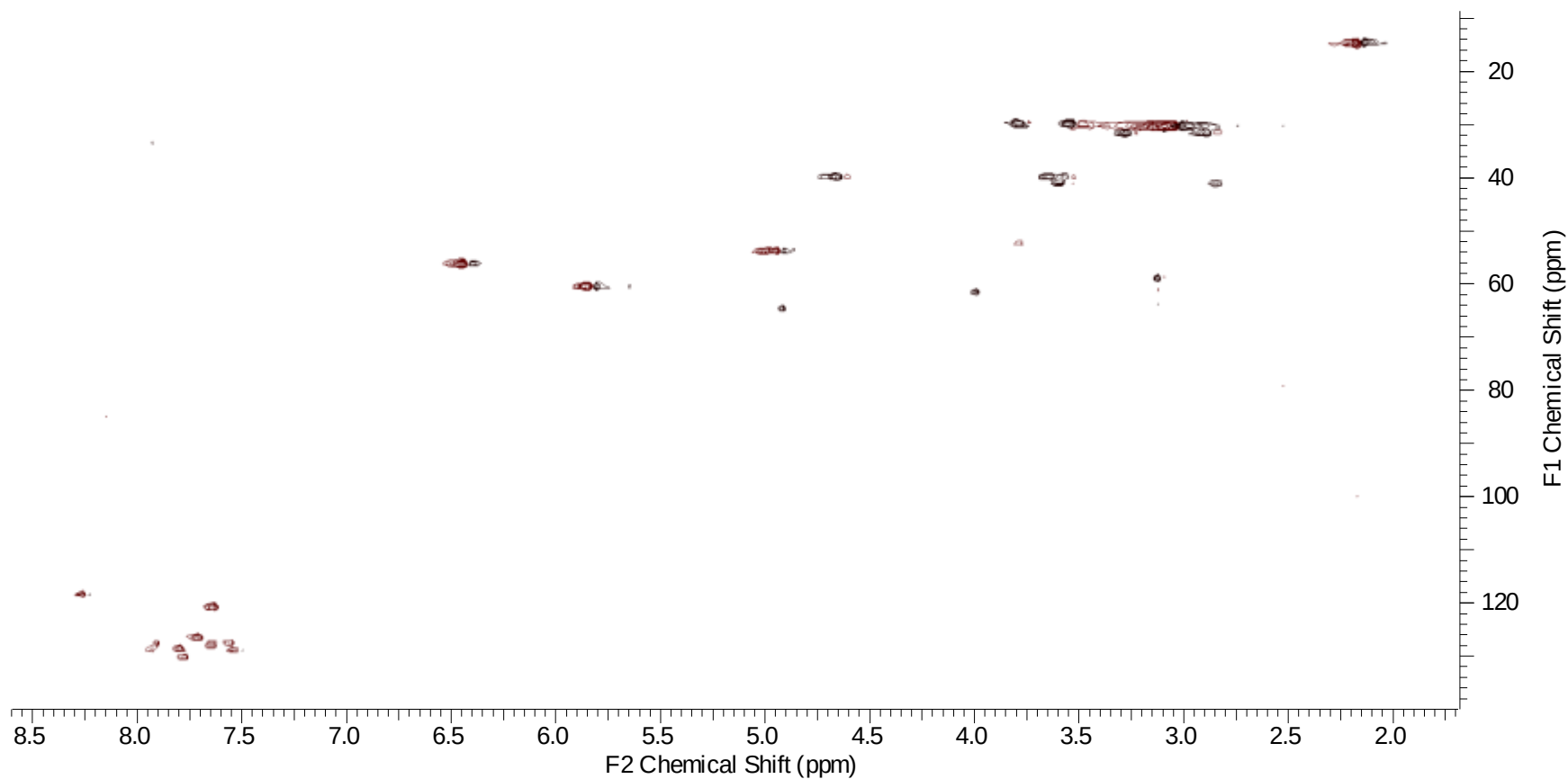
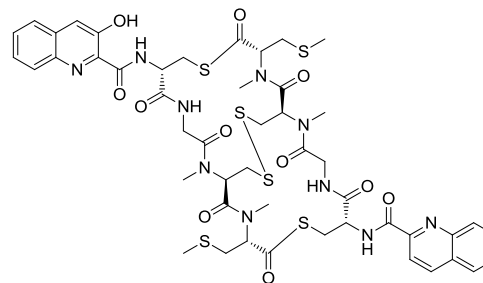
S3. ^{13}C NMR (125 MHz, CDCl_3) of 2



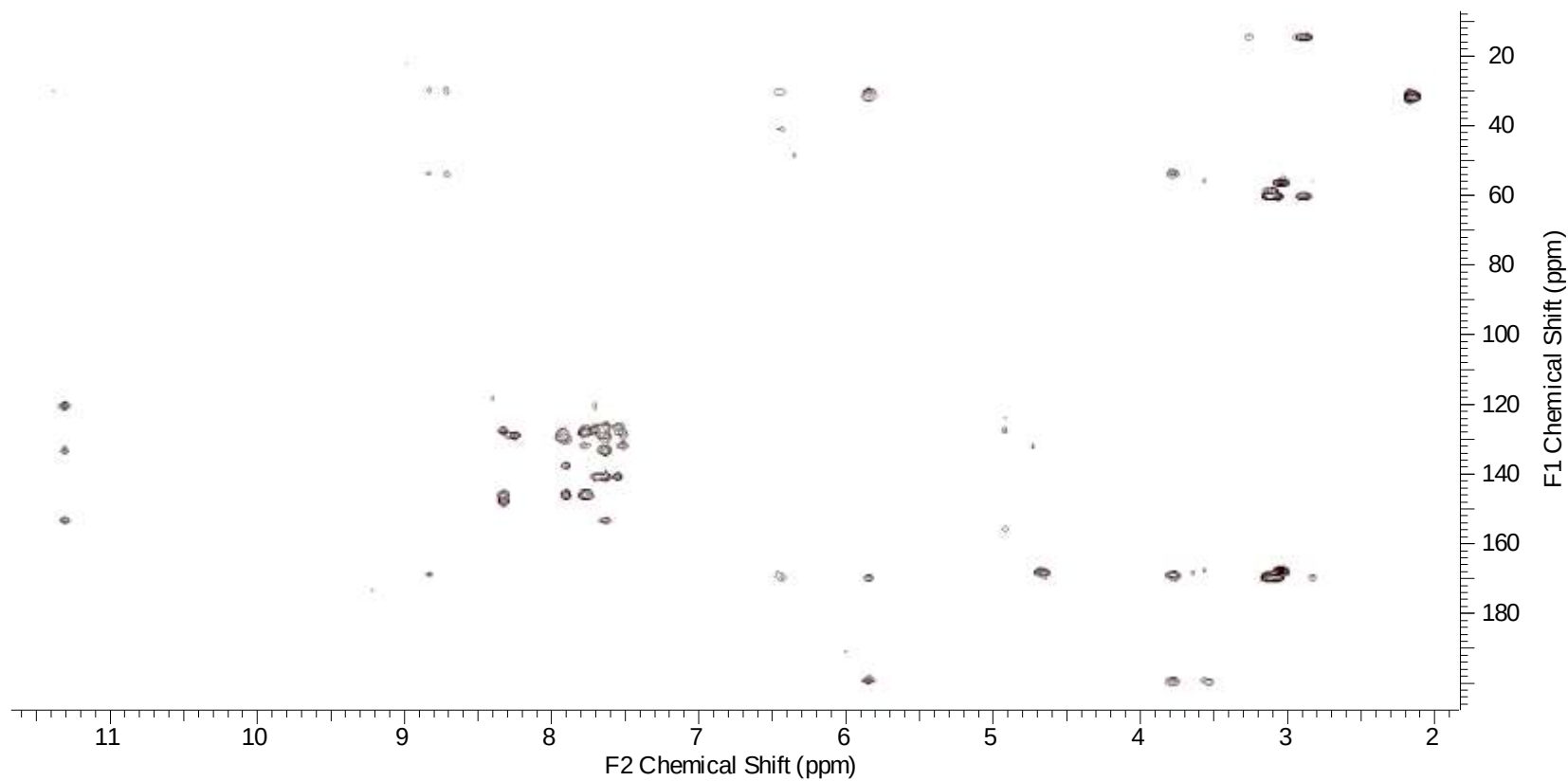
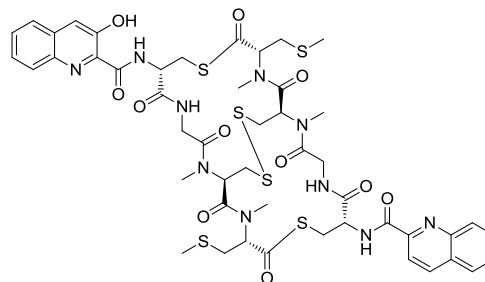
S4. gCOSY (600 MHz, CDCl₃) of **2**



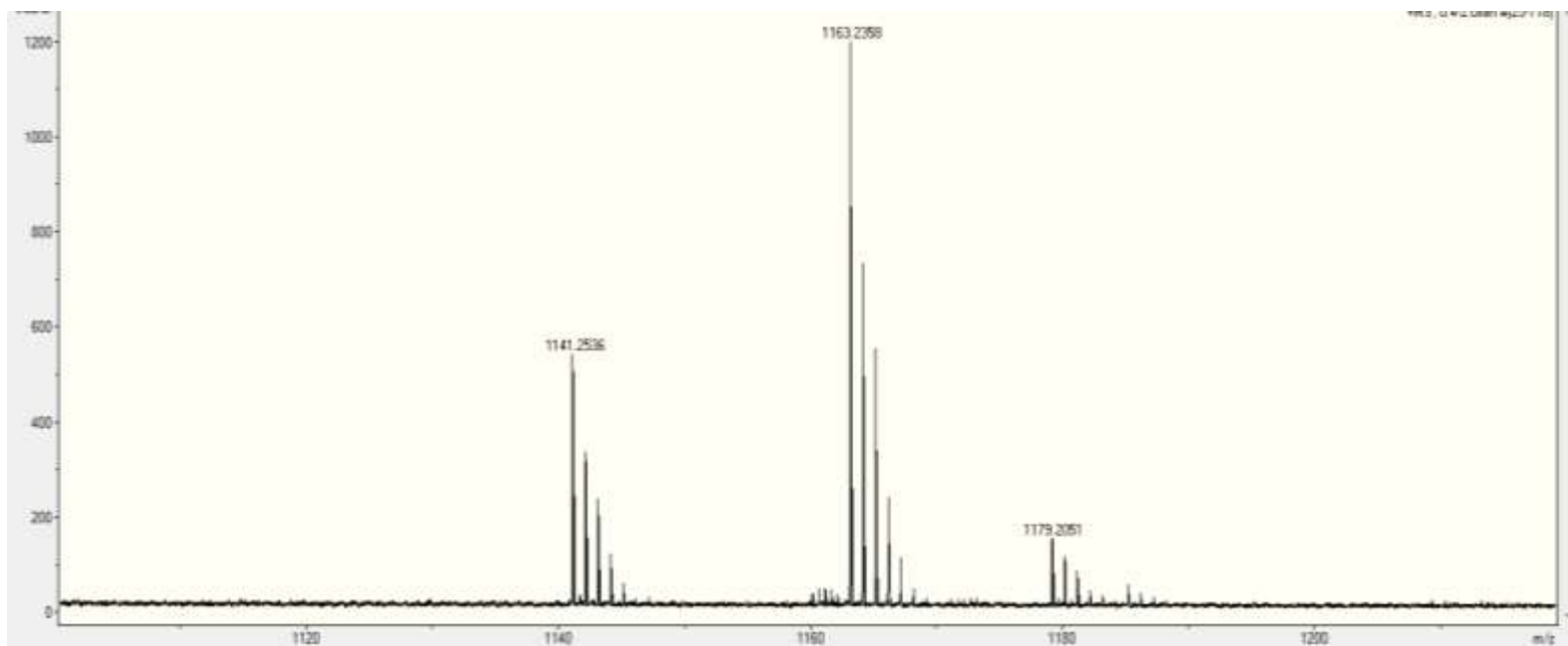
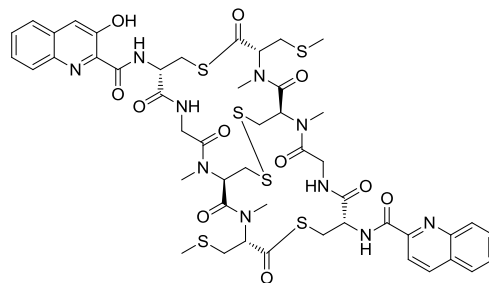
S5. gHSQC (600 MHz, CDCl₃) of 2



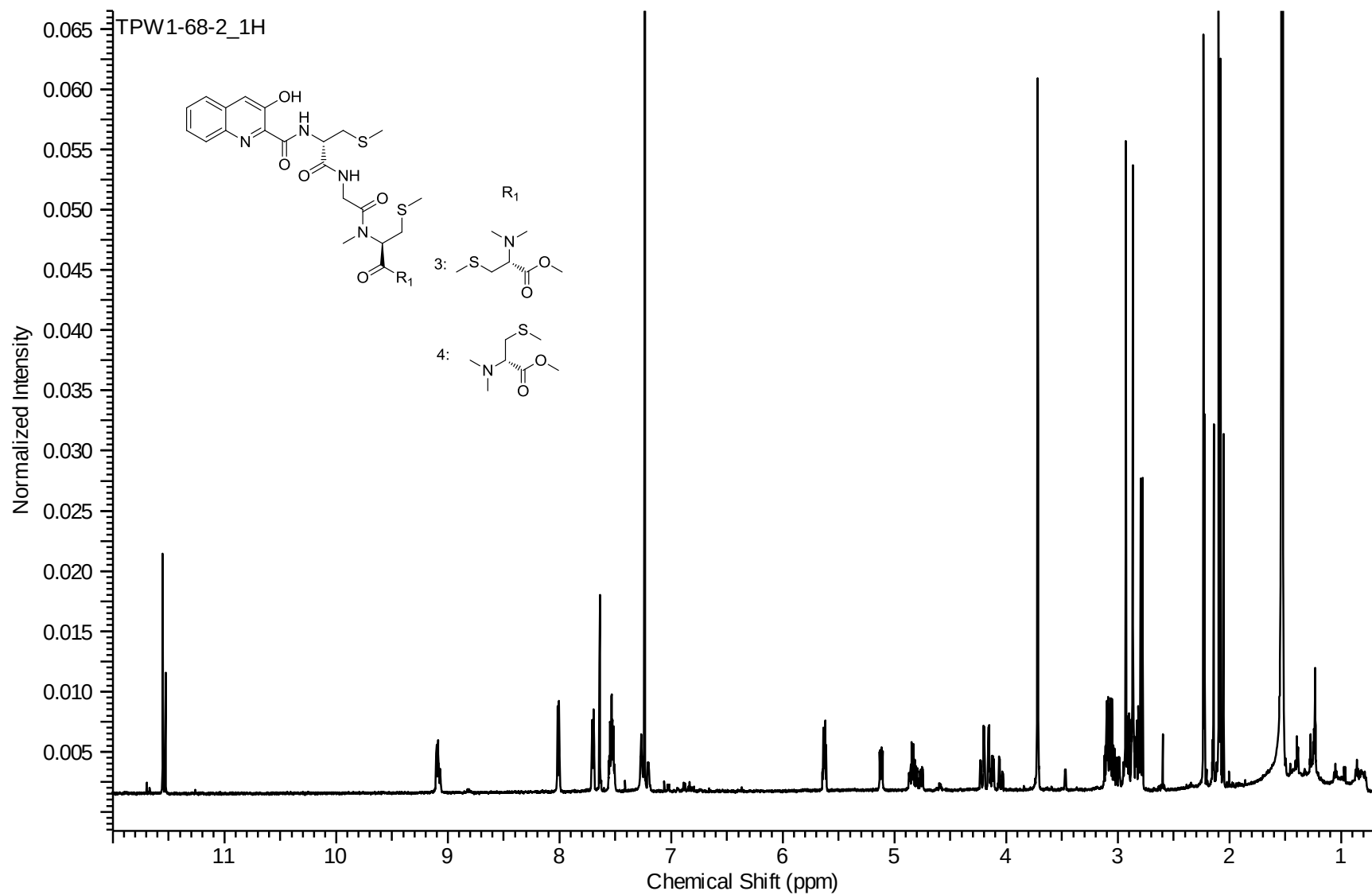
S6. gHMBC (600 MHz, CDCl₃) of **2**



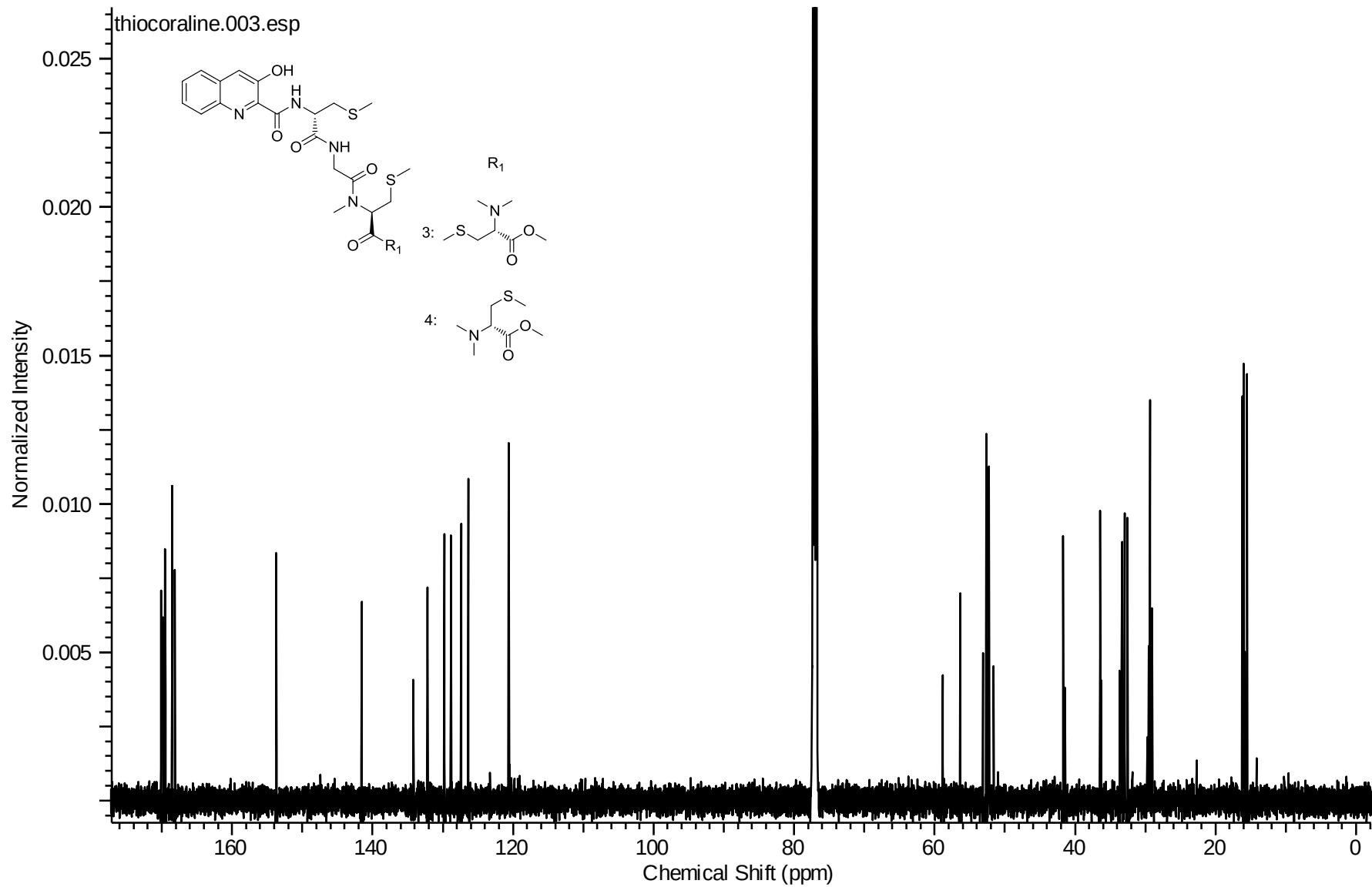
S7. HRMS of 2



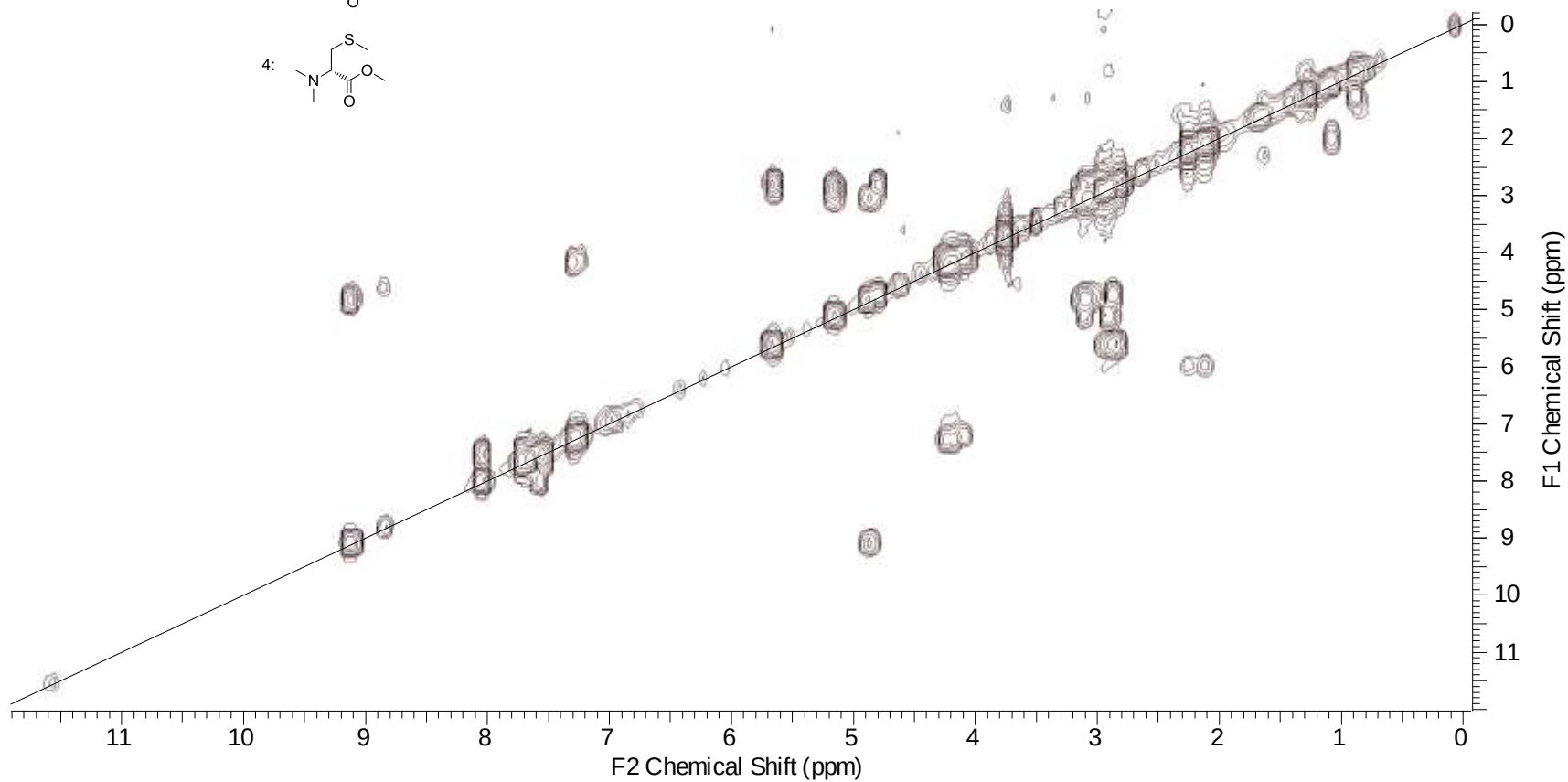
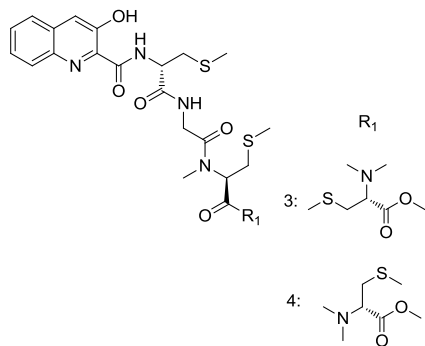
S8. ^1H NMR (600 MHz, CDCl_3) of **3** & **4**



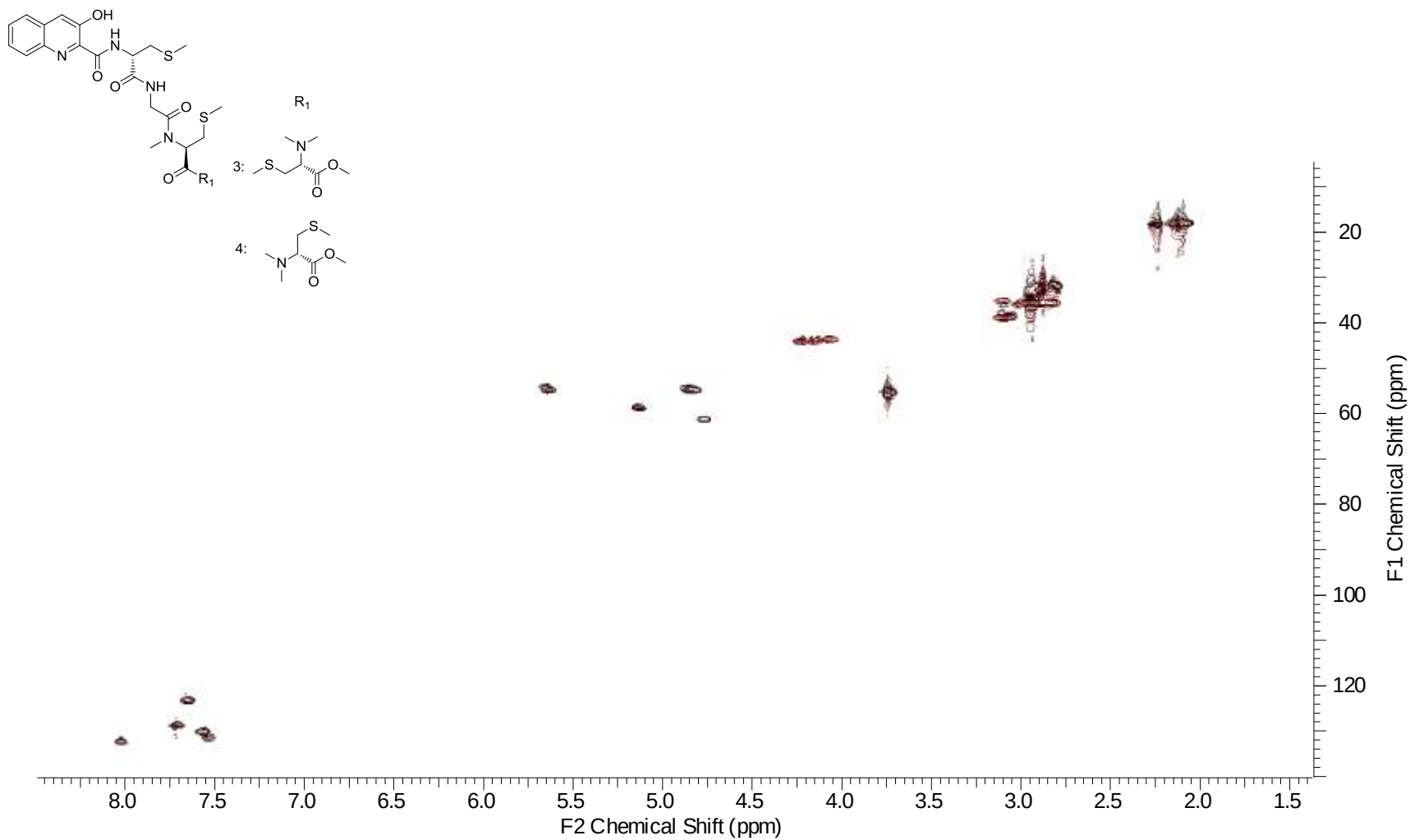
S9. ^{13}C NMR (125 MHz, CDCl_3) of **3** & **4**



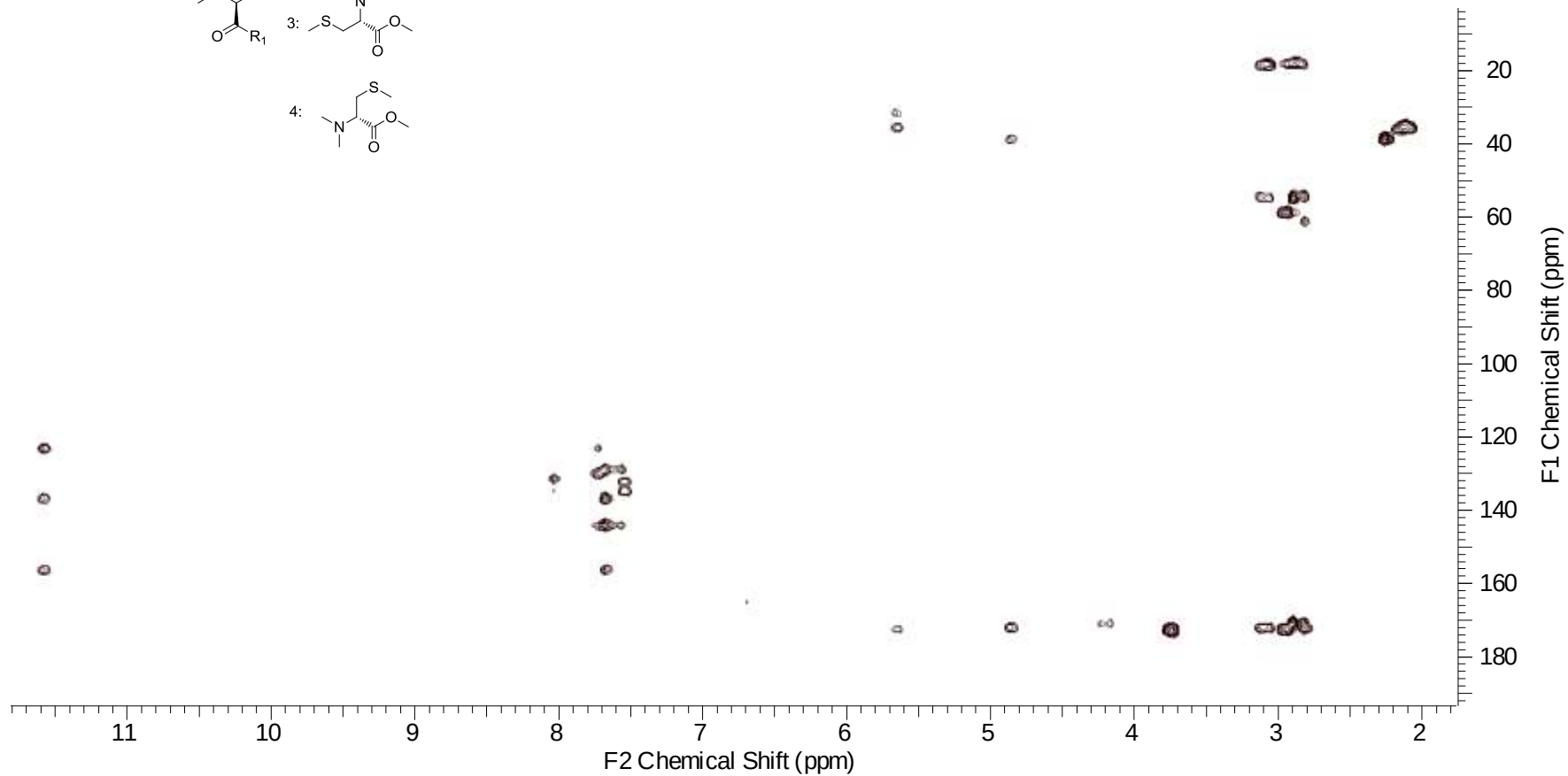
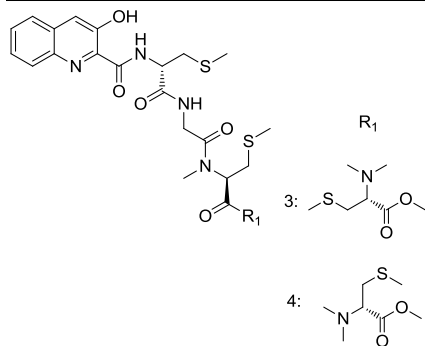
S10. gCOSY (600 MHz, CDCl₃) of 3 & 4



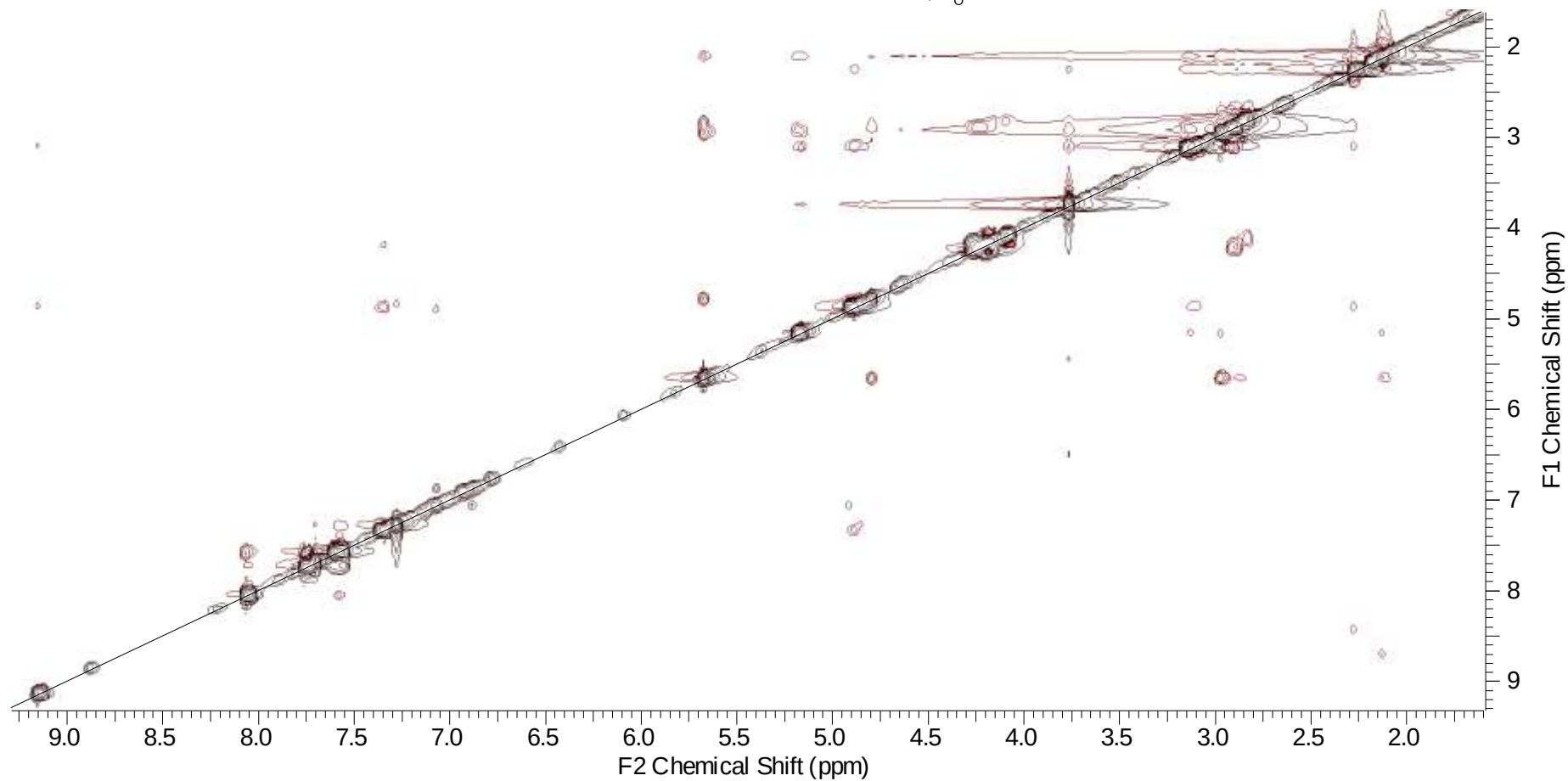
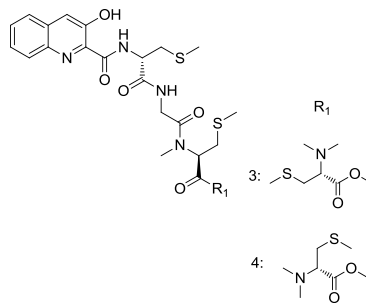
S11. gHSQC (600 MHz, CDCl₃) of 3 & 4



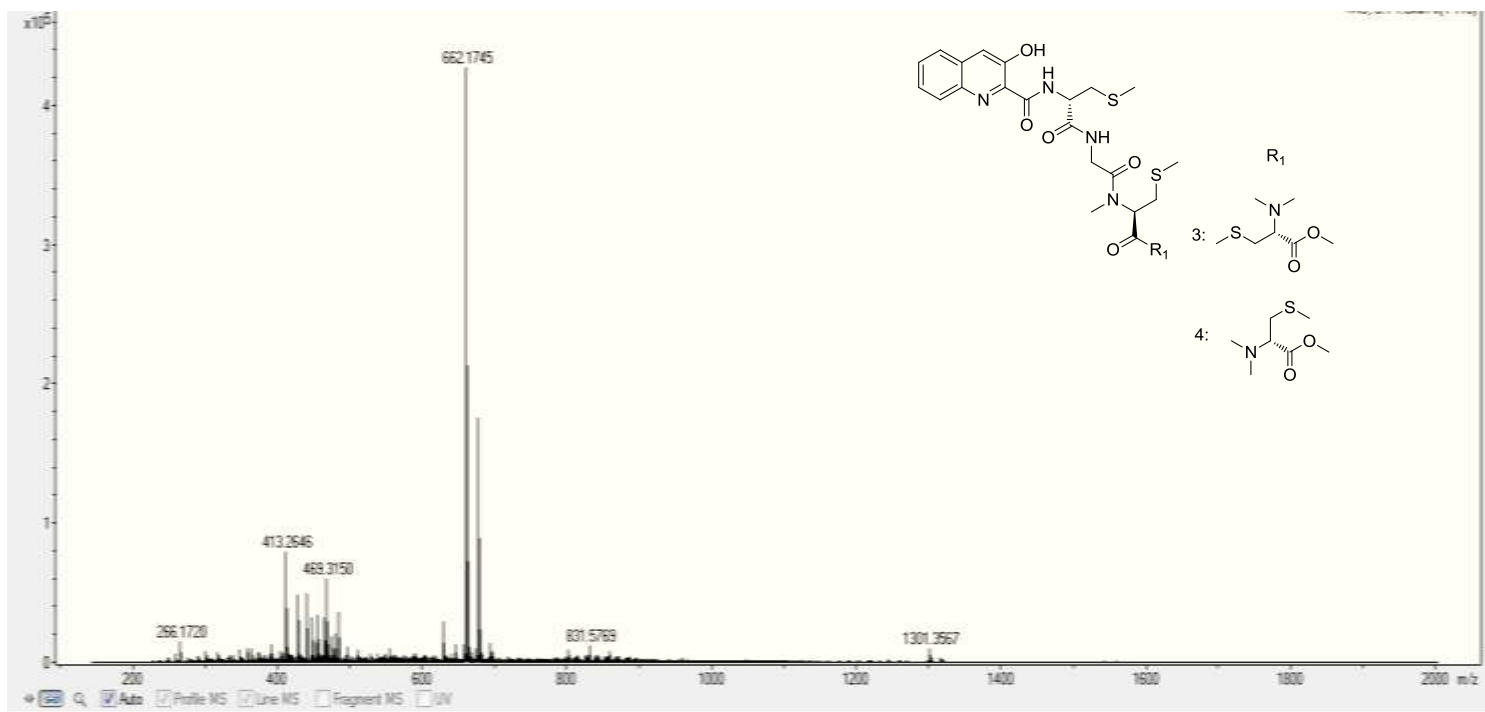
S12. gHMBC (600 MHz, CDCl₃) of 3 & 4



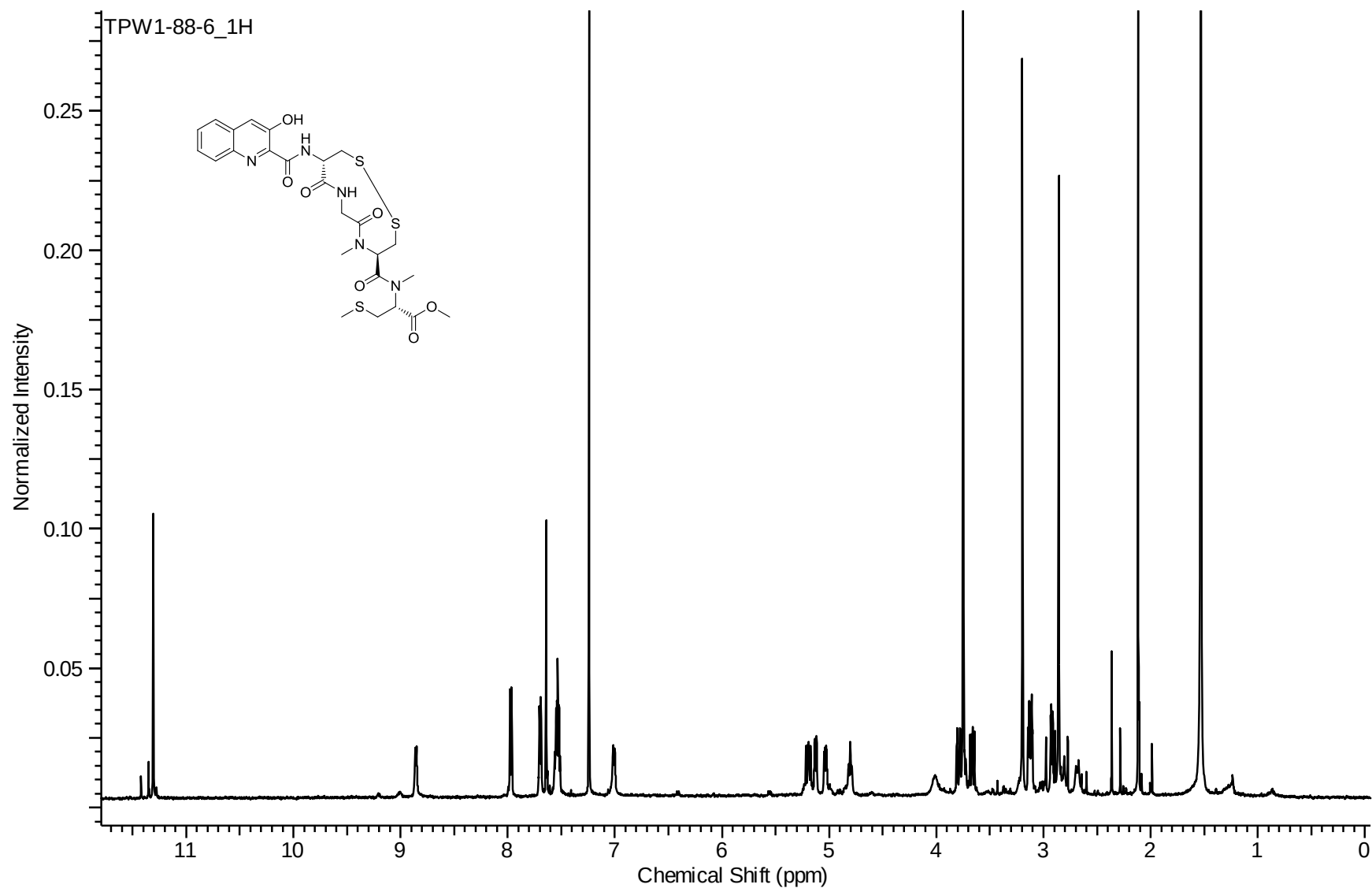
S13. ROESY (600 MHz, CDCl₃) of **3** & **4**



S14. HRMS of Analog 3 & 4

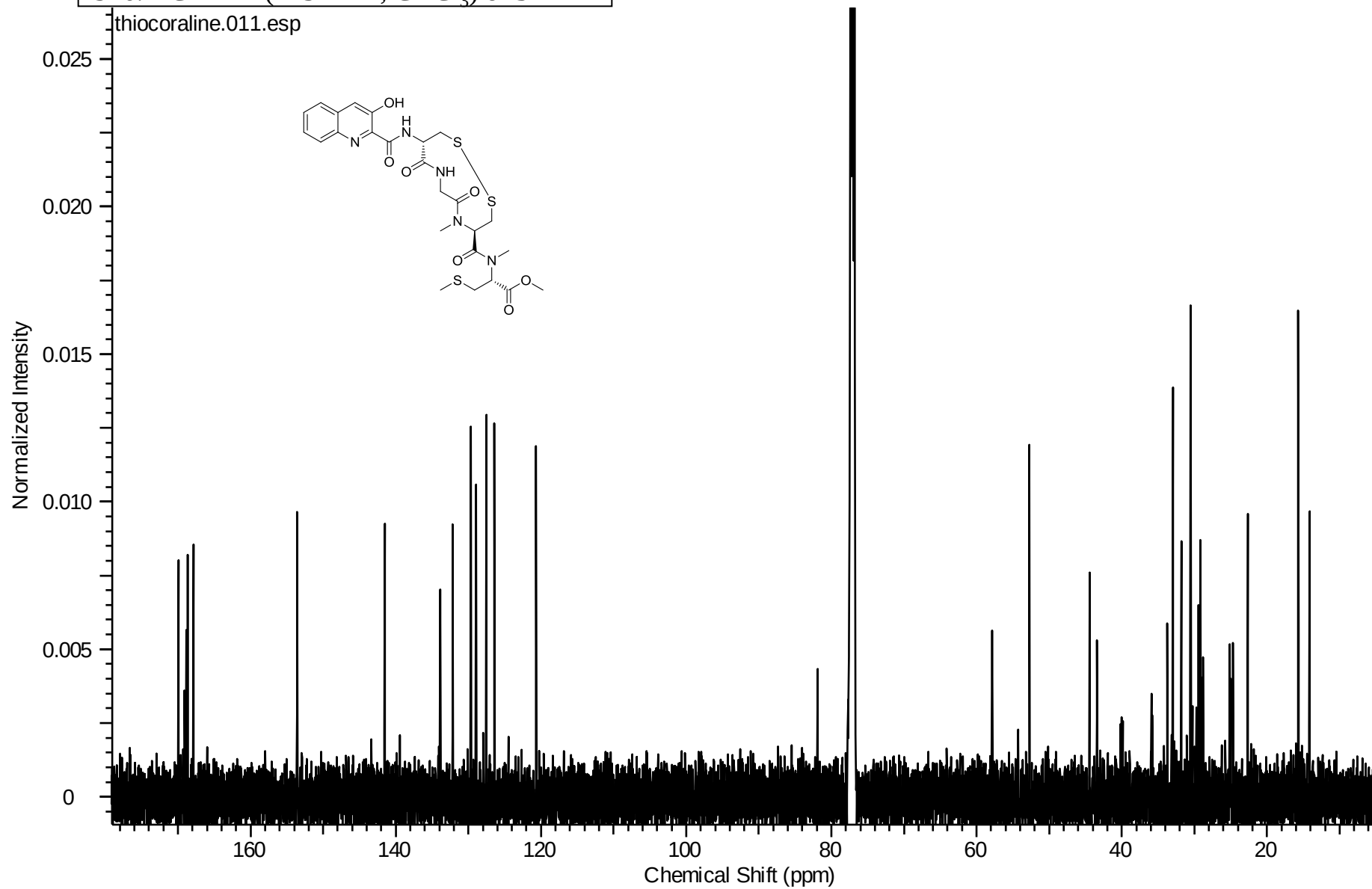
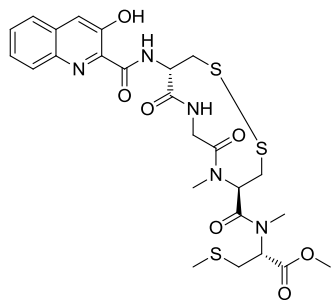


S15. ^1H NMR (600 MHz, CDCl_3) of 5

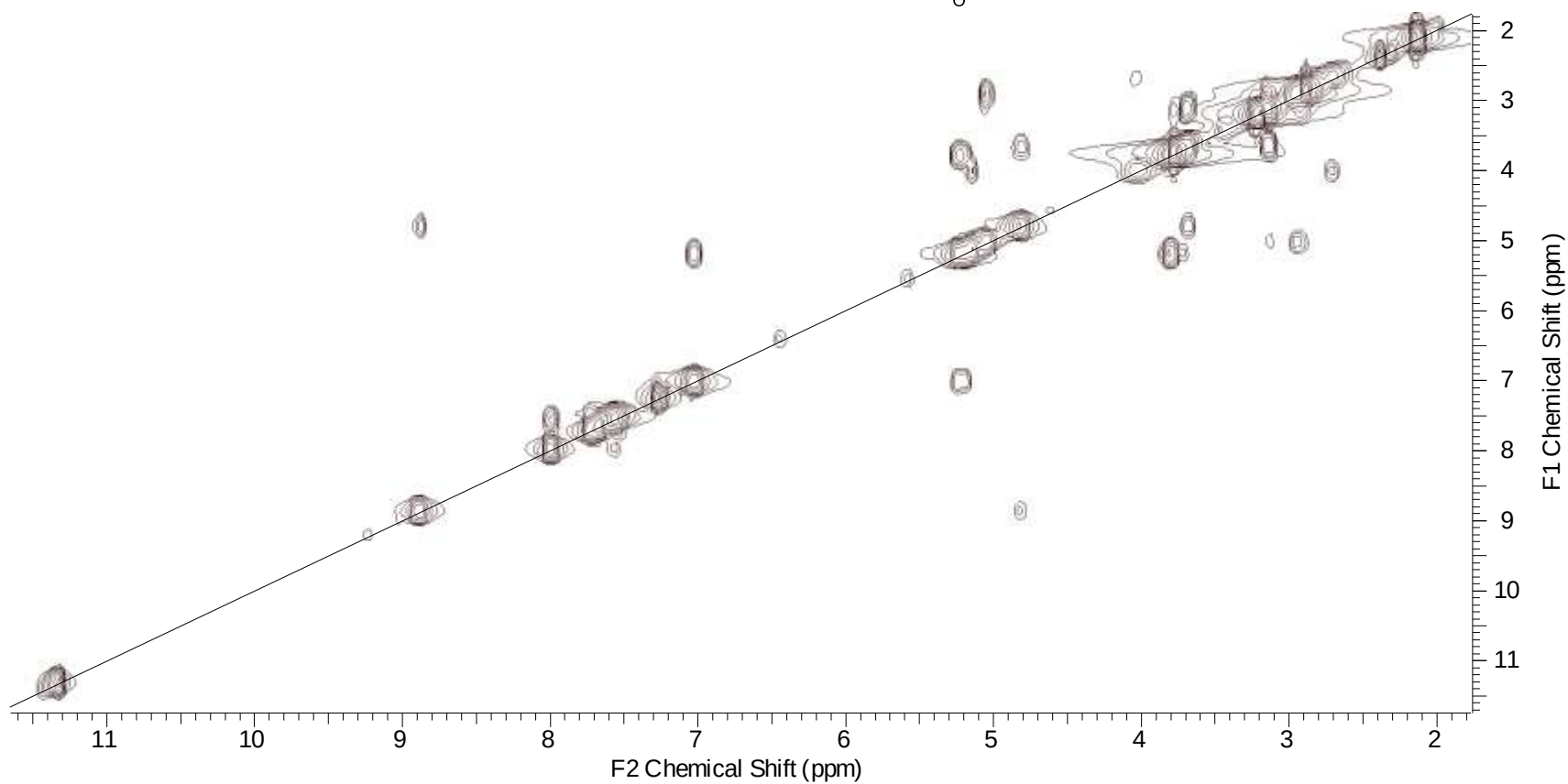
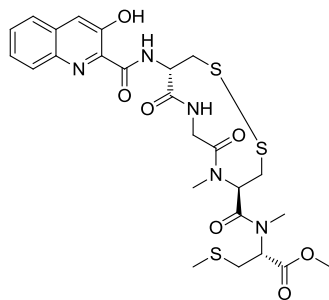


S16. ^{13}C NMR (125 MHz, CDCl_3) of 5

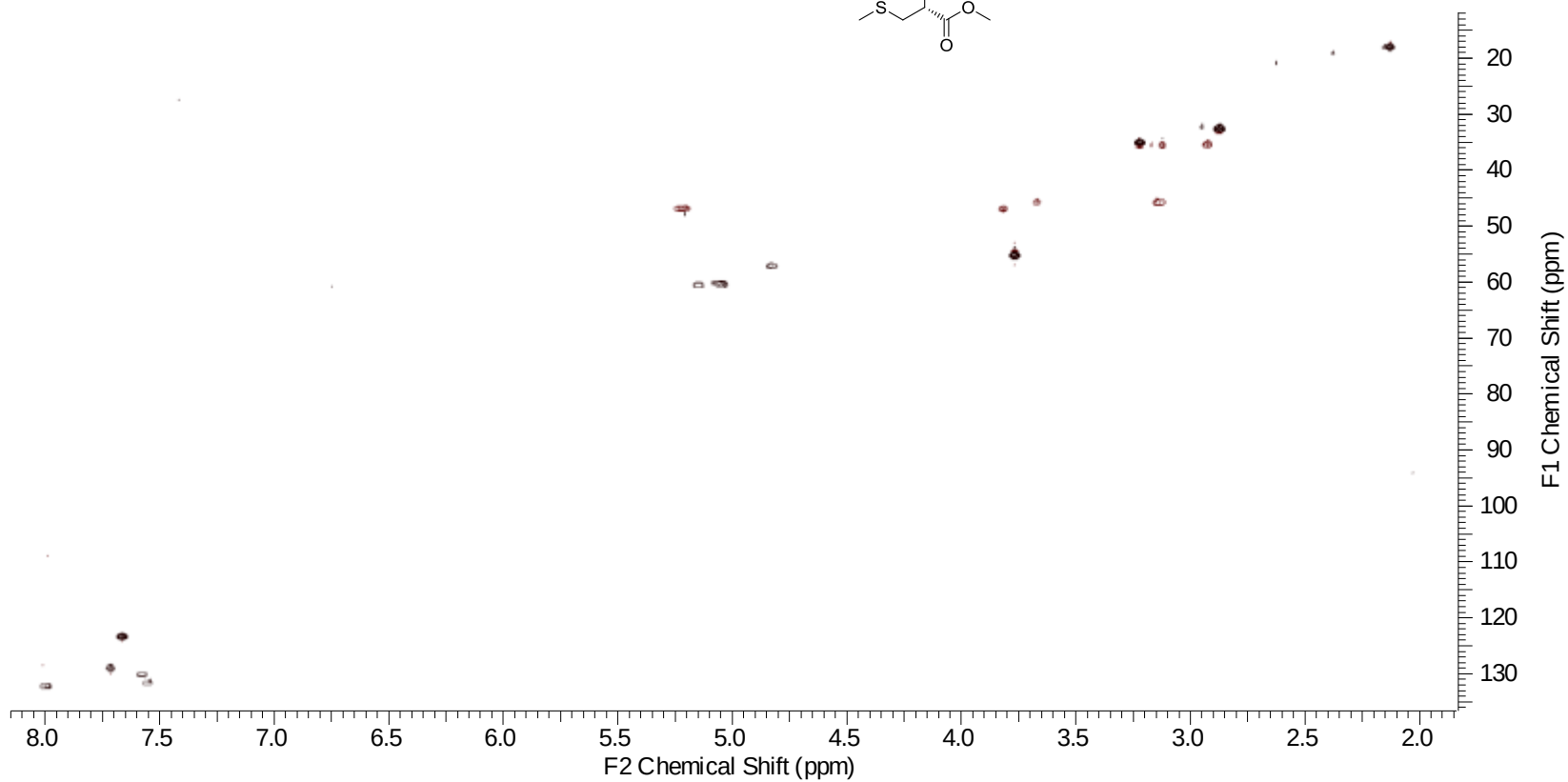
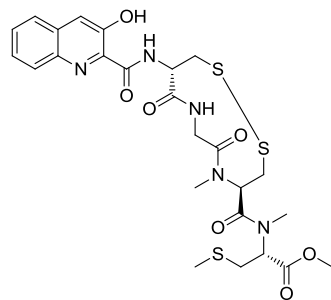
thiocoraline.011.esp



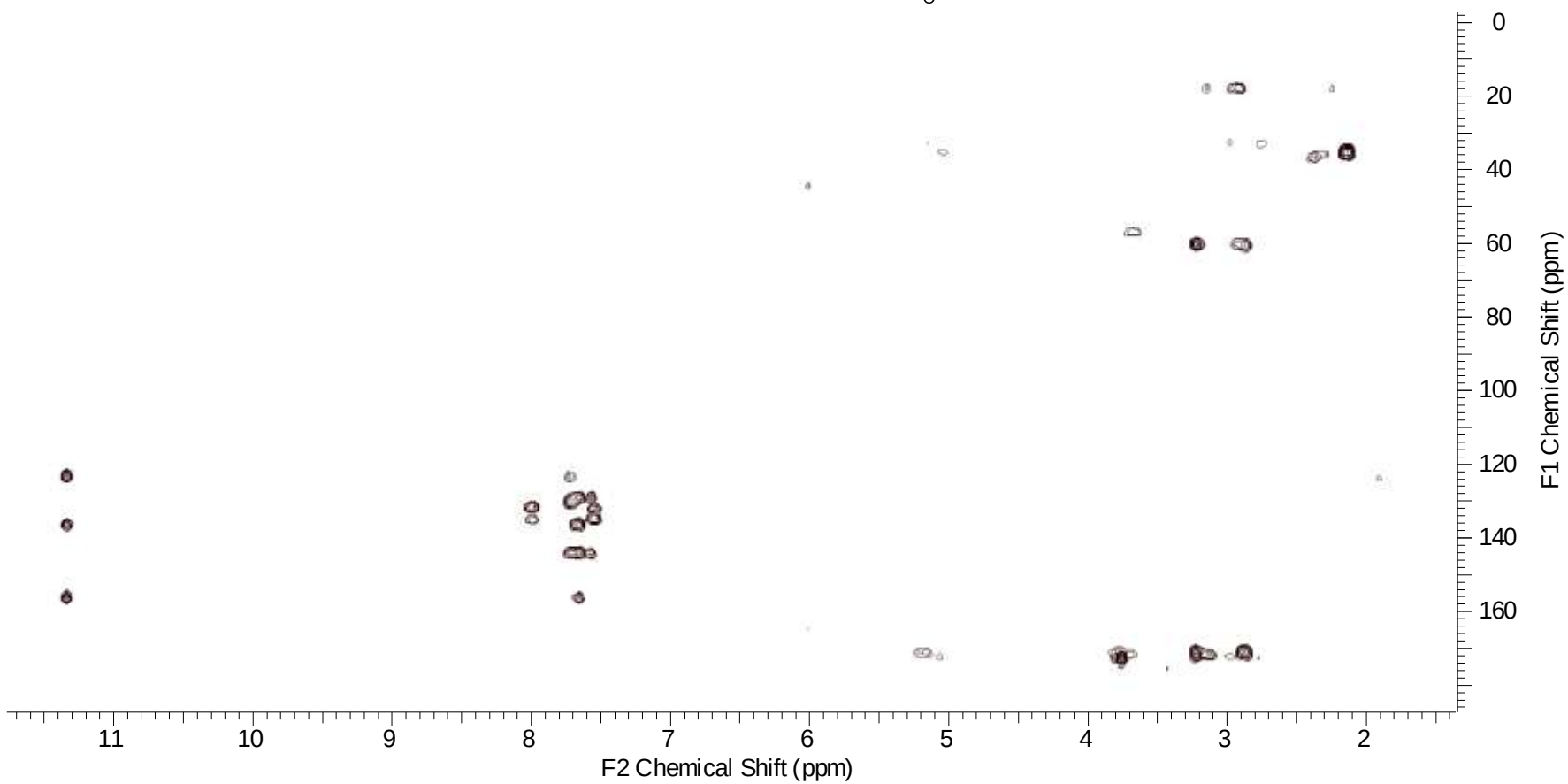
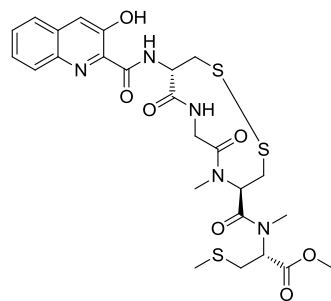
S17. gCOSY (600 MHz, CDCl₃) of **5**



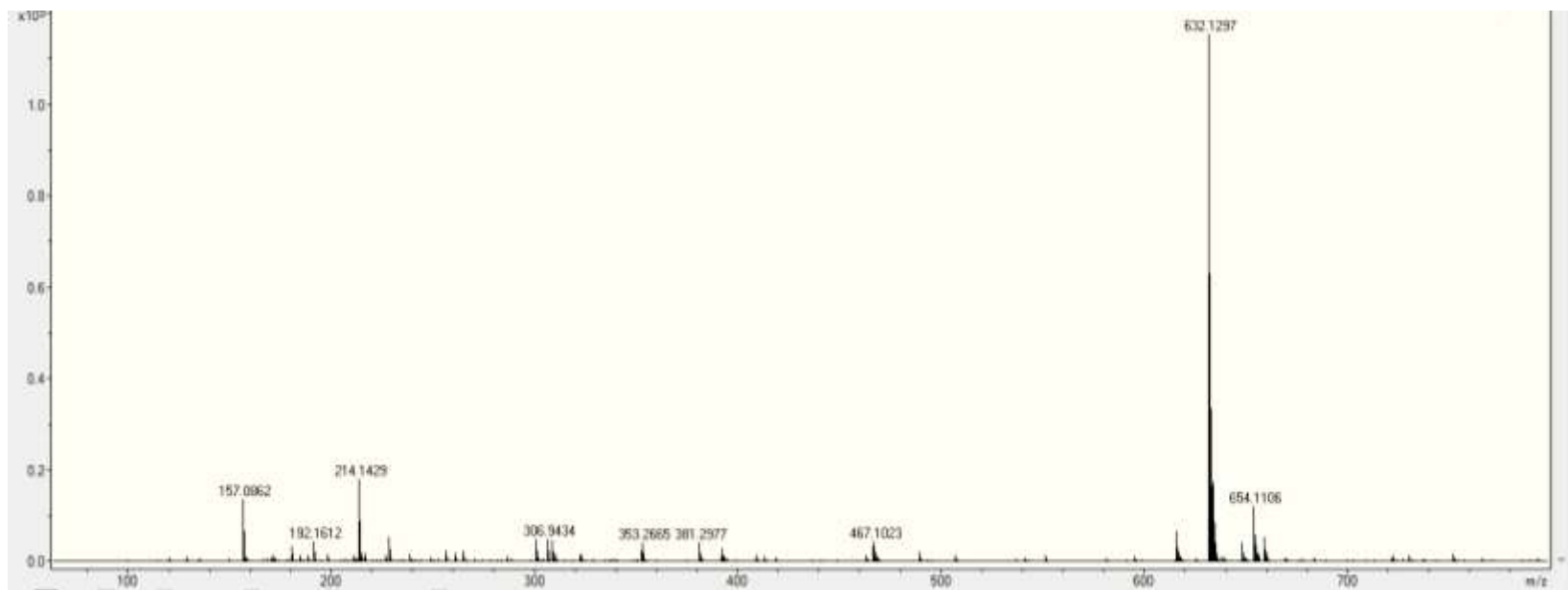
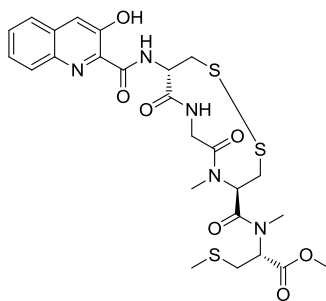
S18. gHSQC (600 MHz, CDCl₃) of **5**



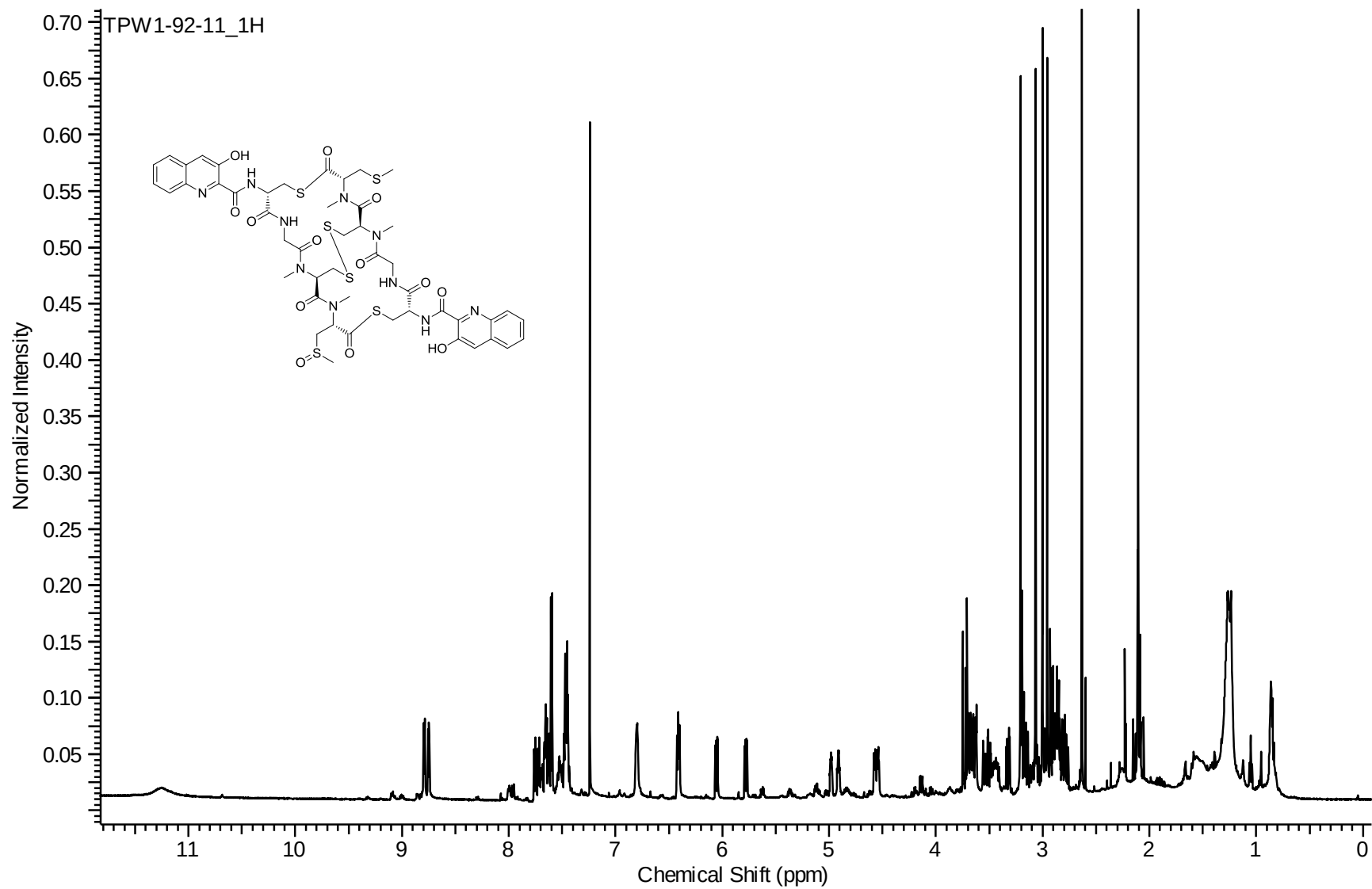
S19. gHMBC (600 MHz, CDCl₃) of **5**



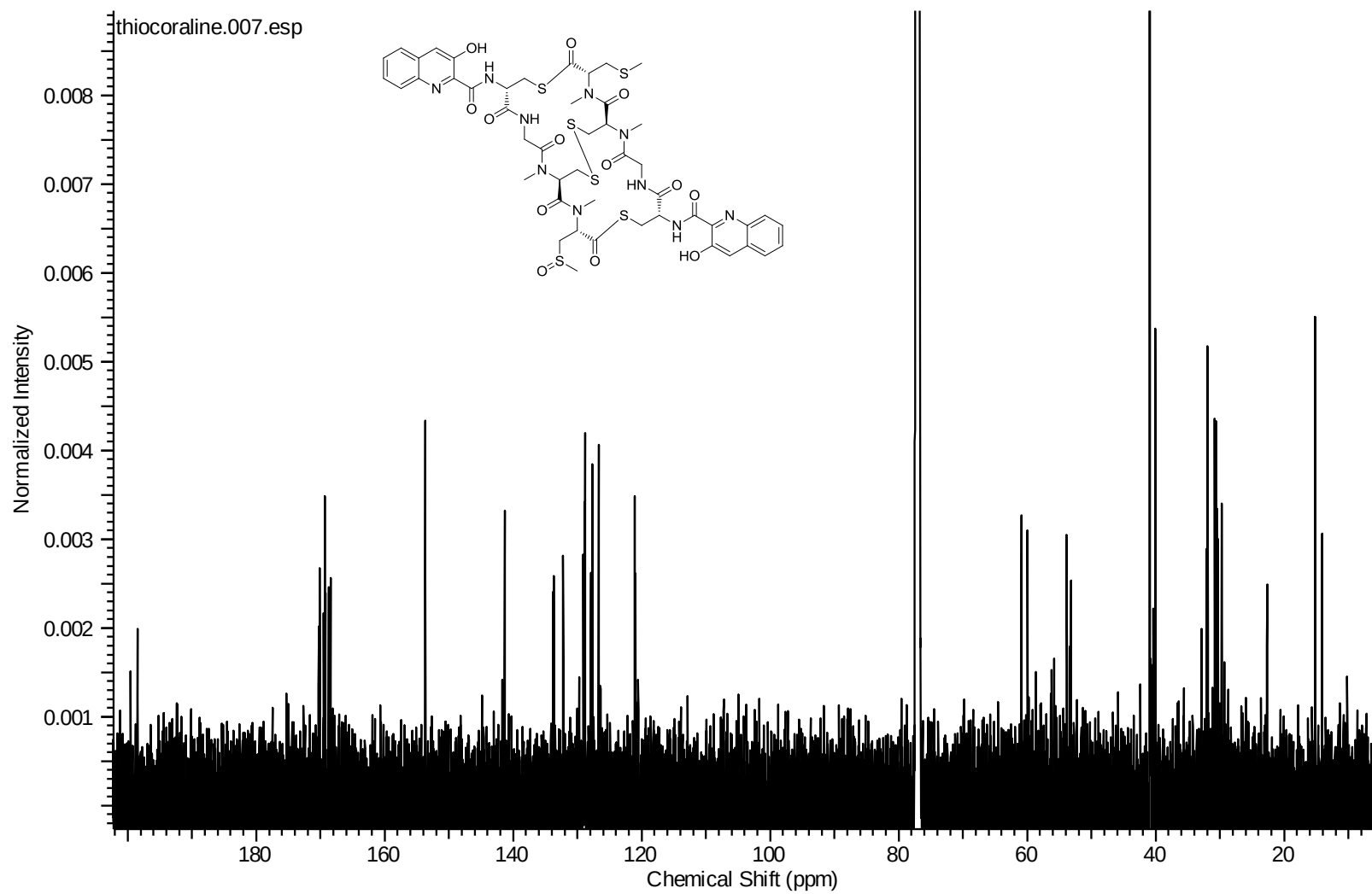
S20. HRMS of 5



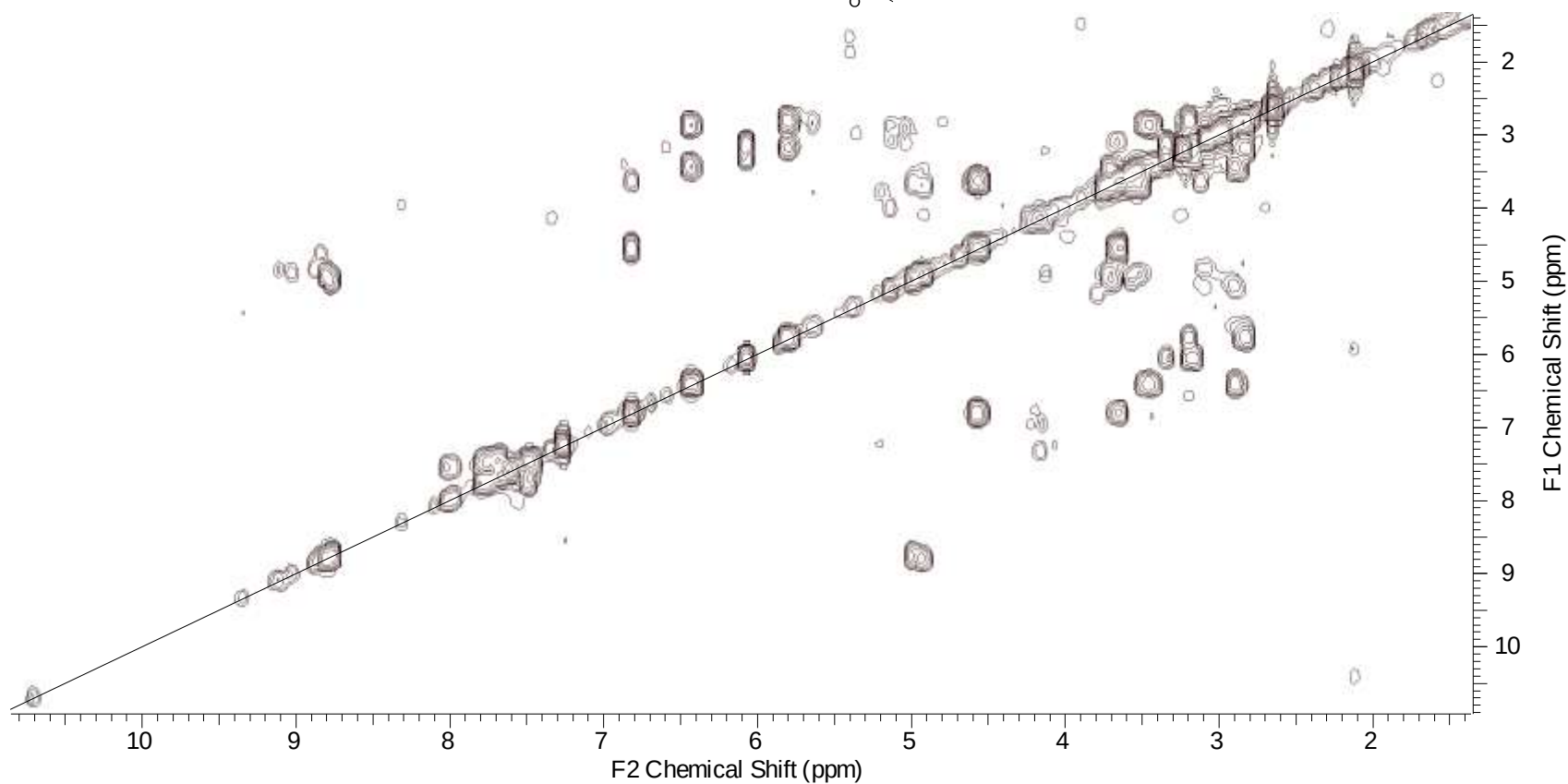
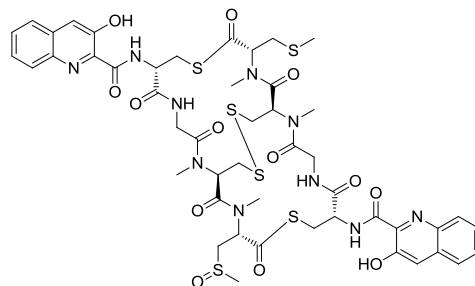
S21. ^1H NMR (600 MHz, CDCl_3) of **6**



S22. ^{13}C NMR (125 MHz, CDCl_3) of **6**

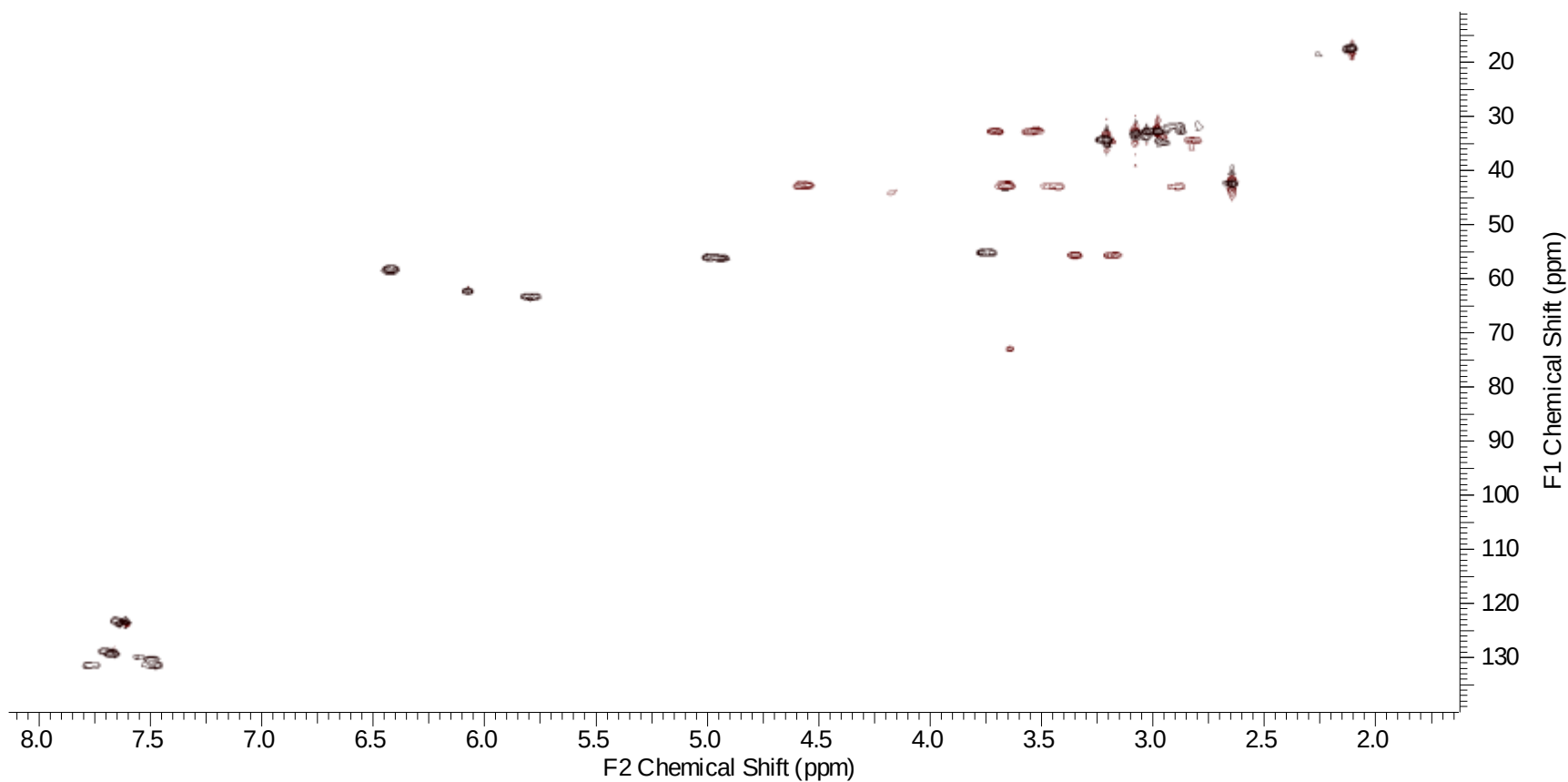
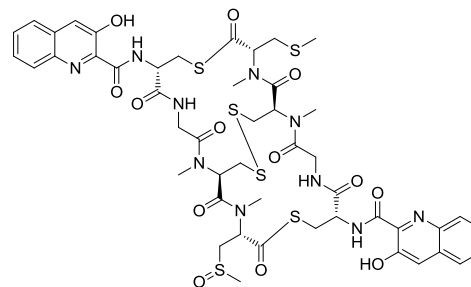


S23. gCOSY (600 MHz, CDCl₃) of **6**

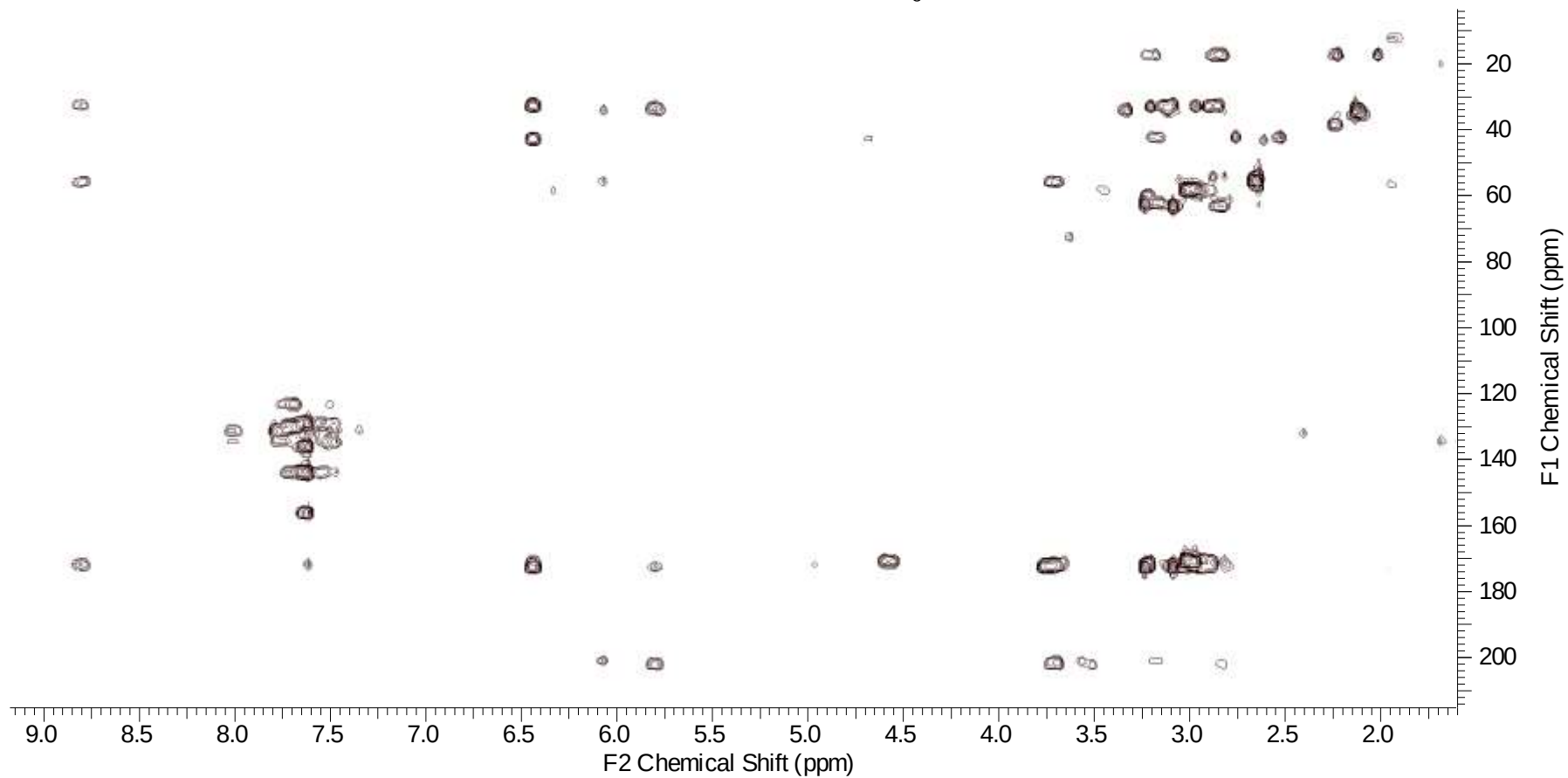
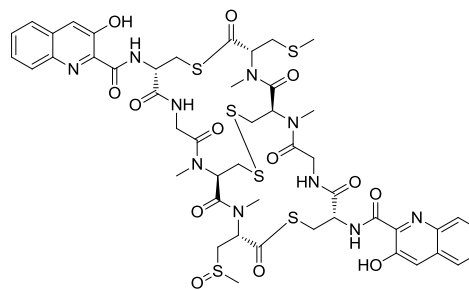


S23

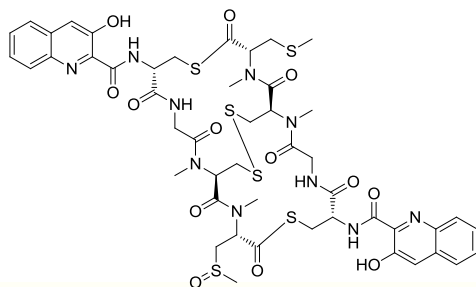
S24. gHSQC (600 MHz, CDCl₃) of **6**

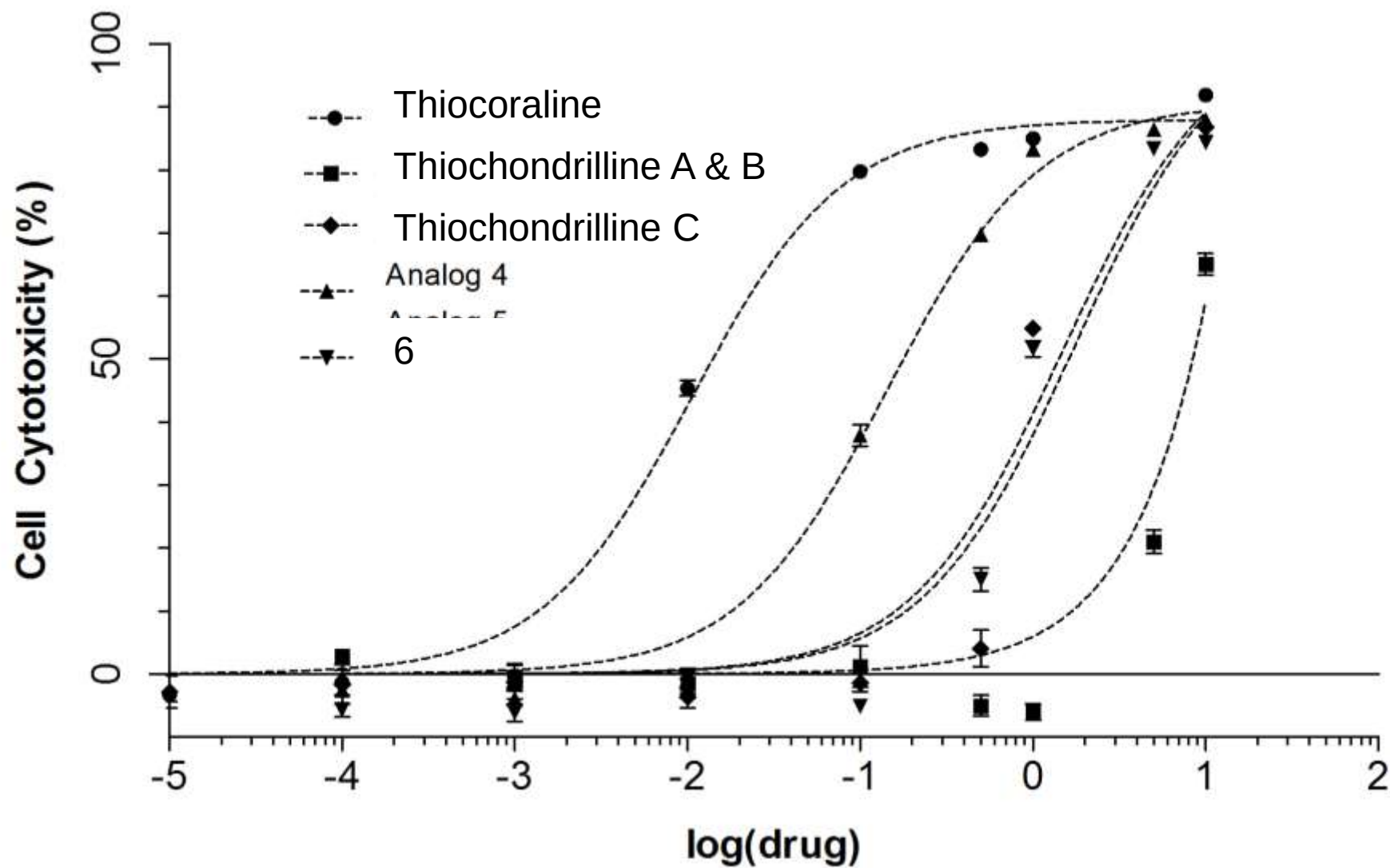


S25. gHMBC (600 MHz, CDCl₃) of **6**



S26. HRMS of **6**





S28. *Ab initio* calculations

Thiochondrilline A

Using the DP4 Probability Method

	¹³ C data	¹ H data	Both
<i>R</i>	78.00%	100	100
<i>S</i>	22.00%	0	0

	¹³ C data	¹ H data	Both
<i>R</i>	100%	100	100
<i>Cis-trans S</i>	0%	0	0

Thiochondrilline A			<i>R</i> (C-2)		<i>S</i> (C-2)		<i>Cis-trans R</i> (C-2)	
	Observed	Observed	Calc	Calc	Calc	Calc	Calc	Calc
Position	¹ H	¹³ C	¹ H	¹³ C	¹ H	¹³ C	¹ H	¹³ C
1		169.8		172.4		167.0		169.7
2	5.11	56.4	5.71	55.6	3.27	62.8	3.37	67.8
3		169.7		170.9		170.7		173.5
4	5.62	52.1	5.40	52.4	5.35	51.9	4.41	56.2
5		167.9		170.4		171.0		167.8
6	4.16	41.5	3.21	42.0	3.25	42.6	4.05	45.9
	4.20		5.03		4.77		4.14	
7-NH	7.27		7.59		7.40		8.36	
8		169.4		170.3	170.30			167.5
9	4.84	52.1	4.67	50.9	4.60	51.2	3.65	57.2
10-NH	9.09		8.41		8.47		8.73	
11		169.2		170.3		170.3		162.0
12	3.08	32.6	3.23	38.4	3.51	37.4	4.12	45.0
	2.88		2.61		2.45		2.45	
13	2.10	15.2	1.97	19.1	2.10	23.2	1.87	20.4
14	2.93	32.5	2.72	30.3	2.80	35.3	3.28	39.7
15	2.91	33.2	3.02	39.5	3.07	39.3	3.13	40.5
	2.83		2.27		2.24		2.54	
16	2.87	29.1	2.67	29.5	2.74	30.2	3.50	27.5
17	3.08	36.2	3.12	39.0	3.18	38.6	3.02	45.5
	3.04		2.96		2.88		2.87	
18	3.72	52.7	3.67	52.2		54.0	3.73	52.3
19	2.08	15.6	1.48	19.0	1.53	18.7	1.98	20.6
20	2.23	15.9	1.48	19.0	1.92	18.0	1.91	22.0
21		134.0		137.6		137.9		143.7
22		153.5		158.6		158.2		154.0
22-OH	11.55		12.57		12.53		4.22	
23	7.64	120.5	7.47	122.6	7.40	122.2	6.89	120.9
24		132.1		135.0		134.8		133.1
25	7.70	126.1	7.75	128.8	7.73	128.7	7.65	127.2
26	7.52	128.7	7.66	130.9	7.57	131.0	7.65	130.4
27	7.54	127.3	7.67	128.4	7.67	128.5	7.70	128.4
28	8.01	129.7	8.09	132.8	8.10	132.8	8.11	132.6
29		141.4		142.5		142.5		142.8

S29. *Ab initio* calculations

Thiochondrilline B

Using the DP4 Probability Method

	¹ H and ¹³ C	¹³ C only
<i>R</i>	99.90%	100%
<i>S</i>	0.10%	0%

	¹ H and ¹³ C	¹³ C only
<i>R</i>	100%	100%
<i>Cis-Cis R</i>	0%	0%

Thiochondrilline B			<i>R</i> (C-2)		<i>S</i> (C-2)		<i>Cis-Cis R</i> (C-2)	
	Observed	Observed	Calc	Calc	Calc	Calc	Calc	Calc
Position	¹ H	¹³ C	¹ H	¹³ C	¹ H	¹³ C	¹ H	¹³ C
1		169.8		170.8		166.8		170.1
2	4.76	58.8	6.04	62.3	3.91	64.4	4.30	61.2
3		169.6		169.2		172.4		171.2
4	5.63	51.7	5.62	53.2	5.92	53.0	3.92	56.7
5		167.9		168.3		170.0		165.5
6	4.06	41.3	3.61	44.6	3.77	45.0	3.39	43.3
	4.12		4.04		3.92		3.77	
7-NH	7.20		8.00		7.48		8.03	
8		169.4		167.7		166.5		169.2
9	4.81	52.2	4.63	50.8	4.66	50.7	4.89	53.0
10-NH	9.07		8.27		8.38		8.41	
11		169.2		169.5		168.7		161.1
12	2.84	33.3	2.59	40.5	2.59	39.0	2.85	40.5
	2.99		3.14		3.31		3.05	
13	2.05	15.4	2.39	20.4	2.69	24.4	1.95	26.3
14	2.78	29.3	2.71	33.0	2.93	36.1	3.02	26.3
15	2.91	33.2	3.28	40.7	3.21	43.9	3.12	40.9
	2.83		2.50		3.00		2.73	
16	2.80	29.0	2.94	28.4	2.77	28.4	3.50	27.9
17	3.08	36.2	3.06	39.1	3.30	38.7	3.39	41.0
	3.03		2.95		2.79		2.52	
18	3.71	52.7	3.76	52.2	3.71	54.6	3.67	54.3
19	2.14	15.8	1.79	20.1	1.78	20.6	1.96	20.3
20	2.22	15.9	1.99	18.0	1.90	20.6	1.92	20.7
21		134.0		137.2		137.5		142.5
22		153.5		158.5		158.6		153.8
22-OH	11.53		12.68		12.70		4.32	
23	7.64	120.5	7.45	122.8	7.42	122.5	6.94	121.2
24		132.1		135.1		135.0		133.3
25	7.70	126.1	7.76	128.9	7.74	128.8	7.69	127.4
26	7.52	128.7	7.66	131.0	7.64	130.6	7.69	130.6
27	7.54	127.3	7.65	128.5	7.64	128.1	7.72	128.7
28	8.01	129.7	8.07	132.7	8.09	132.8	8.13	133.0
29		141.4		142.5		142.4		137.2

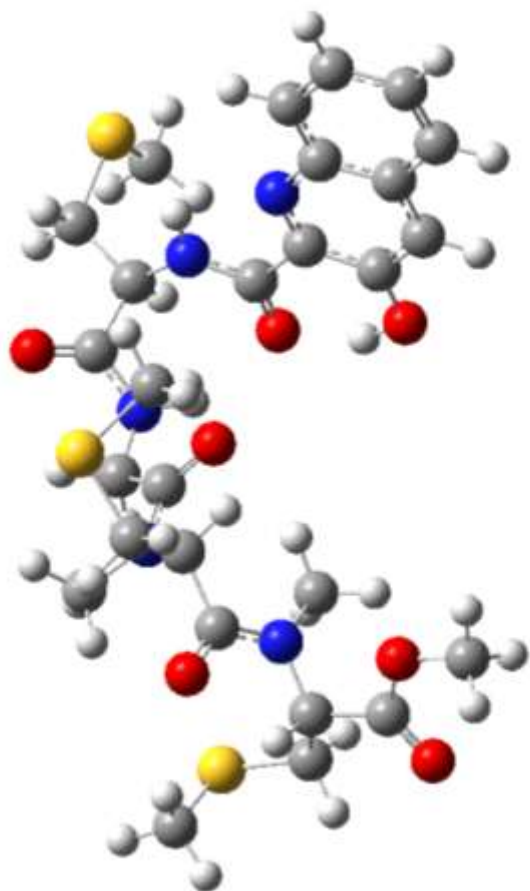
S30. *Ab initio* calculations

Thiochondrilline C

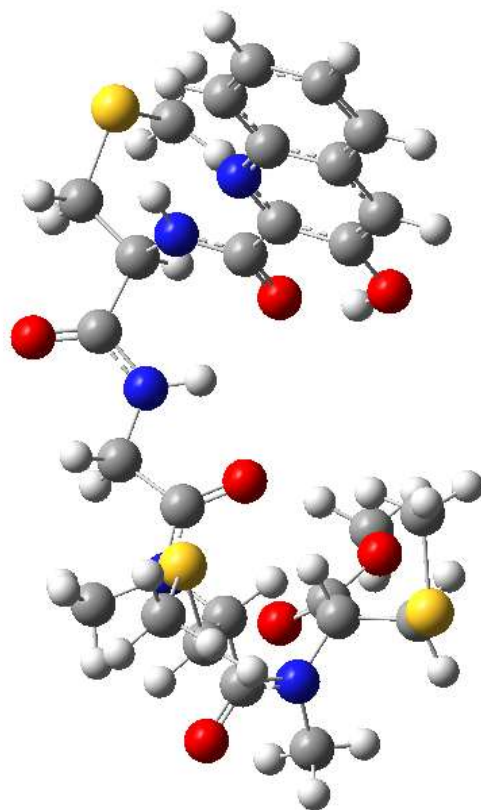
Using the DP4 Probability Method

	¹³ C data
<i>R</i>	97.50%
<i>SH-R</i>	2.50%

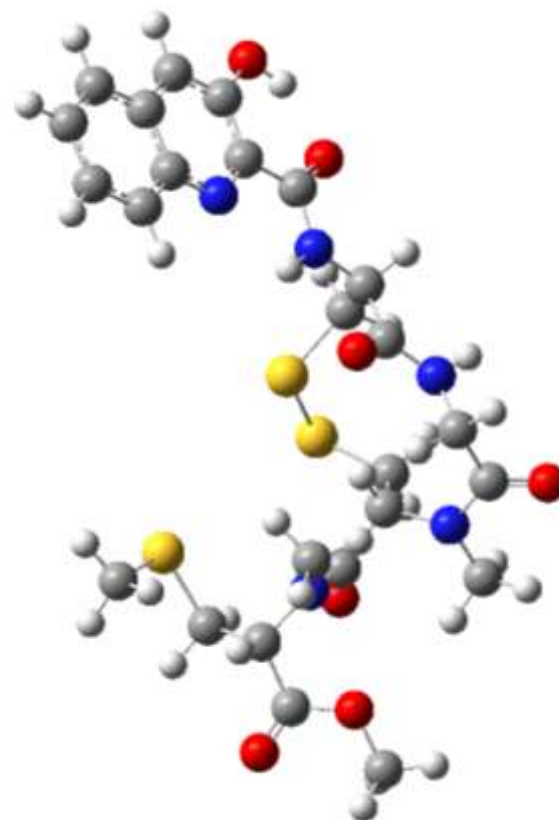
Thiochondrilline C			<i>R</i>		<i>S</i>		<i>SH-trans-R</i>		<i>SH-trans-S</i>	
Position	Observed	Observed	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
	¹ H	¹³ C	¹ H	¹³ C	¹ H	¹³ C	¹ H	¹³ C	¹ H	¹³ C
1		170.1		174.4		170.2		172.2		166.8
2	5.04	58.0	4.17	64.4	5.31	61.0	5.68	55.7	3.28	62.8
3		169.0		172.5		166.5		170.4		170.5
4	5.13	58.1	4.33	60.5	4.68	55.7	5.34	56.3	5.28	56.1
5		168.8		171.3		165.6		170.5		171.3
6	5.20	44.6	4.59	45.1	5.32	46.2	5.02	42.1	4.95	42.2
	3.79		3.49		3.49		3.25		3.20	
7-NH	7.01		4.46		5.07		7.63		7.53	
8		169.2		169.5		169.3		169.2		169.5
9	4.80	54.4	4.47	55.5	4.61	56.4	4.31	57.4	4.30	63.4
10-NH	8.86		9.39		9.13		8.49		8.48	
11		168.1		166.0		168.8		170.2		170.3
12	2.92	33.9	3.46	42.0	2.68	41.8	2.60	38.4	2.43	37.5
	3.12		3.76		3.05		2.66		3.51	
13	2.12	15.9	1.94	18.1	2.47	23.0	1.97	19.0	2.07	22.9
14	3.20	33.2	3.13	39.8	3.19	38.6	2.72	30.3	2.83	35.2
15	4.00	43.2	3.65	41.6	3.48	42.8	2.83	32.3	2.87	32.3
	2.70		2.23		2.25		2.60		2.54	
16	2.86	30.7	2.75	32.8	2.80	31.1	2.74	34.8	2.80	29.9
17	3.66	43.6	4.33	46.4	4.30	47.2	3.23	32.0	3.18	31.8
	3.13		1.80		1.94		1.91		2.92	
18	3.75	52.9	3.67	51.3	4.20	55.3	1.97	52.2	3.50	54.1
21		134.0		139.4		136.8		137.4		137.6
22		153.7		153.7		158.4		158.5		158.4
22-OH	11.31		10.20		12.21		12.50		12.52	
23	7.64	120.9	7.59	126.9	7.50	123.0	7.48	122.7	7.45	122.5
24		132.4		129.2		135.0		135.1		135.0
25	7.70	126.6	7.80	128.9	7.79	129.0	7.78	128.9	7.75	128.7
26	7.54	129.1	7.70	130.1	7.69	131.4	7.68	131.0	7.67	131.0
27	7.56	127.7	7.80	128.8	7.73	128.9	7.69	128.6	7.70	128.6
28	7.97	129.8	8.22	131.3	8.18	132.9	8.10	132.8	8.12	132.9
29		141.7		138.7		142.8		142.6		142.5



Thiochondrilline A



Thiochondrilline B



Thiochondrilline C