

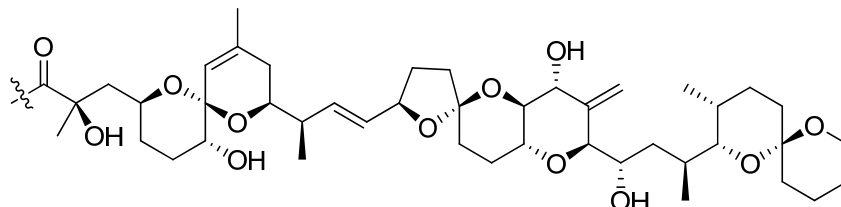
Isolation and Structural Identification of new Diol
Esters of Okadaic Acid and Dinophysistoxin-1 from
the Cultured *Prorocentrum lima*

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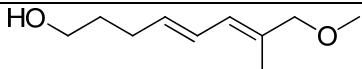
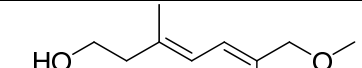
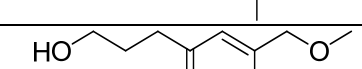
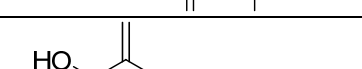
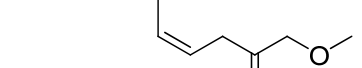
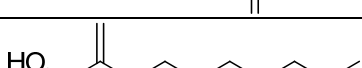
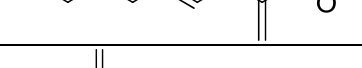
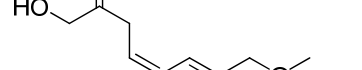
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Table S1. (A) OA diol and (B) DTX-1 diol derivatives previously isolated from *Prorocentrum* / *Dinophysis* species.

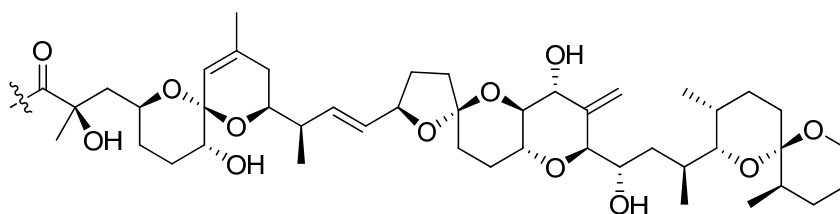
(A)



OA-diols	structure	molecular formula [M+NH ₄] ⁺	Ref.
D4		C ₄₈ H ₇₄ O ₁₄ 892.5422	23
D6		C ₅₀ H ₇₆ O ₁₄ 918.5597	8
D6		C ₅₀ H ₇₈ O ₁₄ 920.5735	15
D7		C ₅₁ H ₇₈ O ₁₄ 932.5732	24
D7		C ₅₁ H ₇₈ O ₁₄ 932.5732	6
D8		C ₅₂ H ₈₀ O ₁₄ 946.5892	6
D8		C ₅₃ H ₈₂ O ₁₄ 960.6048	17
D8		C ₅₂ H ₈₀ O ₁₄ 946.5892	25
D8		C ₅₂ H ₈₀ O ₁₄ 946.5892	This study
D9		C ₅₃ H ₈₂ O ₁₄ 960.6048	24
D9		C ₅₃ H ₈₂ O ₁₄ 960.6048	6
D9		C ₅₃ H ₈₂ O ₁₄ 960.6048	9
T9		C ₅₃ H ₈₂ O ₁₅ 970.5997	8
D9		C ₅₃ H ₈₂ O ₁₆ 992.5947	8

D9		$C_{53}H_{82}O_{14}$ 960.6048	16
D9		$C_{53}H_{82}O_{14}$ 960.6048	16
D9		$C_{53}H_{82}O_{14}$ 960.6048	This study
D10		$C_{54}H_{82}O_{14}$ 972.6048	8
D10		$C_{54}H_{82}O_{14}$ 972.6048	11
D10		$C_{54}H_{84}O_{14}$ 972.6048	15
D10		$C_{54}H_{82}O_{14}$ 970.6205	16
D11		$C_{55}H_{84}O_{14}$ 986.6205	This study

(B)



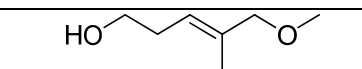
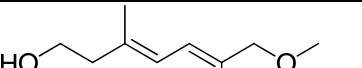
DTX-1-diols	structure	molecular formula $[M+NH_4]^+$	Ref.
D6		$C_{51}H_{80}O_{14}$ 934.5892	15
D9		$C_{54}H_{84}O_{14}$ 974.6205	10

Table S2. Spectral Data for Dinophysistoxin-1 (DTX-1) and DTX-1 part of compound **1** in CD₃OD (500 MHz, ¹H).

	$\delta_{\text{H}}(\mathbf{1})$	$\delta_{\text{C}}(\mathbf{1})$	$\delta_{\text{C}}(\text{DTX-1})$
1		176.2.0, C	182.7
2		75.5, C	76.5
3	1.89 (m)	46.5, CH ₂	46.6
4	3.97 (t, 2.5)	68.1, CH	69.0
5	1.38 (m); 1.74 (m)	33.4, CH ₂	33.4
6	1.65 (m); 1.96 (m)	28.0, CH ₂	28.2
7	3.35 (m)	73.0, CH	73.4
8		97.6, C	97.6
9	5.23 (br s)	123.4, CH	123.7
10		139.6, C	139.4
11	1.83 (m); 1.91 (m)	34.0, CH ₂	34.0
12	3.64 (m)	72.3, CH	71.8
13	2.33, m	42.9, CH	43.3
14	5.77 (dd, 15.2, 8.1)	136.5, CH	137.6
15	5.54 (dd, 15.2, 7.6)	132.3, CH	131.9
16	4.56 (m)	80.4, CH	80.6
17	1.62 (m); 2.20 (m)	31.6, CH ₂	31.5
18	1.86 (m); 2.00 (m)	38.0, CH ₂	38.1
19		107.1, C	107.0
20	1.87 (m)	34.1, CH ₂	34.1
21	1.76 (m); 1.89 (m)	27.7, CH ₂	27.7
22	3.64 (m)	71.2, CH	71.3
23	3.36 (t, 9.8)	78.3, CH ₂	78.2
24	4.10, m	71.7, CH	72.1
25		147.1, C	147.1
26	3.93 (d, 9.1)	86.5, CH	86.4
27	4.10 (m)	66.1, CH	66.1
28	0.94 (m); 1.34 (m)	36.8, CH ₂	36.8
29	1.89 (m)	32.4, CH	32.4
30	3.24 (dd, 10.2, 2.0)	76.5, CH	76.5
31	1.79 (m)	28.7, CH	28.7
32	1.40 (m); 1.99 (m)	27.5, CH ₂	27.5
33	1.12 (m); 1.95 (m)	26.9, CH ₂	26.9
34		99.4, C	99.3
35	1.52 (m)	40.4, CH ₂	40.4
36	1.45 (m); 1.63 (m)	28.6, CH ₂	28.6
37	1.51 (m); 1.63 (m)	27.4, CH ₂	27.5
38	3.48 (m); 3.64 (m)	60.9, CH ₂	60.9
39	1.44 (s)	25.7, CH ₃	27.9
40	1.73 (s)	23.1, CH ₃	23.2
41	1.03 (d, 6.9)	16.5, CH ₃	16.7
42	5.03 (br s); 5.32 (br s)	112.4, CH ₂	112.3
43	1.03 (d, 6.4)	16.5, CH ₃	16.5
44	0.92 (d, 7.1)	11.1, CH ₃	11.1
45	0.93 (d, 6.6)	17.2, CH ₃	17.2

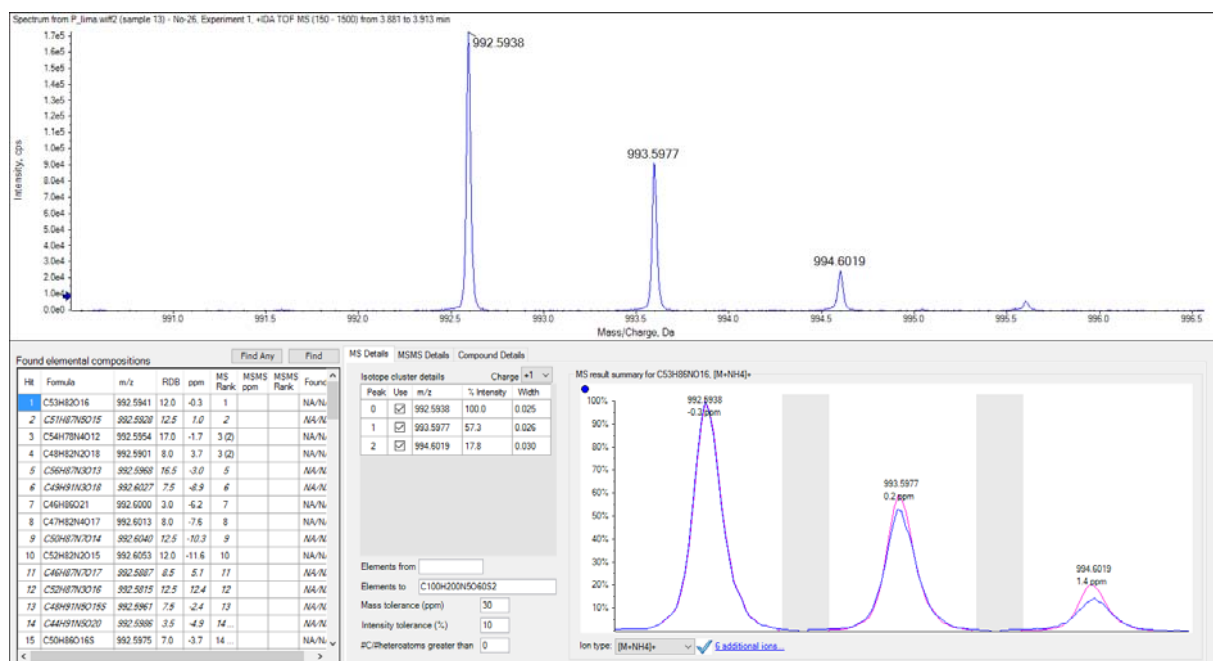
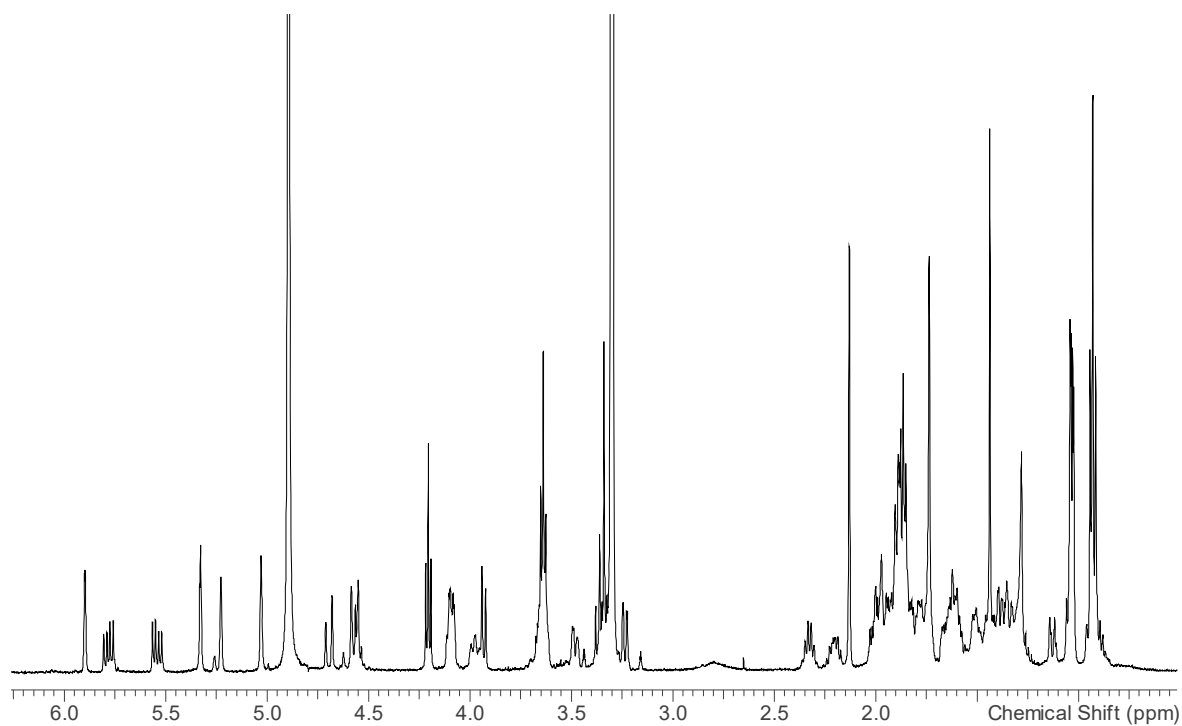


Figure S1. HRESIMS data for compound **1**.

(A)



(B)

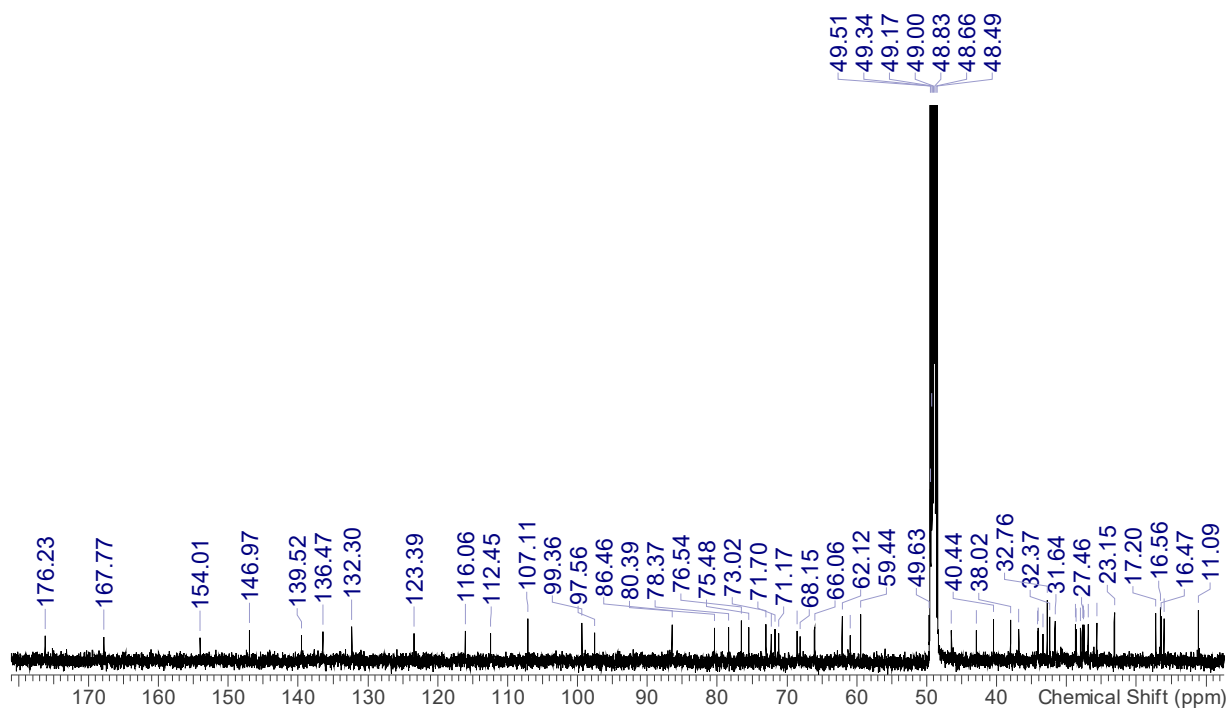


Figure S2. (A) ¹H NMR and (B) ¹³C NMR spectra of compound **1** measured at 500 MHz(¹H).

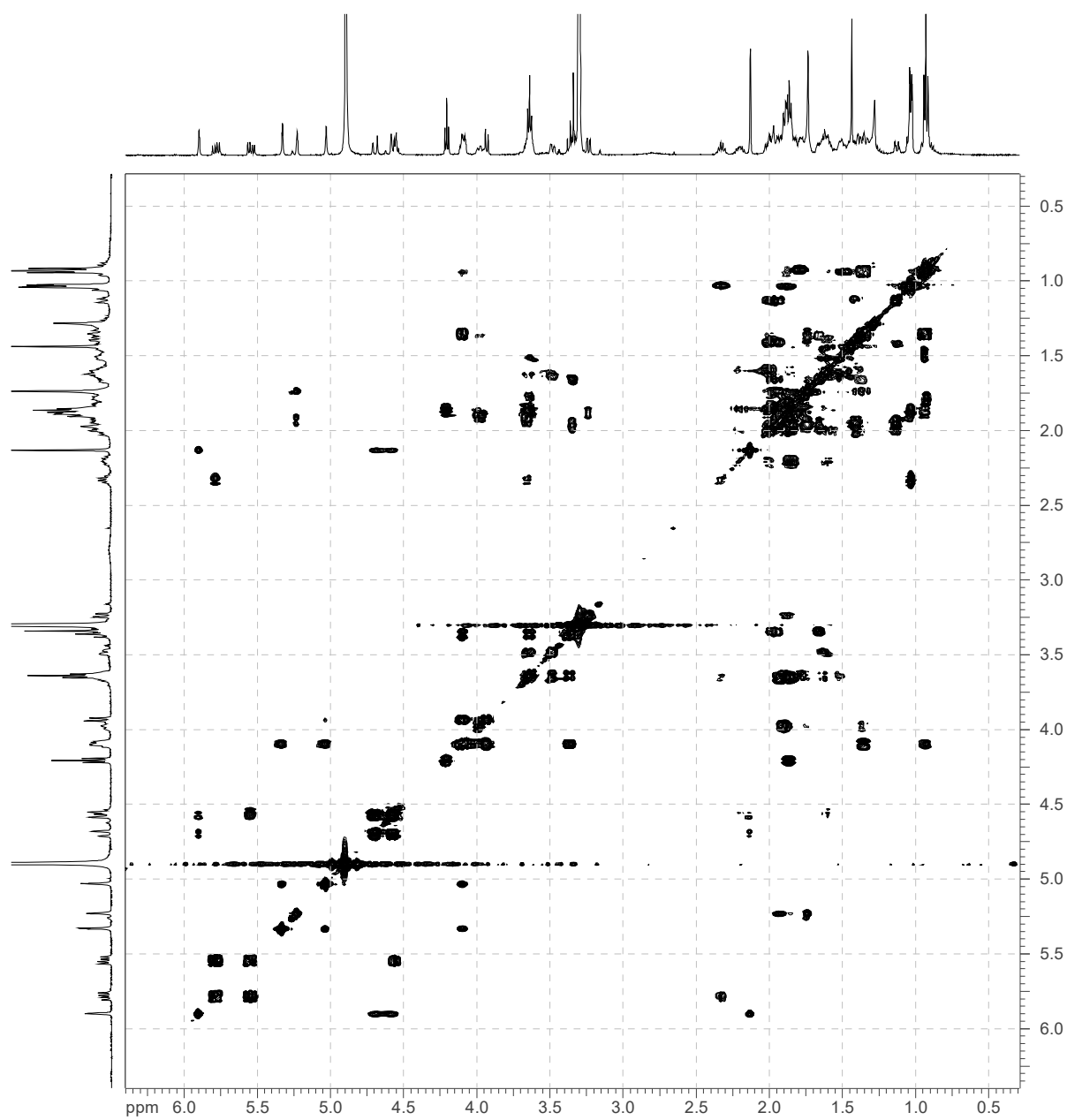


Figure S3. COSY spectrum of compound **1** measured at 500 MHz(¹H).

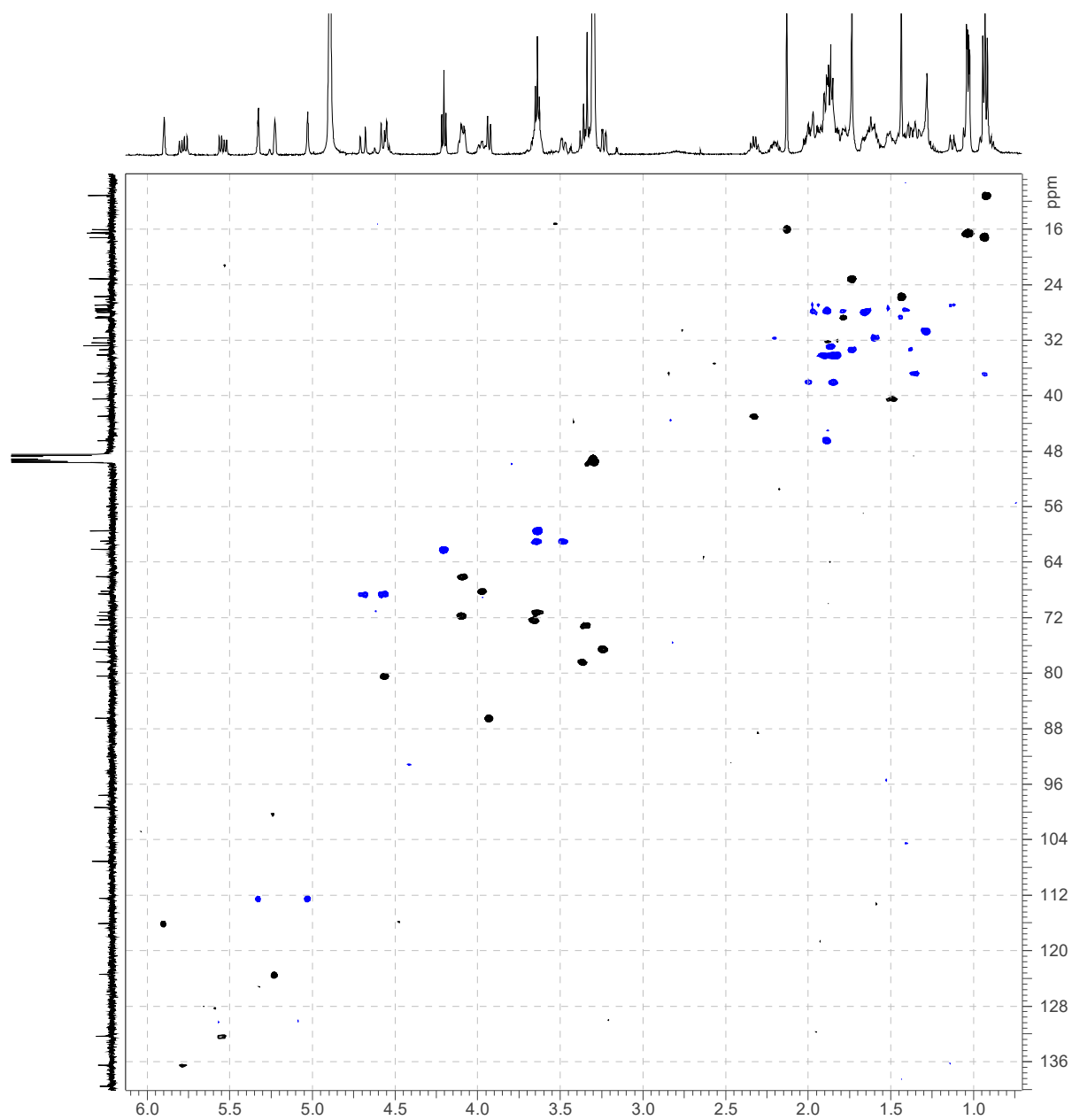


Figure S4. HSQC spectrum of compound **1** measured at 500 MHz(^1H).

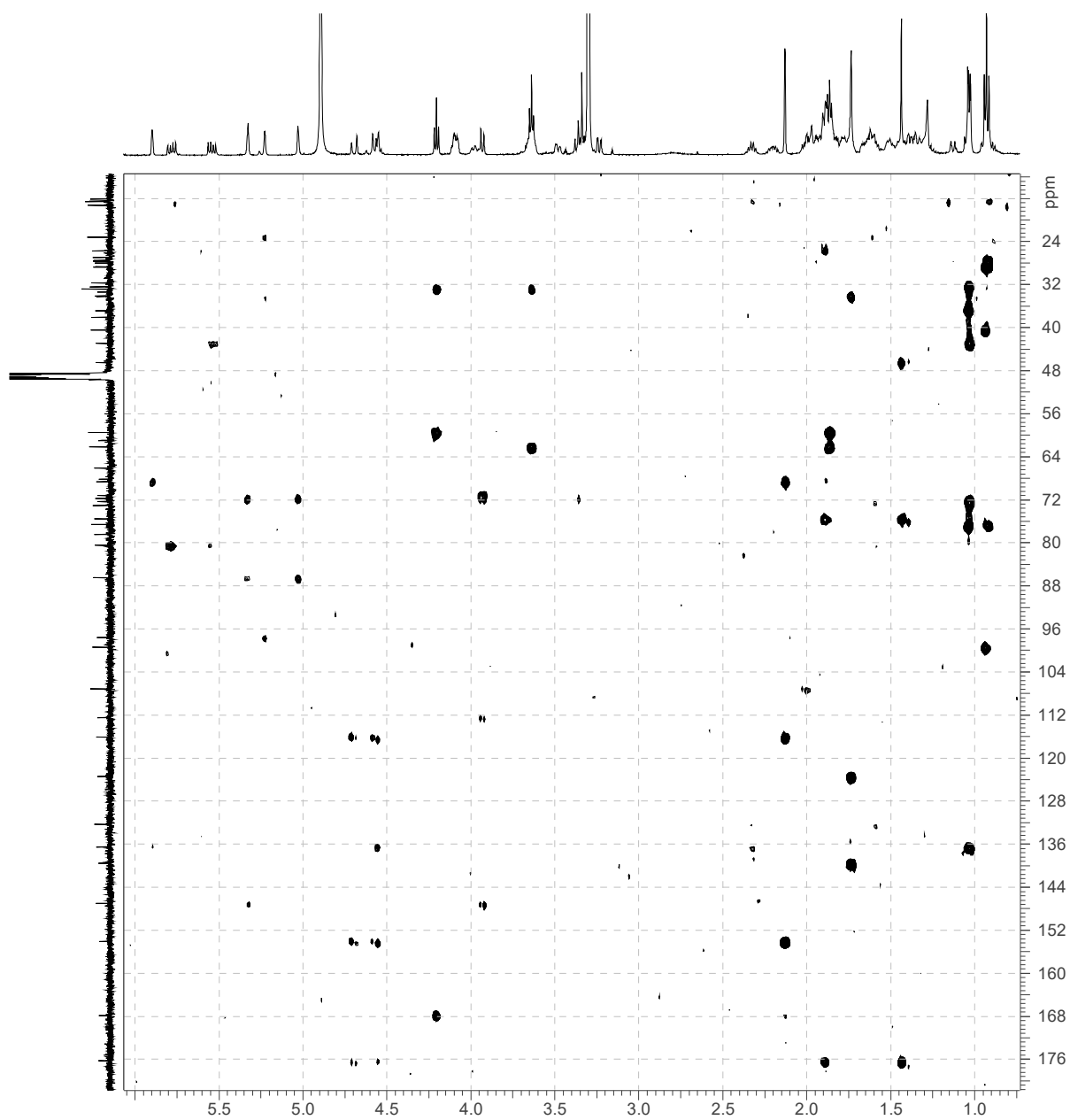




















Figure S5. HMBC spectrum of compound **1** measured at 500 MHz(^1H).

	A	B	C	D	E	F	G	H
1	Functional		Solvent?		Basis Set		Type of Data	
2	mPW1PW91		PCM		6-311G(d,p)		Shielding Tensors	
3								
4			Isomer 1	Isomer 2	Isomer 3	Isomer 4	Isomer 5	Isomer 6
5	sDP4+ (H data)	 41.00%	 59.00%	-	-	-	-	-
6	sDP4+ (C data)	 100.00%	 0.00%	-	-	-	-	-
7	sDP4+ (all data)	 100.00%	 0.00%	-	-	-	-	-
8	uDP4+ (H data)	 98.96%	 1.04%	-	-	-	-	-
9	uDP4+ (C data)	 99.85%	 0.15%	-	-	-	-	-
10	uDP4+ (all data)	 100.00%	 0.00%	-	-	-	-	-
11	DP4+ (H data)	 98.51%	 1.49%	-	-	-	-	-
12	DP4+ (C data)	 100.00%	 0.00%	-	-	-	-	-
13	DP4+ (all data)	 100.00%	 0.00%	-	-	-	-	-

Isomer 1 = (*E*)-form diol

Isomer 2 = (*Z*) form diol

Figure S6. DP4+ probability analysis for the diol moiety of compound **1**.

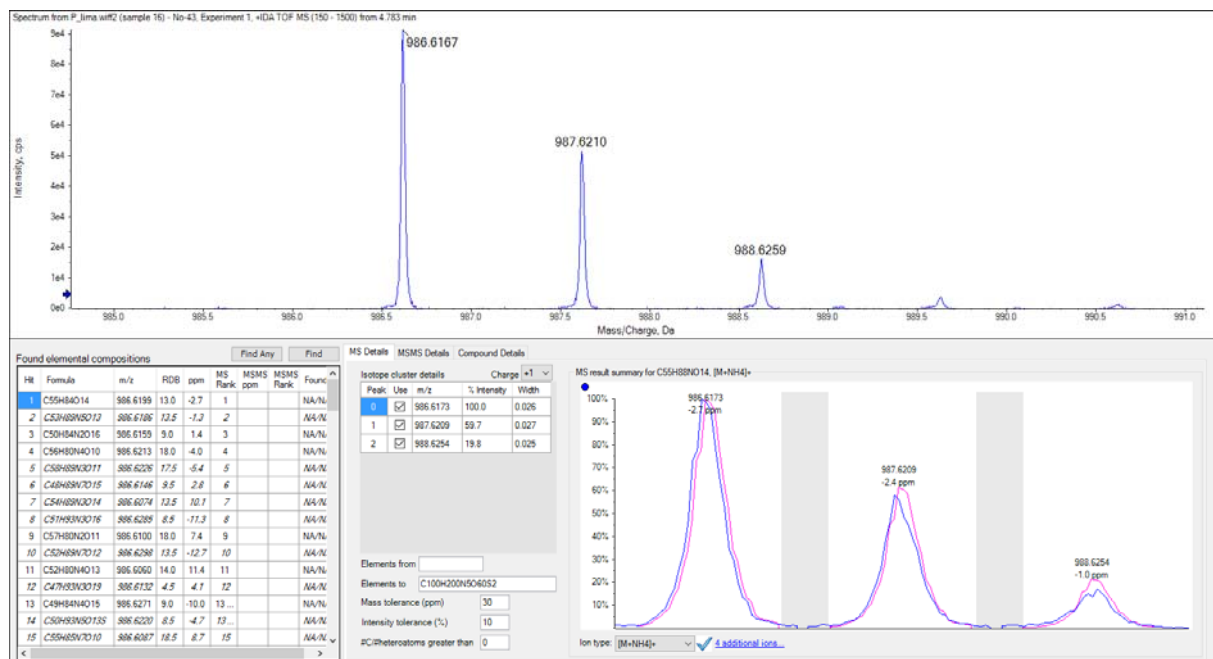
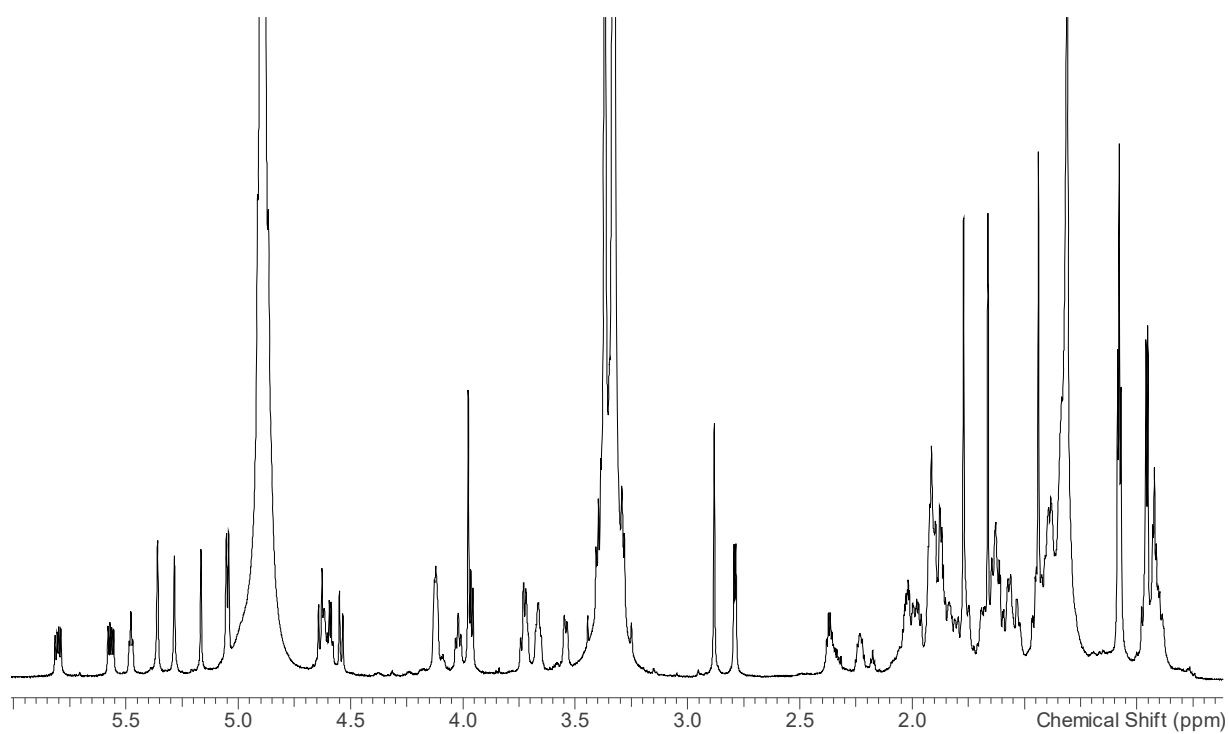


Figure S7. HRESIMS data of compound 2.

(A)



(B)

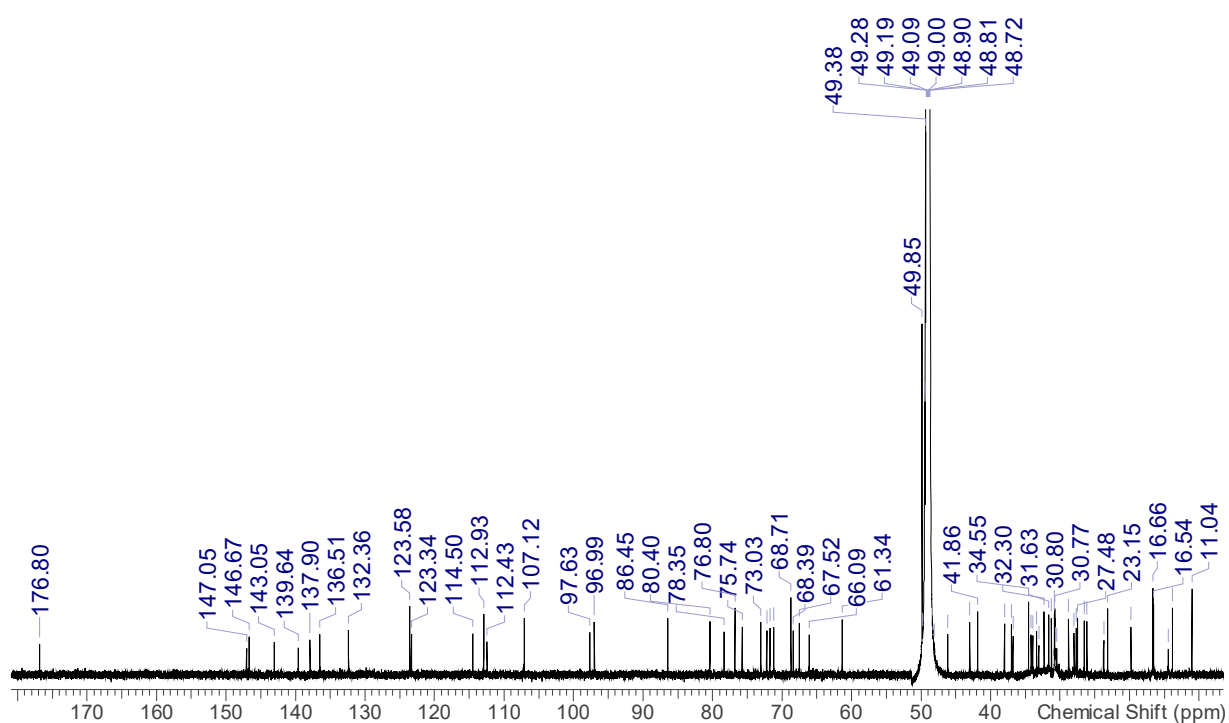


Figure S8. (A) ¹H NMR and (B) ¹³C NMR spectra of compound **2** measured at 900 MHz(¹H).

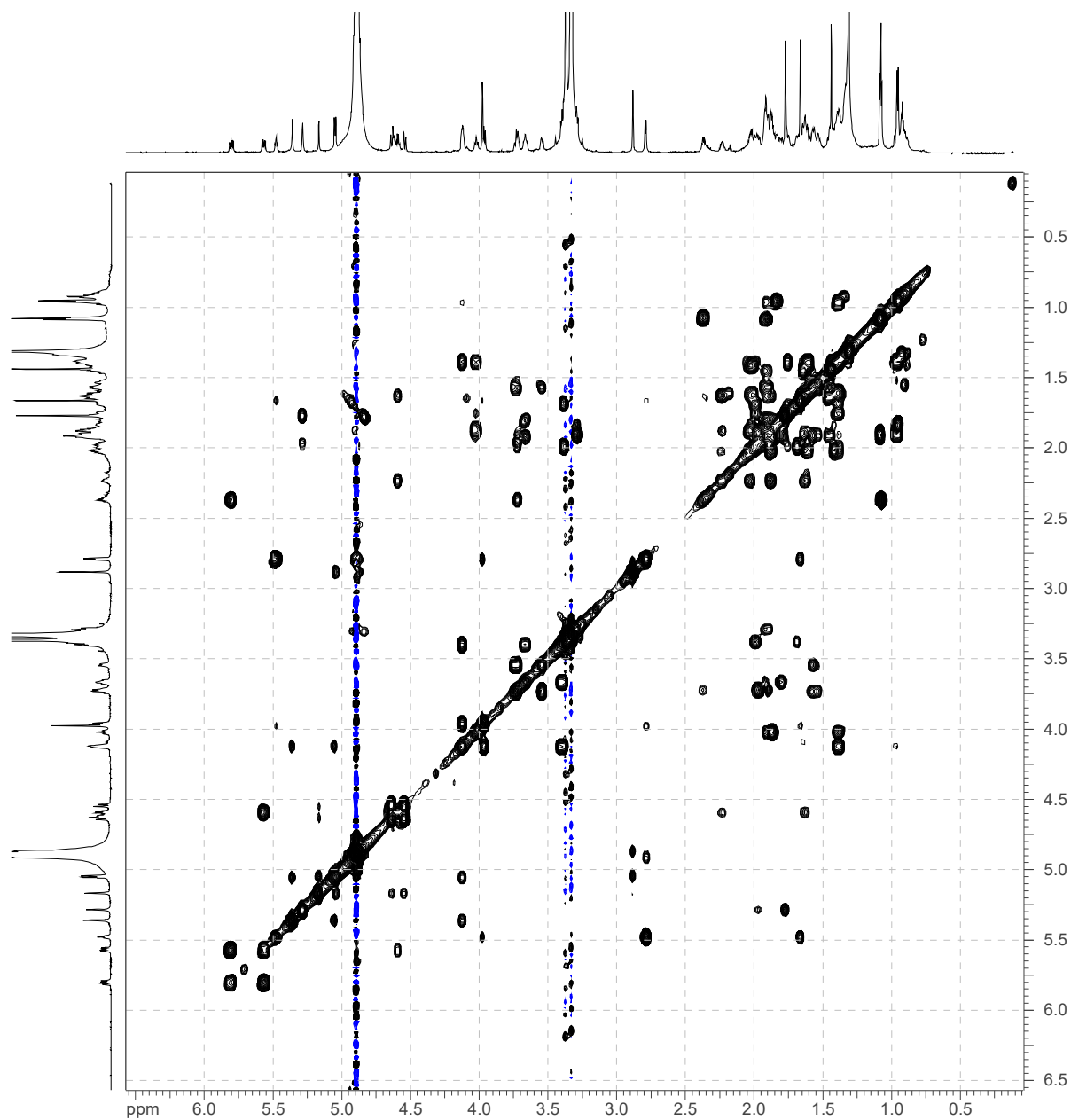


Figure S9. COSY spectrum of compound **2** measured at 900 MHz(^1H).

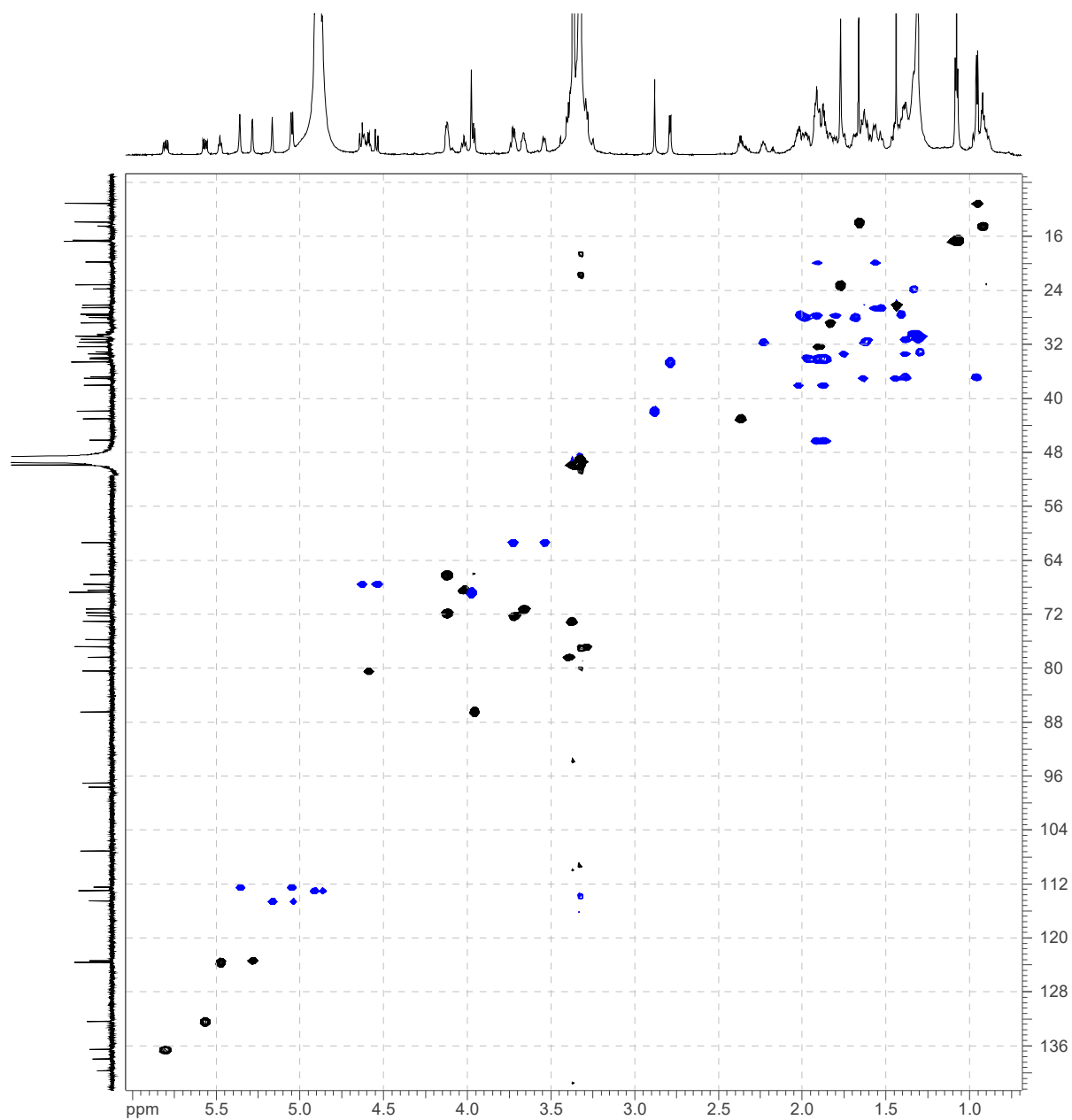


Figure S10. HSQC spectrum of compound **2** measured at 900 MHz(^1H).

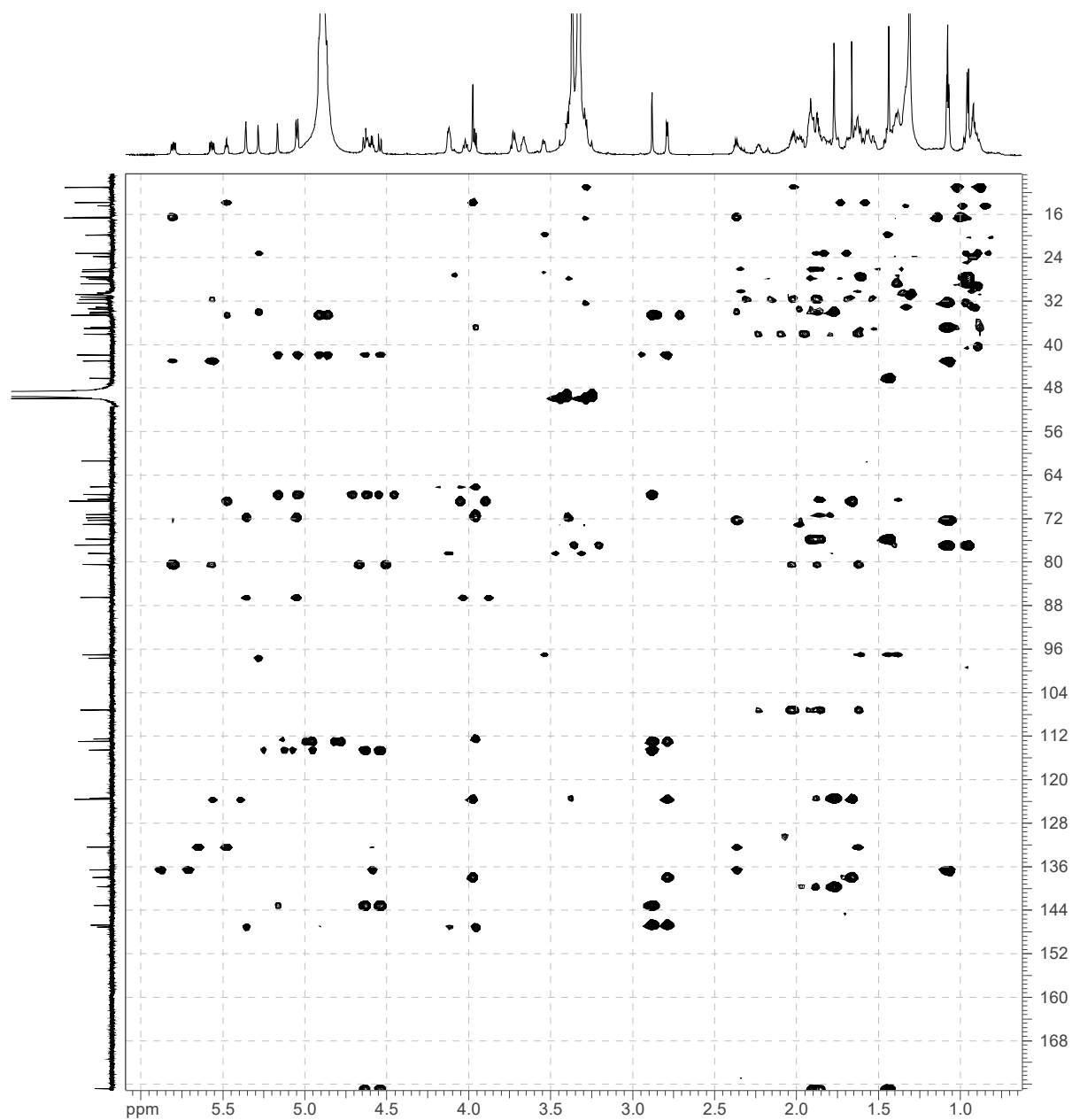


Figure S11. HMBC spectrum of compound **2** measured at 900 MHz(^1H).

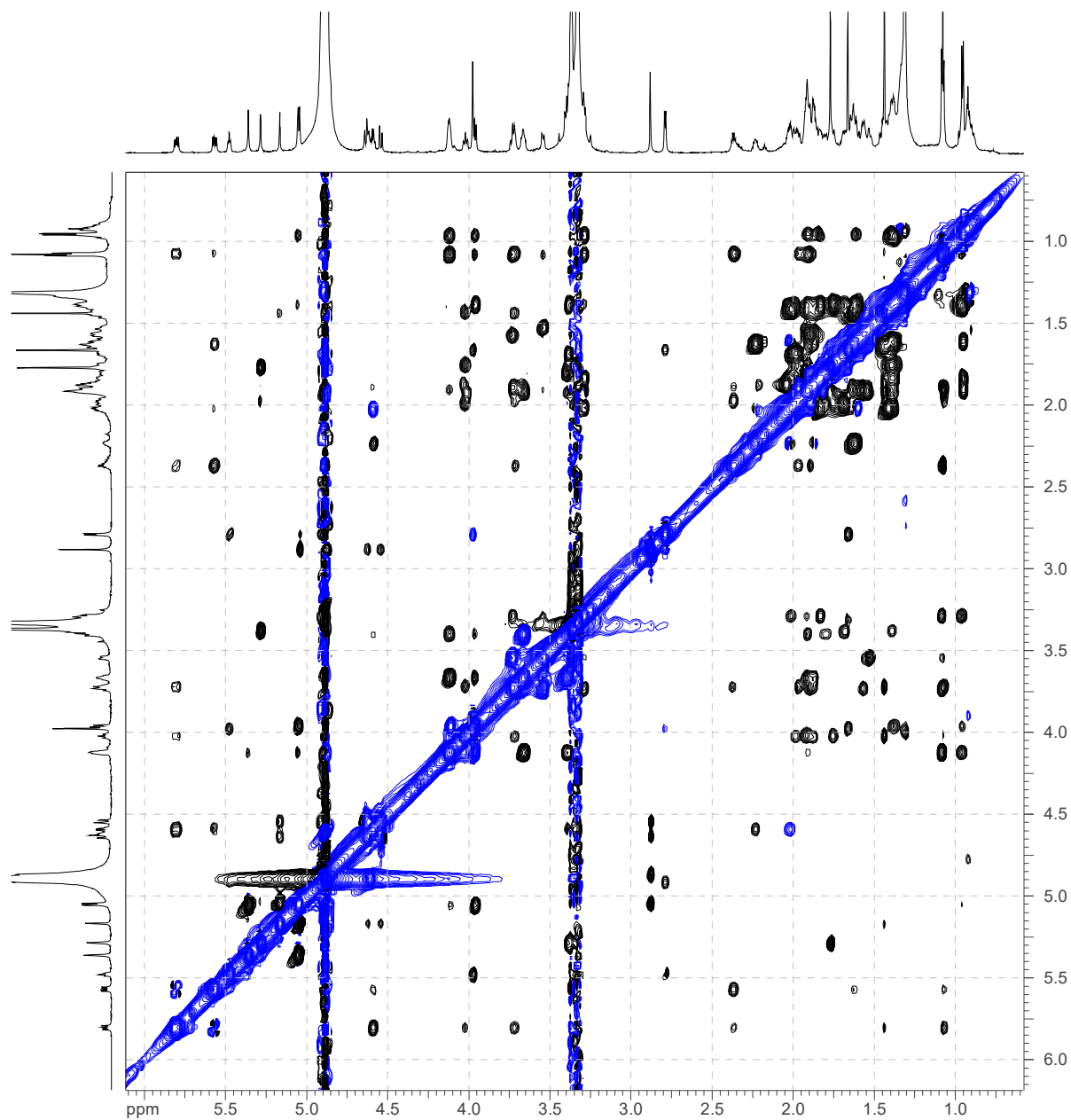


Figure S12. ROESY spectrum of compound **2** measured at 900 MHz(^1H).

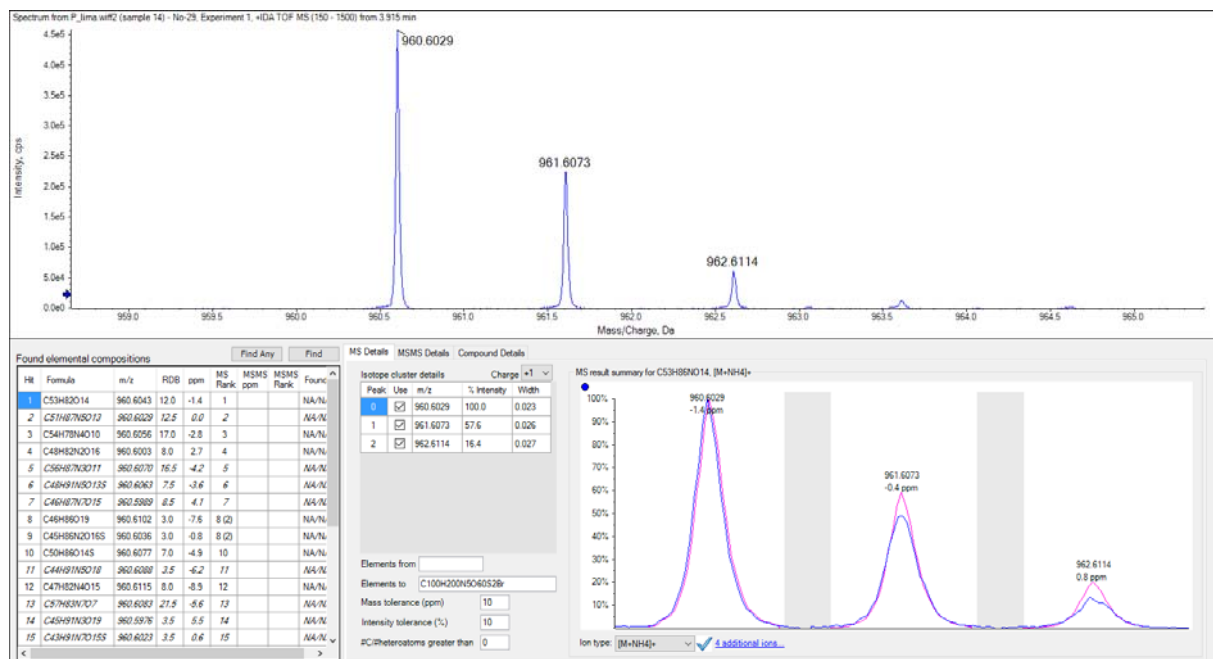
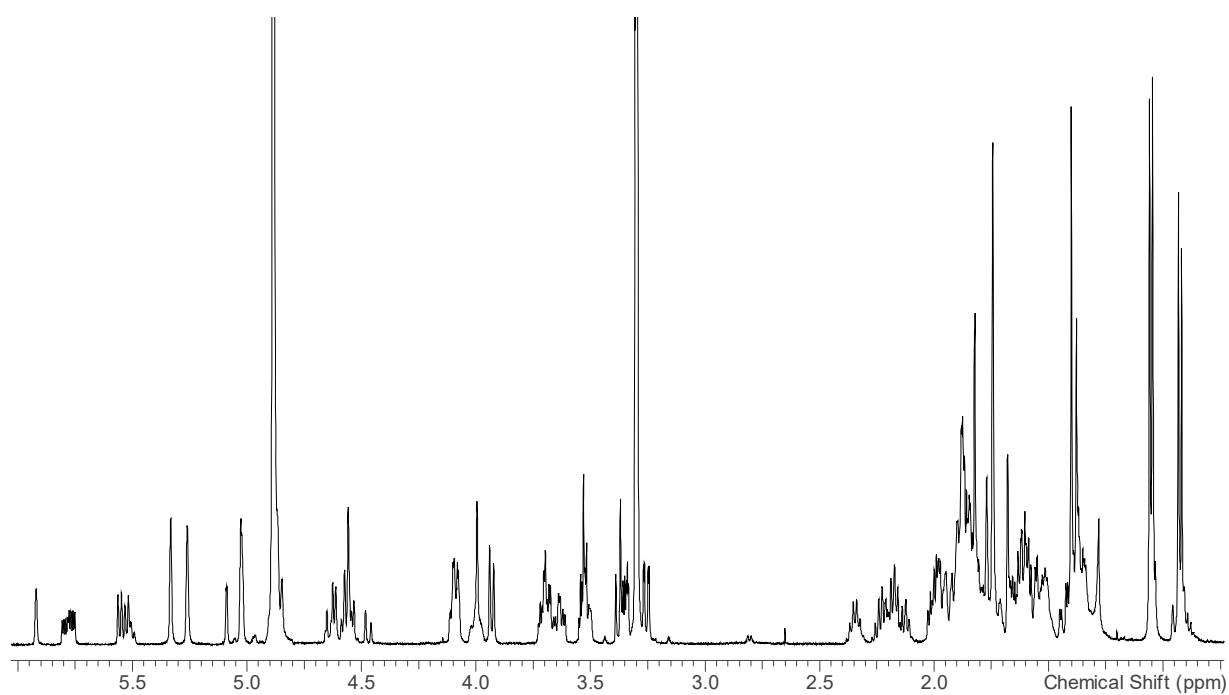


Figure S13. HRESIMS data of compound **3**.

(A)



(B)

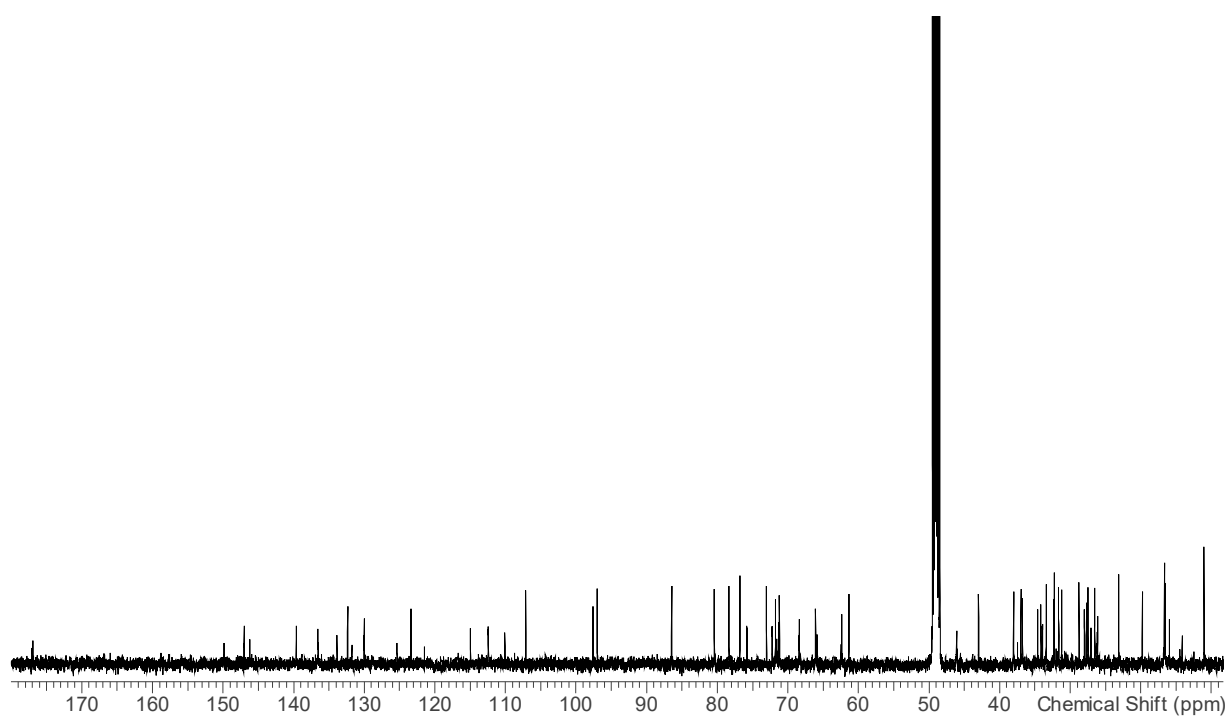


Figure S14. (A) ¹H NMR and (B) ¹³C NMR spectra of compound **3** measured at 500 MHz(¹H).

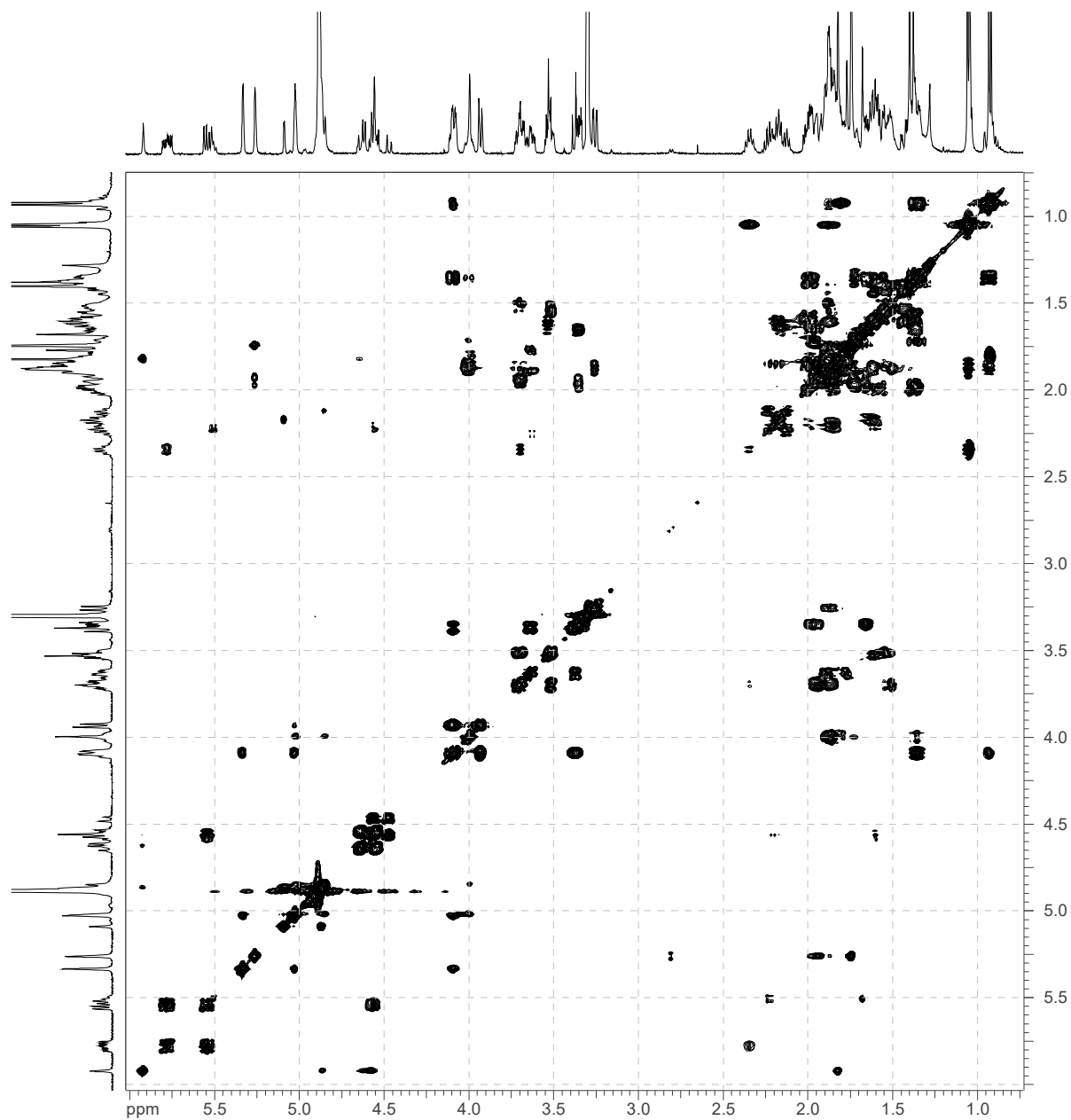


Figure S15. COSY spectrum of compound **3** measured at 500 MHz(¹H).

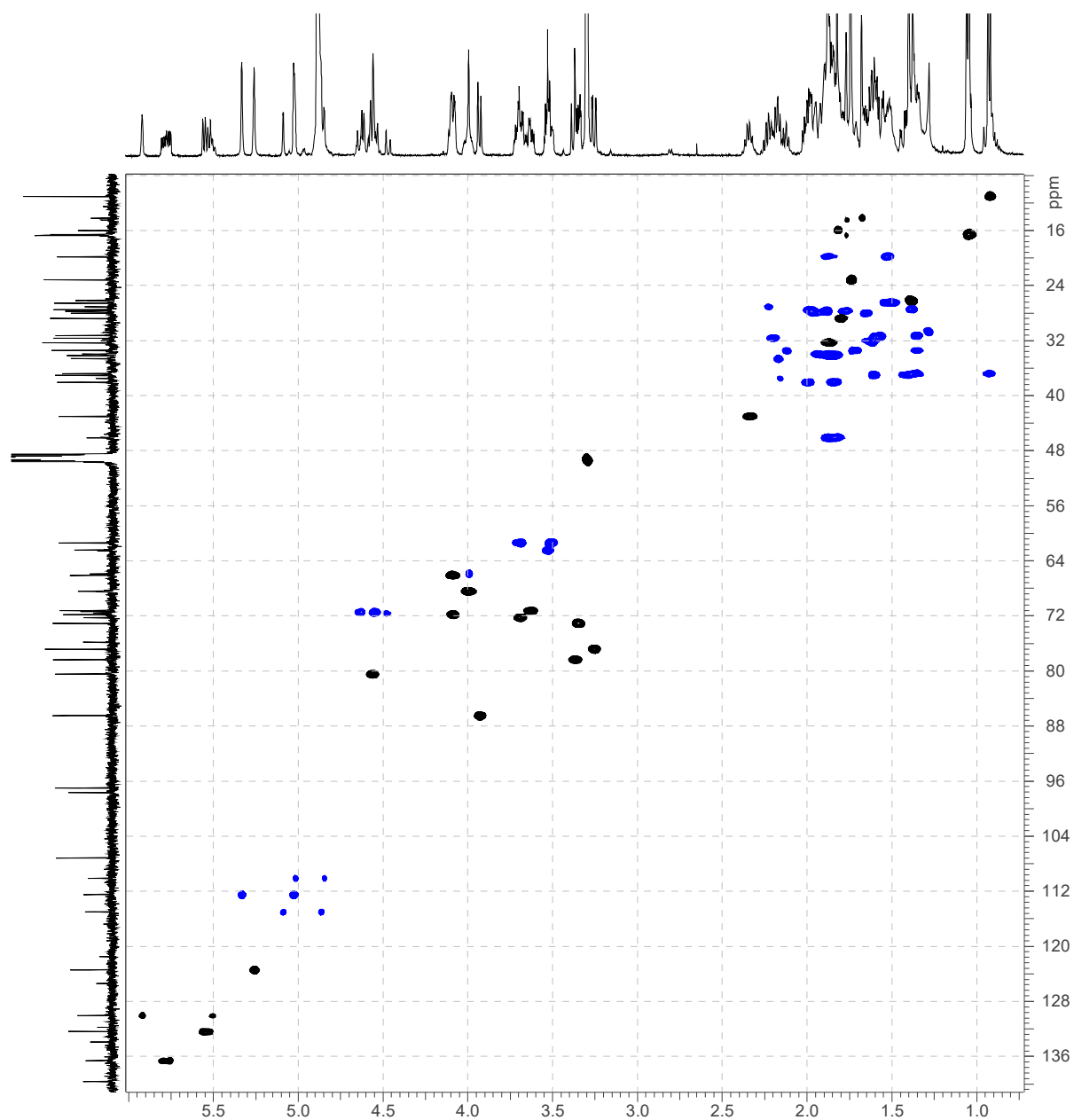


Figure S16. HSQC spectrum of compound **3** measured at 500 MHz(^1H).

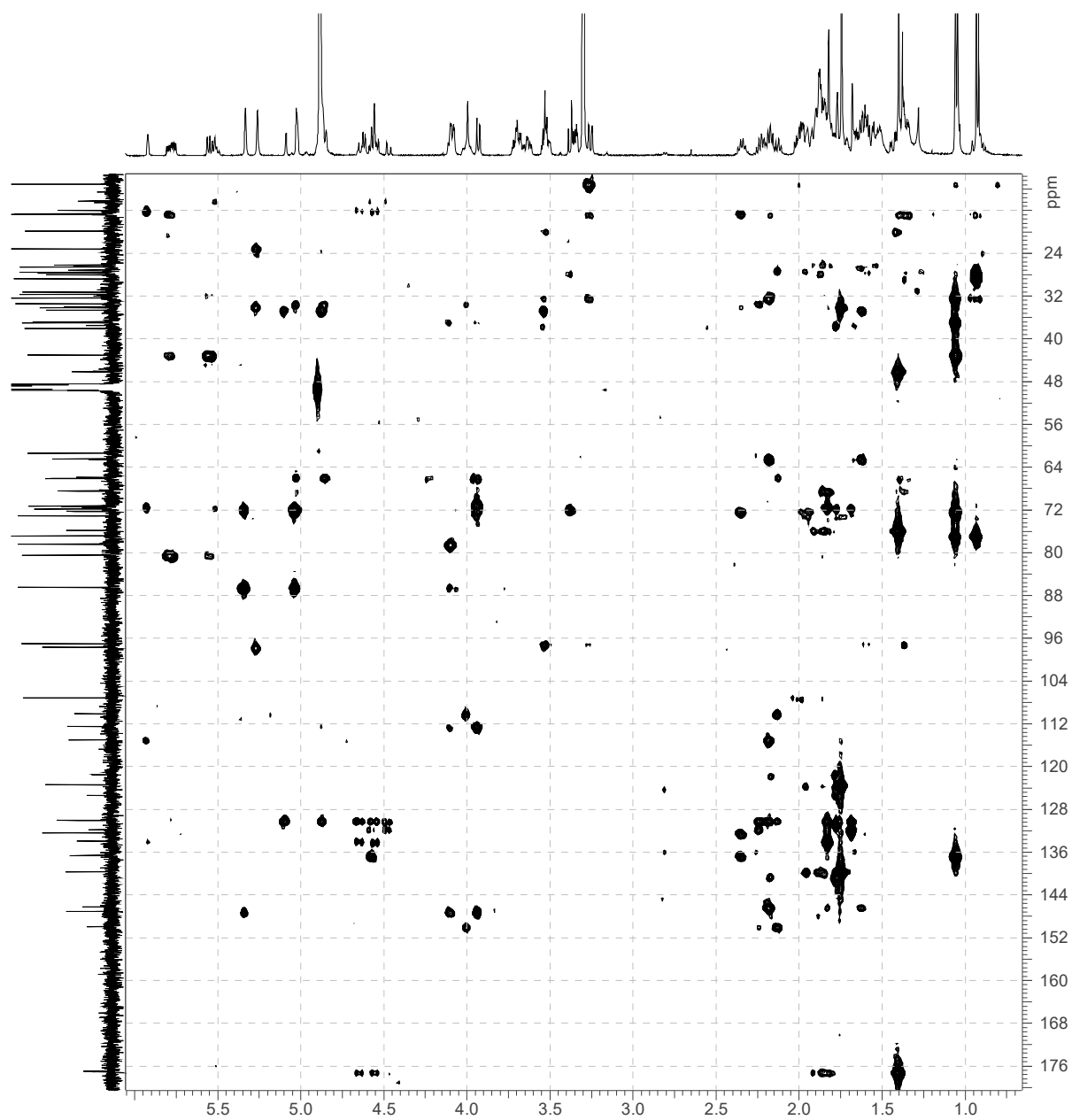




















Figure S17. HMBC spectrum of compound **3** measured at 500 MHz(^1H).

Functional mPW1PW91	Solvent? PCM	Basis Set 6-311G(d,p)	Type of Data Shielding Tensors						
				Isomer 1	Isomer 2	Isomer 3	Isomer 4	Isomer 5	Isomer 6
sDP4+ (H data)	 5.72%	 94.28%	-	-	-	-	-	-	
sDP4+ (C data)	 99.83%	 0.17%	-	-	-	-	-	-	
sDP4+ (all data)	 97.27%	 2.73%	-	-	-	-	-	-	
uDP4+ (H data)	 43.89%	 56.11%	-	-	-	-	-	-	
uDP4+ (C data)	 99.15%	 0.85%	-	-	-	-	-	-	
uDP4+ (all data)	 98.92%	 1.08%	-	-	-	-	-	-	
DP4+ (H data)	 4.53%	 95.47%	-	-	-	-	-	-	
DP4+ (C data)	 100.00%	 0.00%	-	-	-	-	-	-	
DP4+ (all data)	 99.97%	 0.03%	-	-	-	-	-	-	

Isomer 1 = (*E*) form diol

Isomer 2 = (*Z*) form diol

Figure S18. DP4+ probability analysis for the diol moiety of compound **3**.

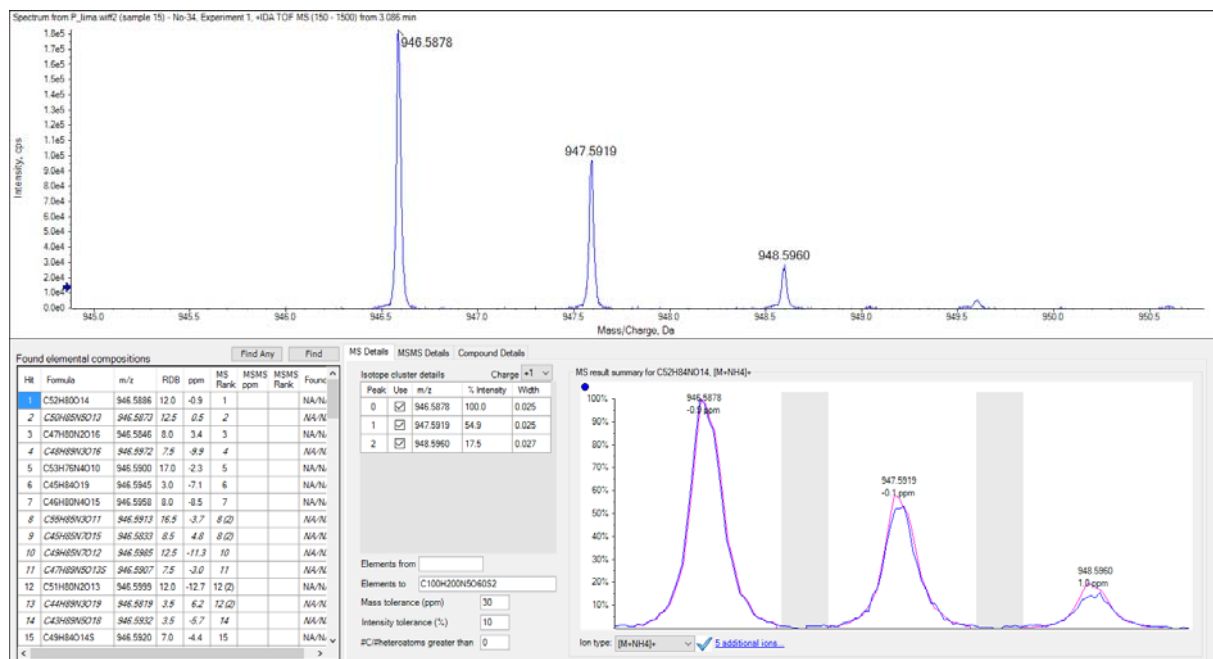
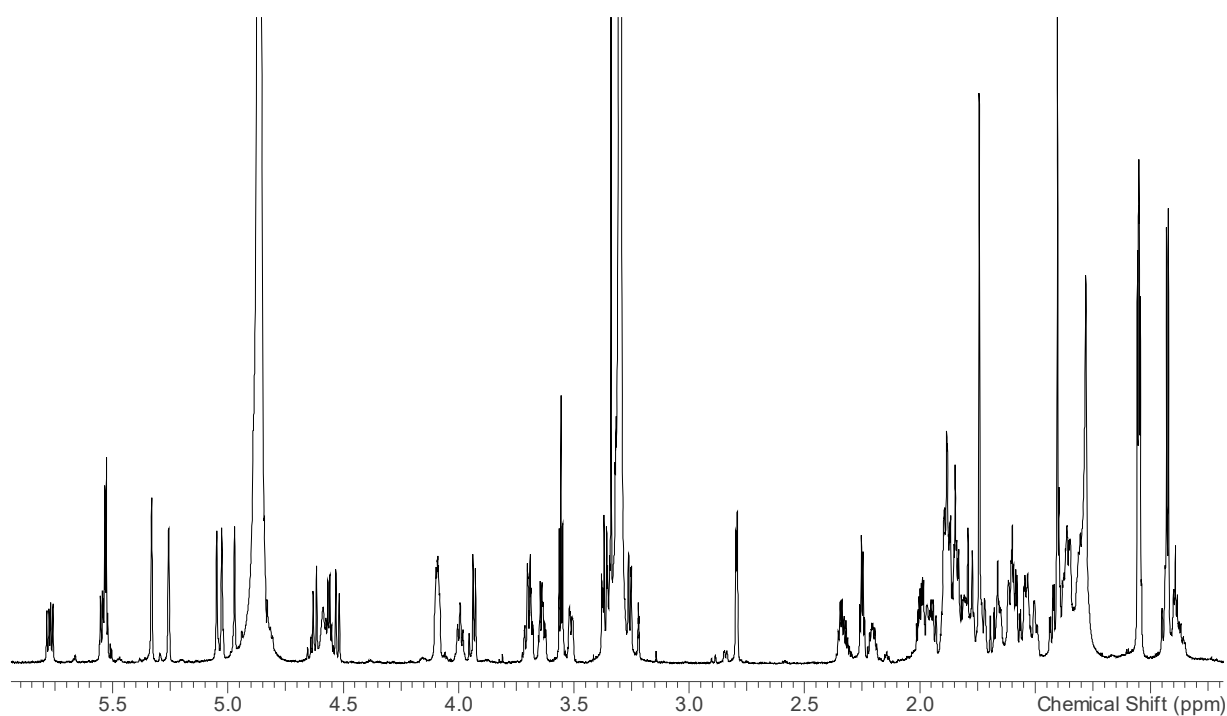


Figure S19. HRESIMS data of compound **4**.

(A)



(B)

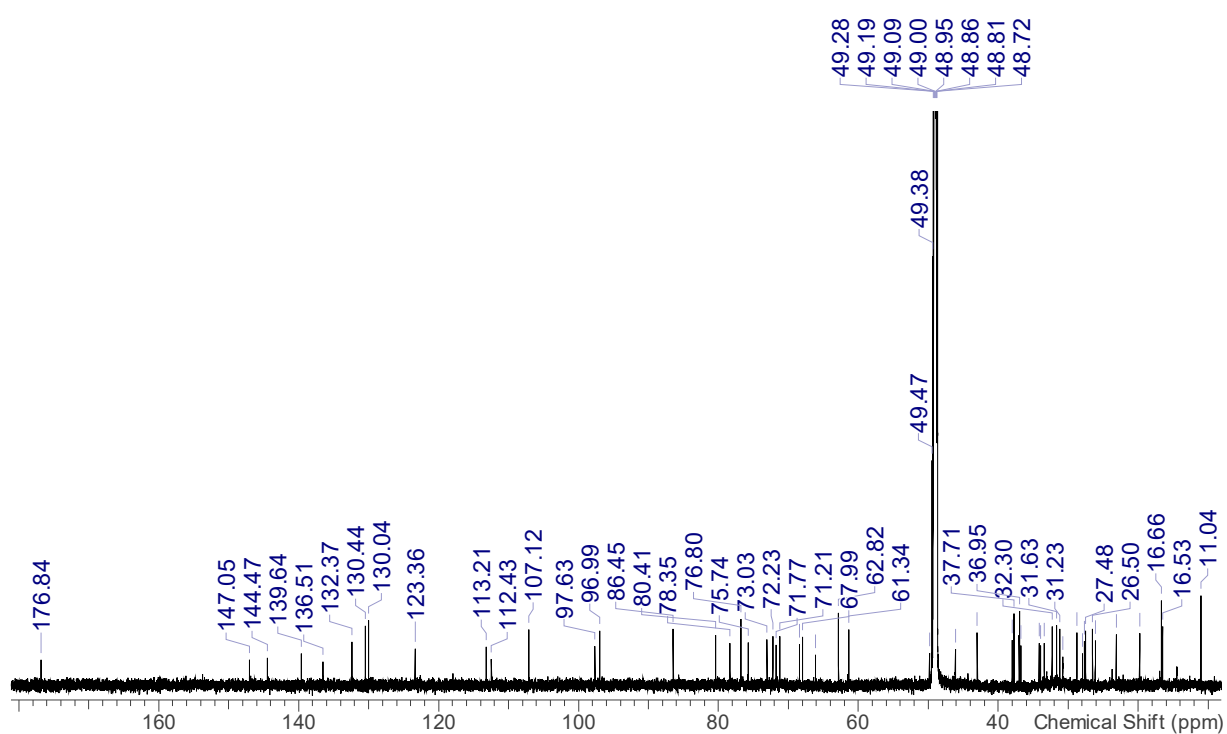


Figure S20. (A) ¹H NMR and (B) ¹³C NMR spectra of compound **4** measured at 900 MHz(¹H).

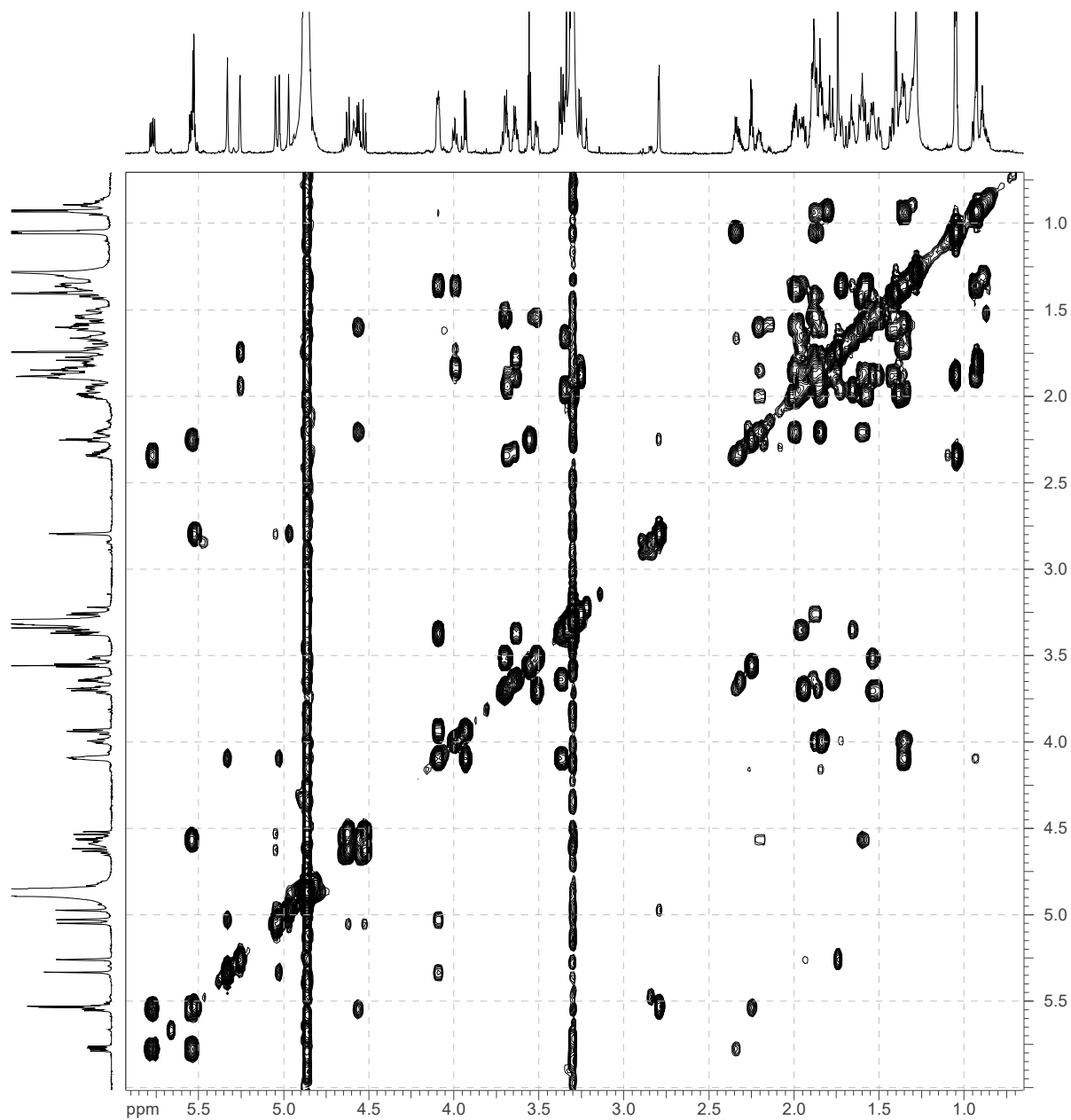


Figure S21. COSY spectrum of compound **4** measured at 900 MHz(^1H).

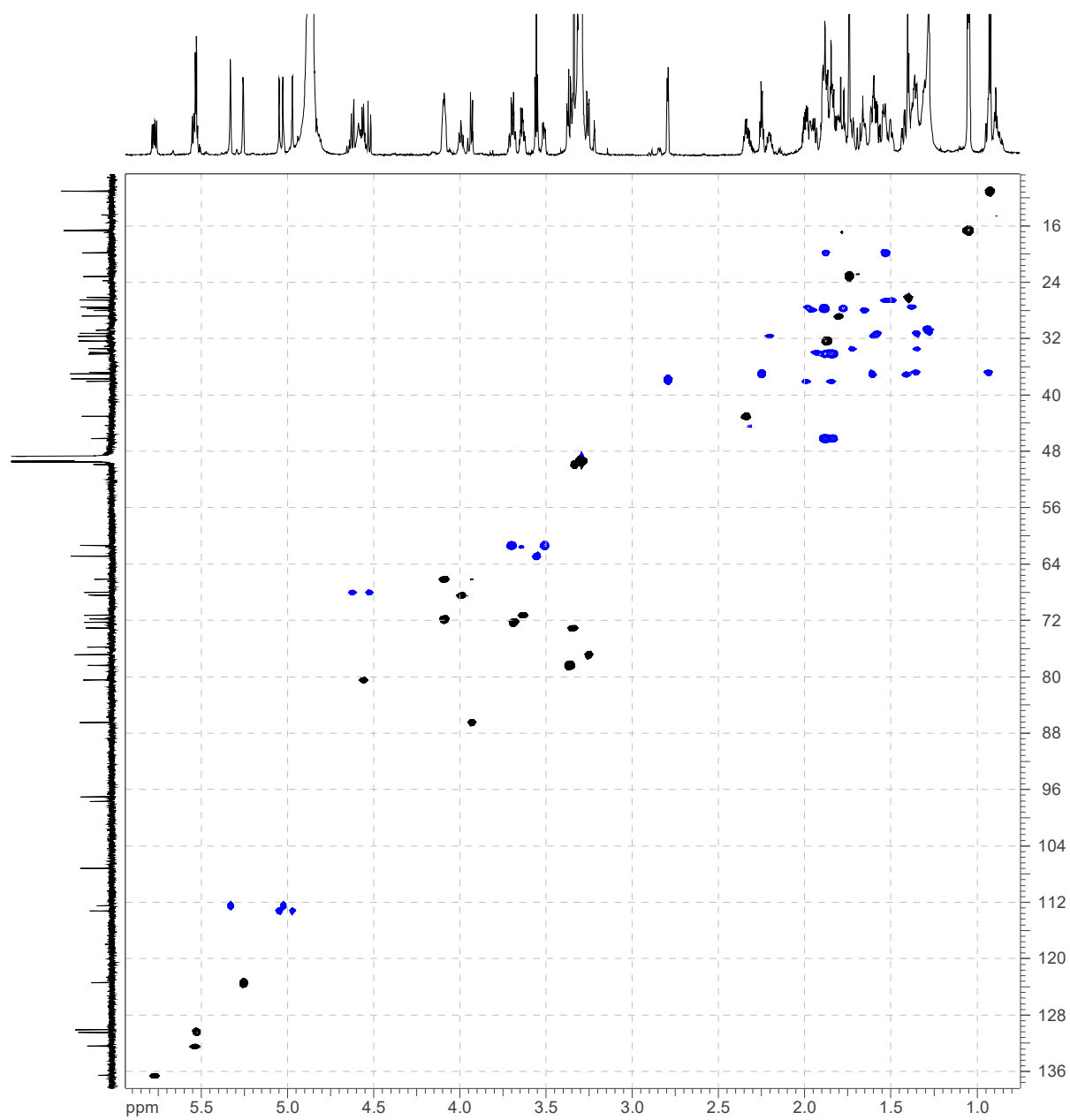


Figure S22. HSQC spectrum of compound **4** measured at 900 MHz(^1H).

HMBC.esp

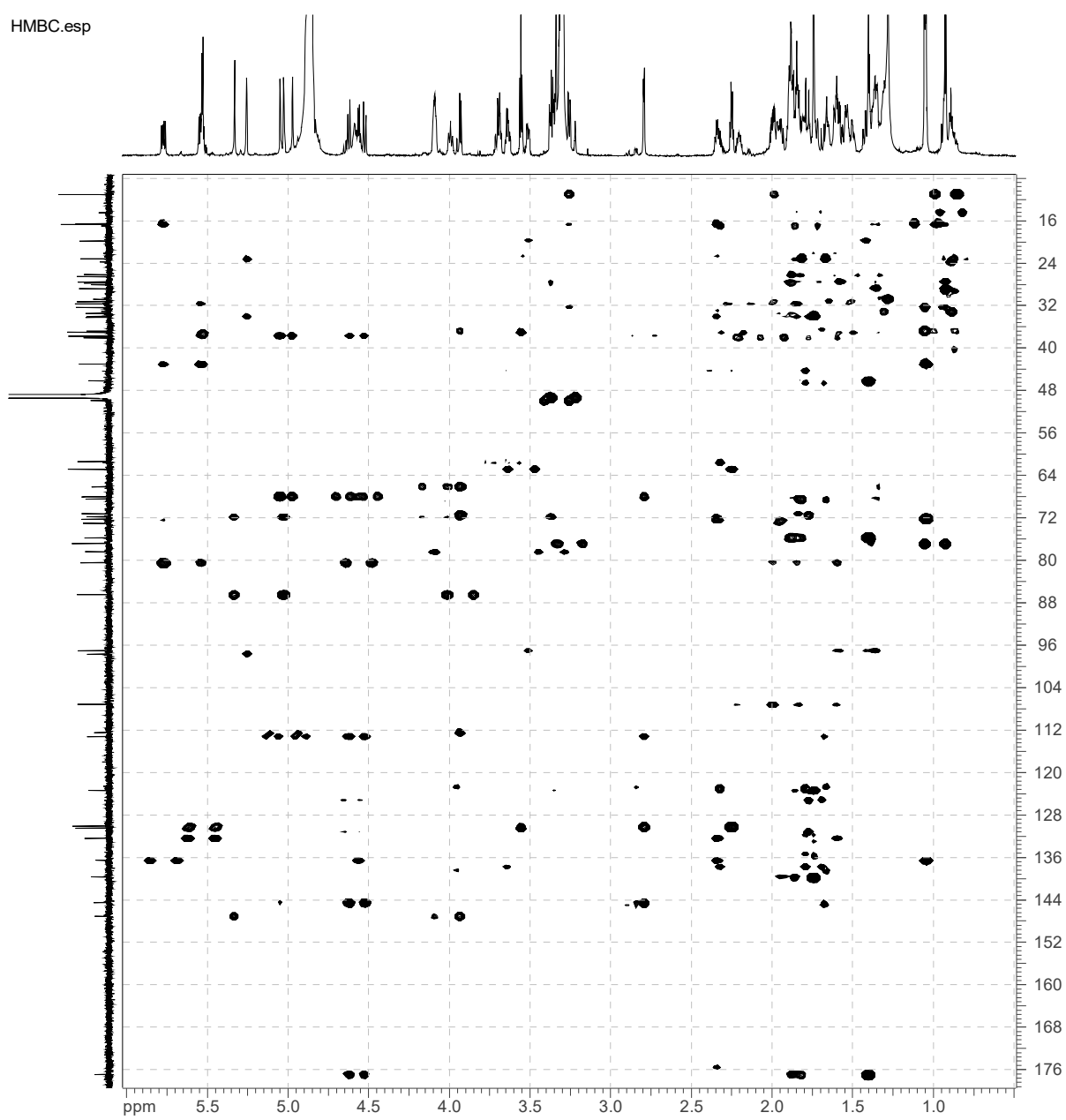


Figure S23. HMBC spectrum of compound **4** measured at 900 MHz(^1H).

ROESY.esp

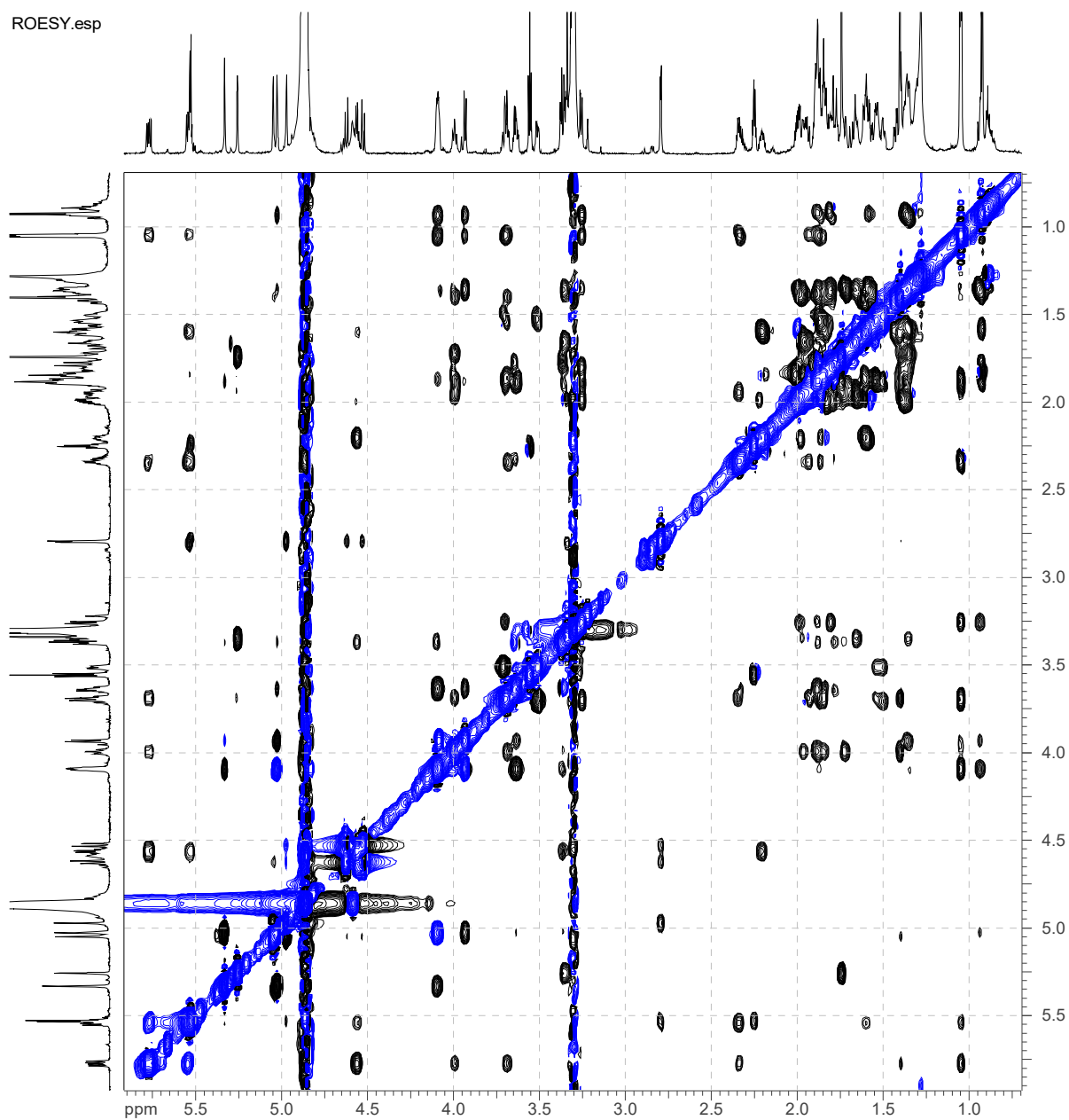
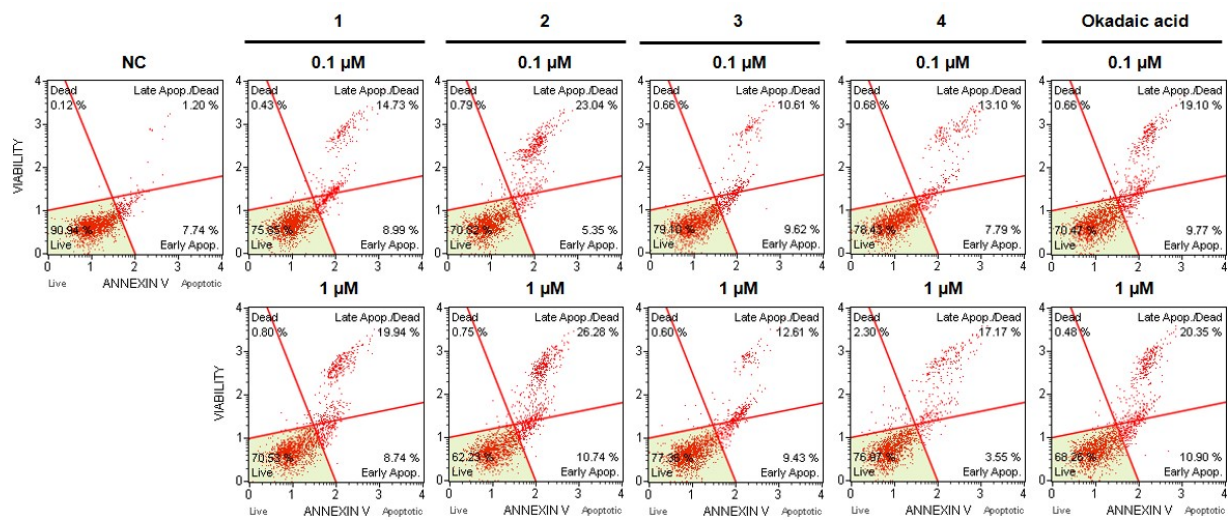
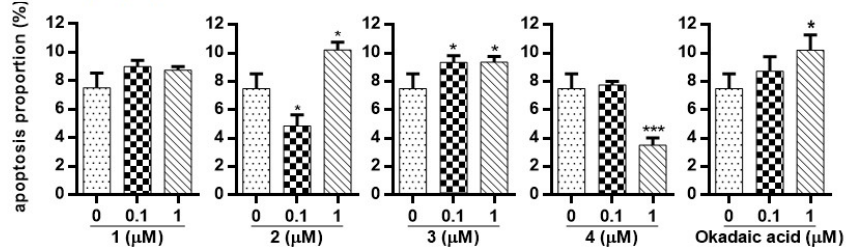


Figure S24. ROESY spectrum of compound **4** measured at 900 MHz(¹H).

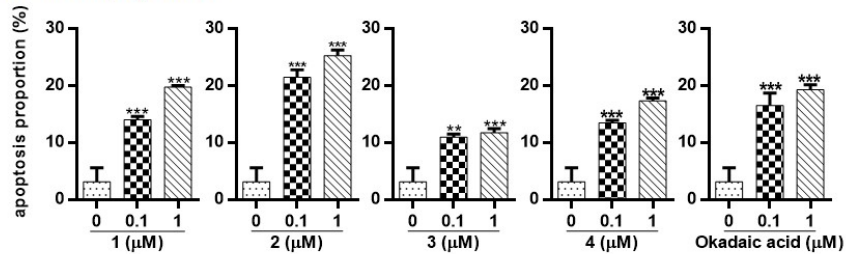
(A)



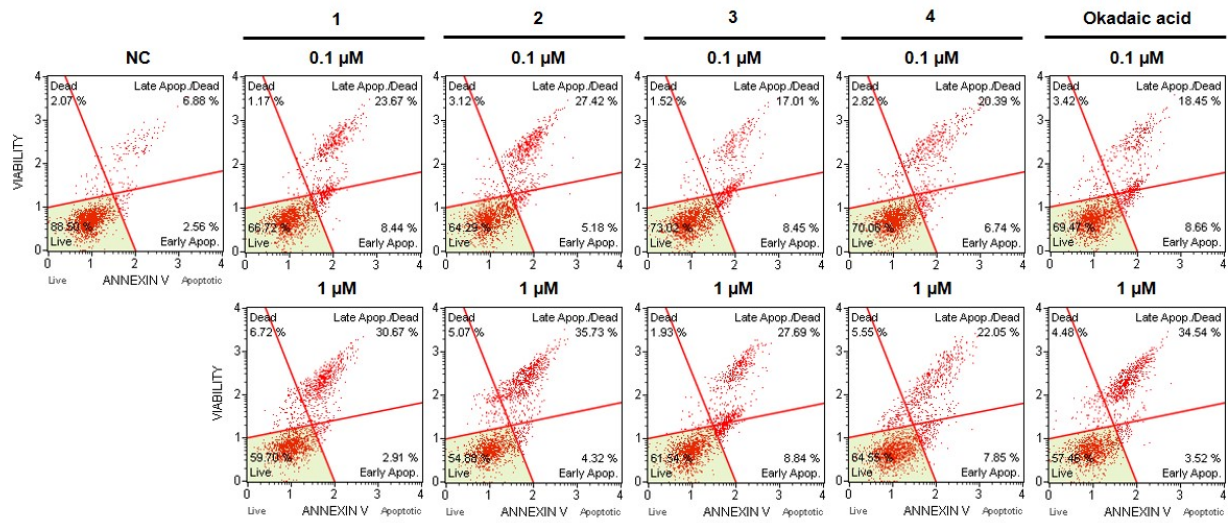
A. Early Apop.



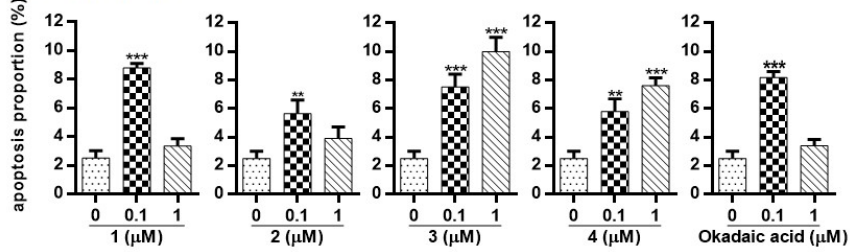
B. Late Apop./Dead



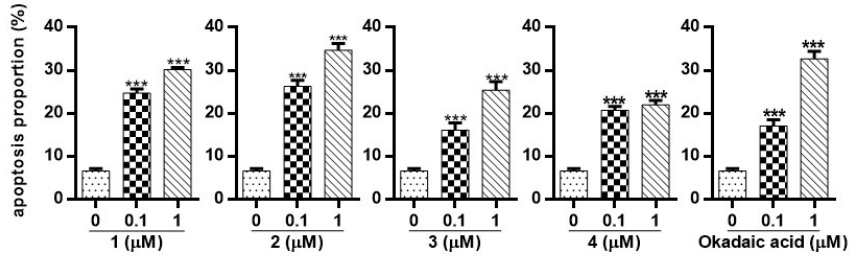
(B)



A. Early Apop.



B. Late Apop./Dead



(C)

1 2 3 4 Okadaic acid

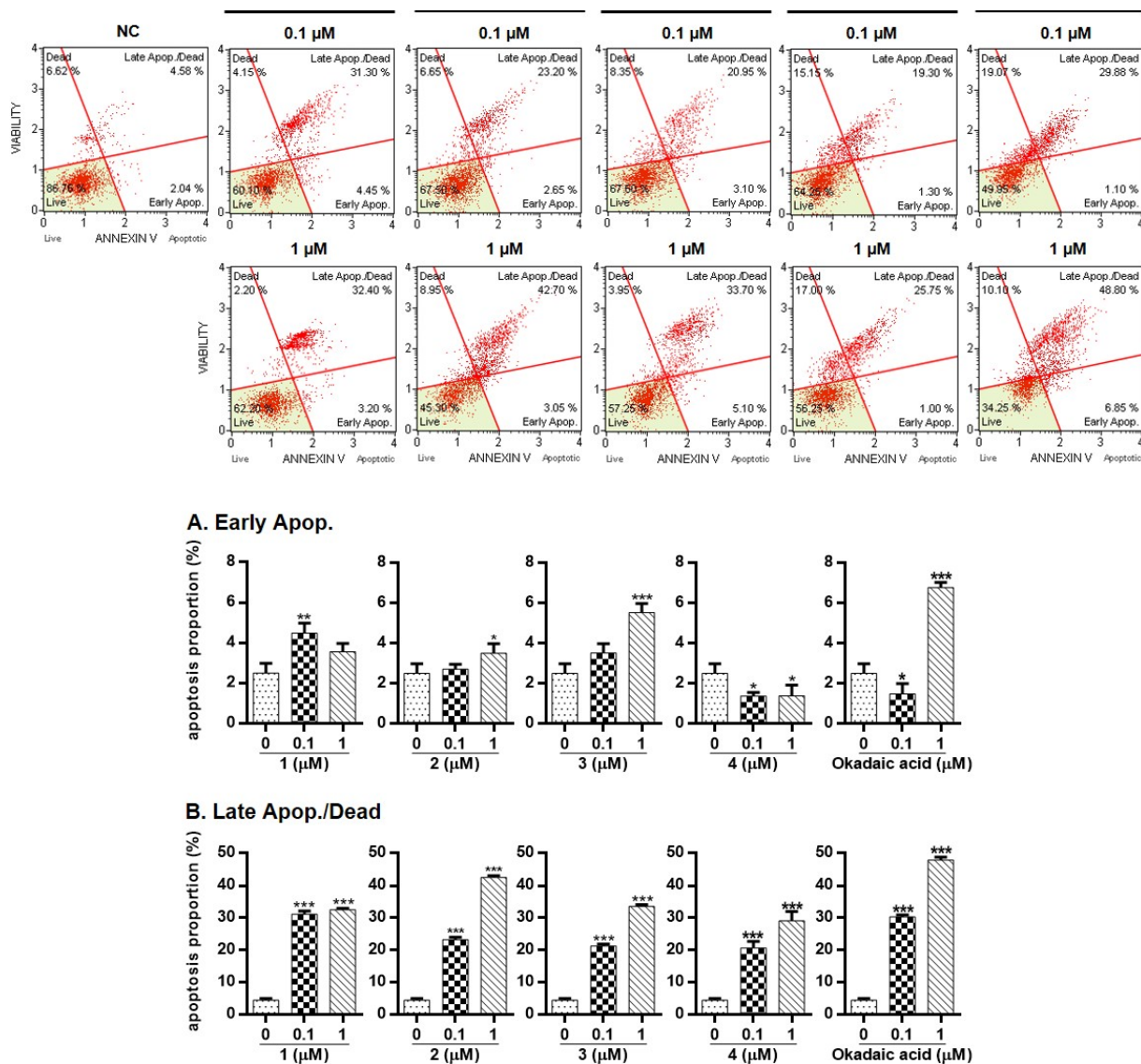


Figure S25. Apoptosis of (A) Neuro2a, (B) HCT116, and (C) HepG2 cells in the presence of compounds 1–4 or okadaic acid as determined using the Annexin-V/PI double staining assay.