Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information of

New Dimeric and Trimeric *Erythrina* Alkaloids from *Erythrina variegata*

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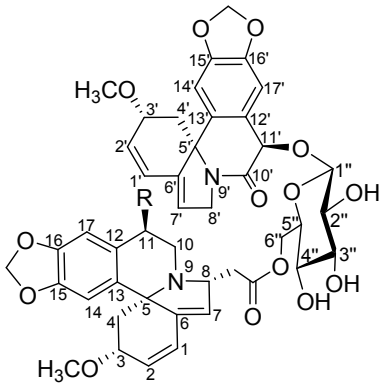
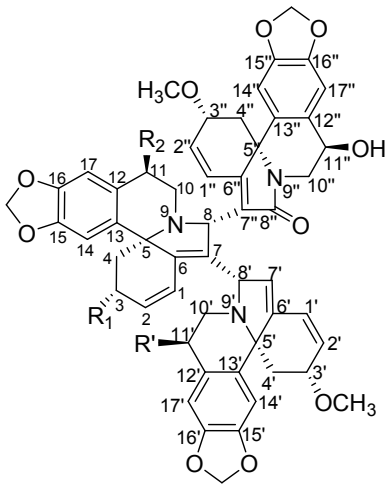
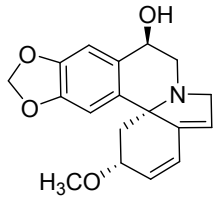
1、 Structures of erythrivarines C–G (**1**-**5**) and their units, erythrinine (**6**) and 8-oxo-erythrinine (**7**)**.**



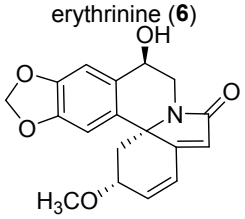
1 R=OH
2 R=OCH_3



3 R_1=OCH_3 R_2=OH R'=OH
4 R_1=OCH_3 R_2=OCH_3 R'=OH
5 R_1= =O R_2=OH R'=OCH_3



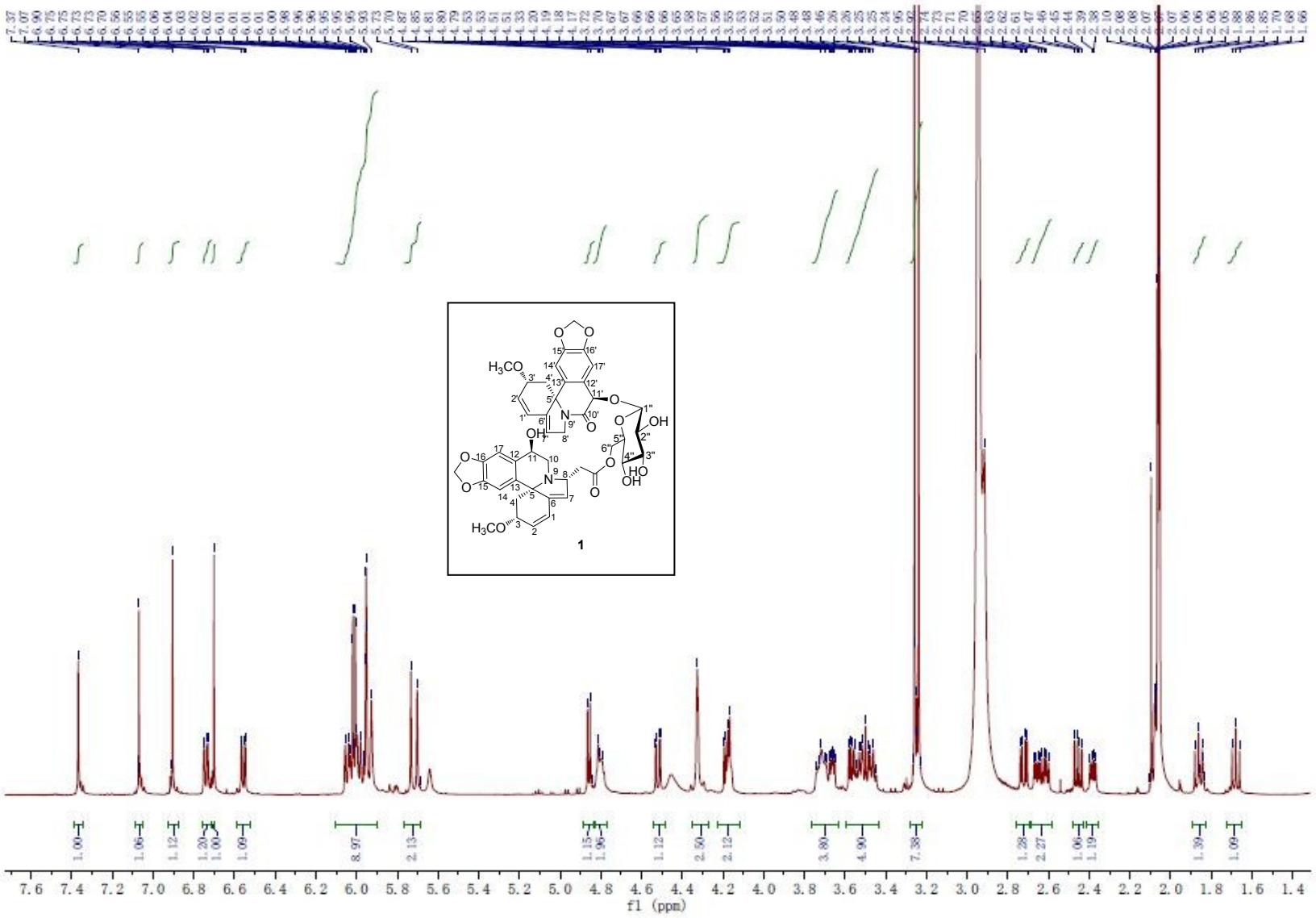
erythrinine (**6**)



8-oxo-erythrinine (**7**)

2、NMR spectroscopic data of dimeric erythrivarines C-D (**1**-**2**)

Figure S1. ^{1}H NMR spectrum of Erythrivarine C (**1**)



Expended ^{1}H NMR spectrum of Erythrivarine C (**1**)

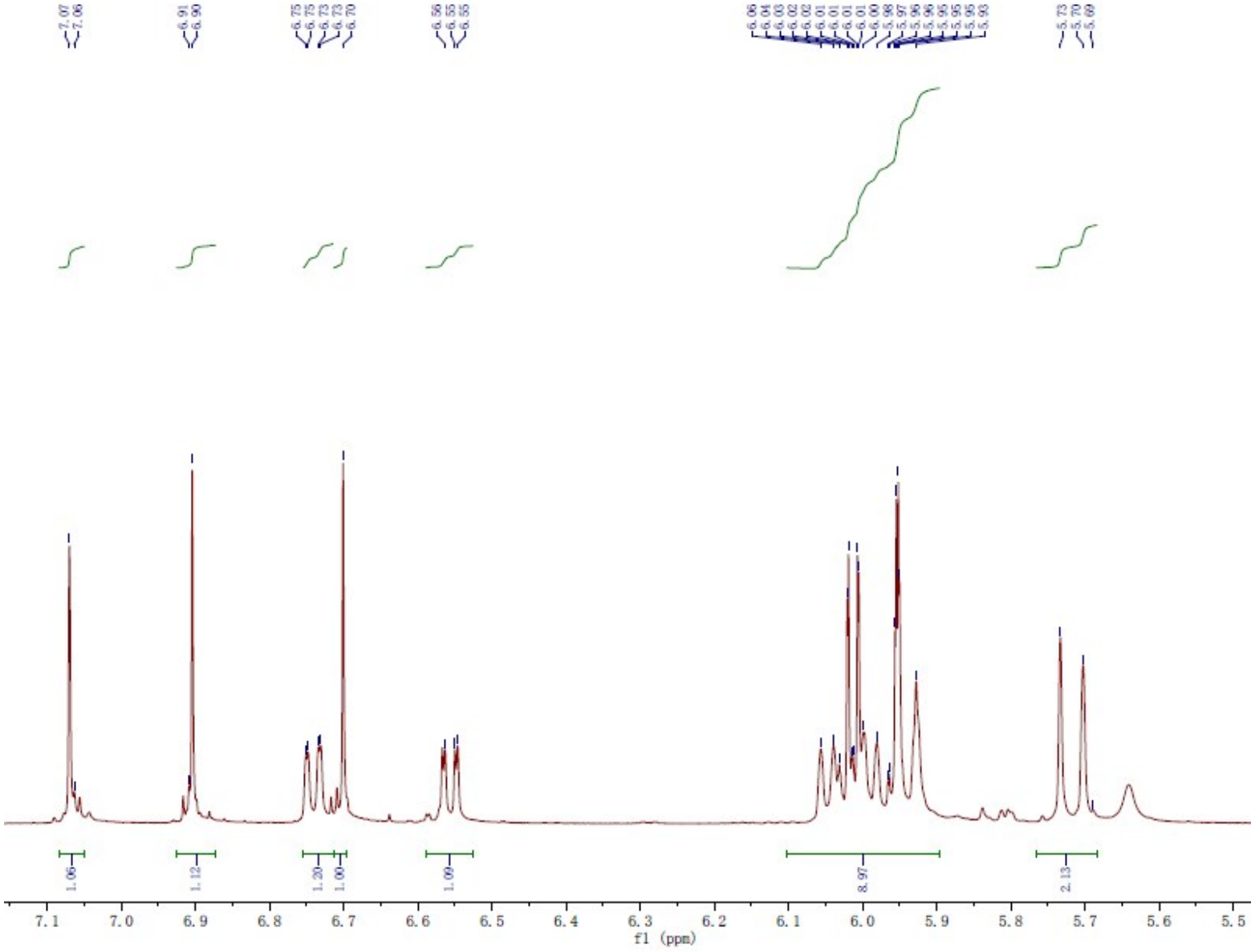


Figure S2. ^{13}C NMR spectrum of erythrivarine C (**1**)

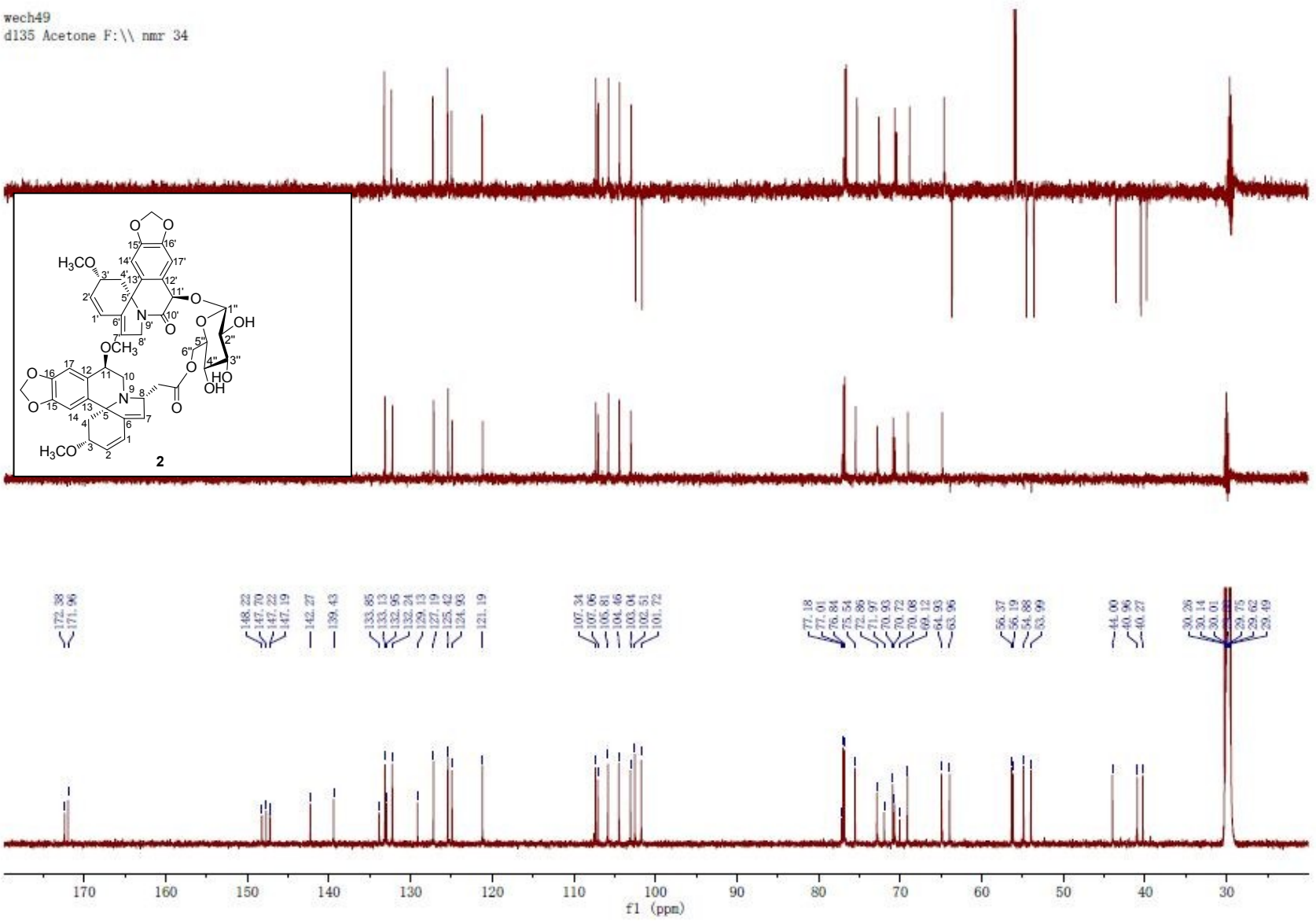
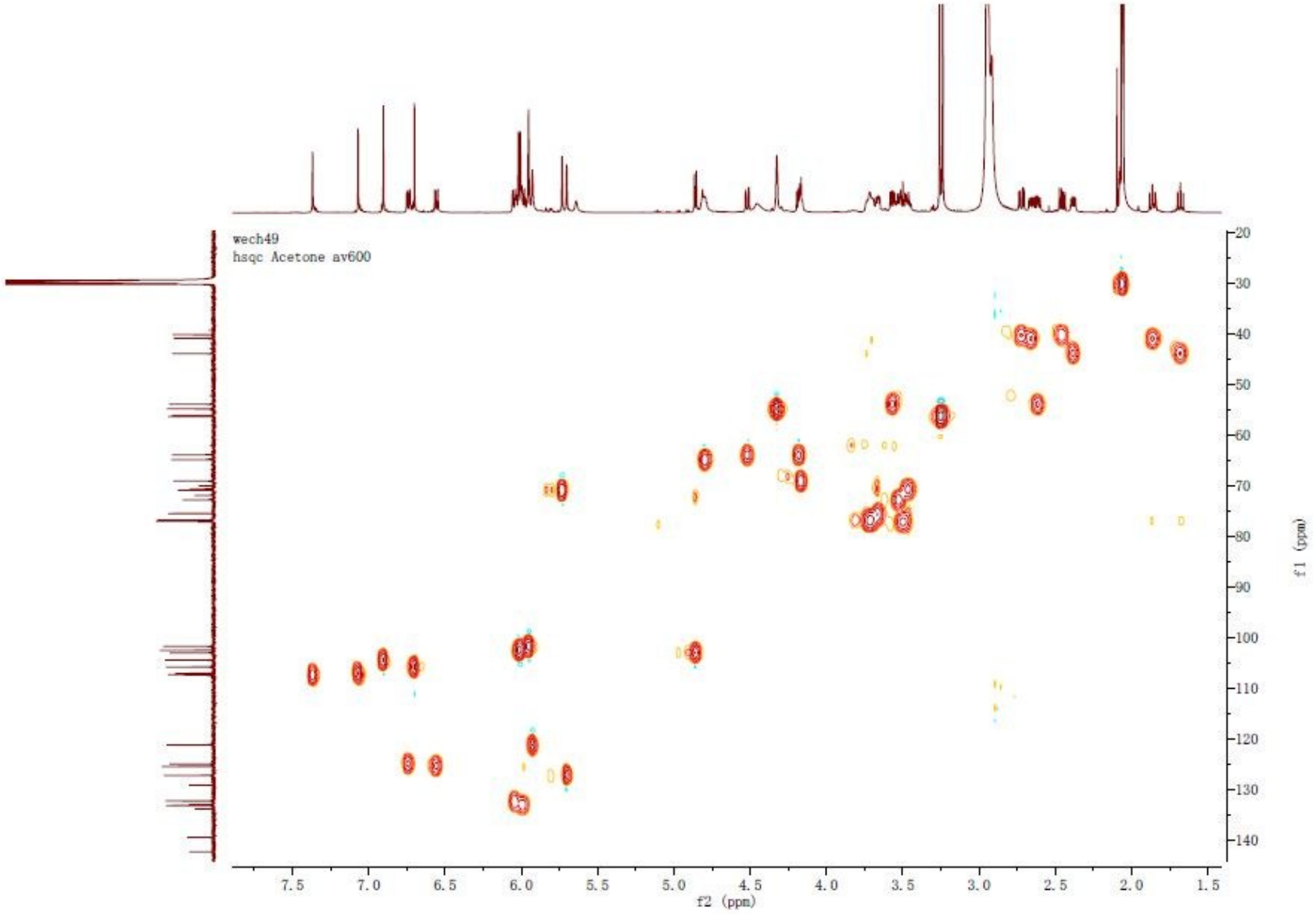


Figure S3. HSQC spectrum of erythrivarine C (**1**)



Expended HSQC spectrum of erythrivarine C (**1**)

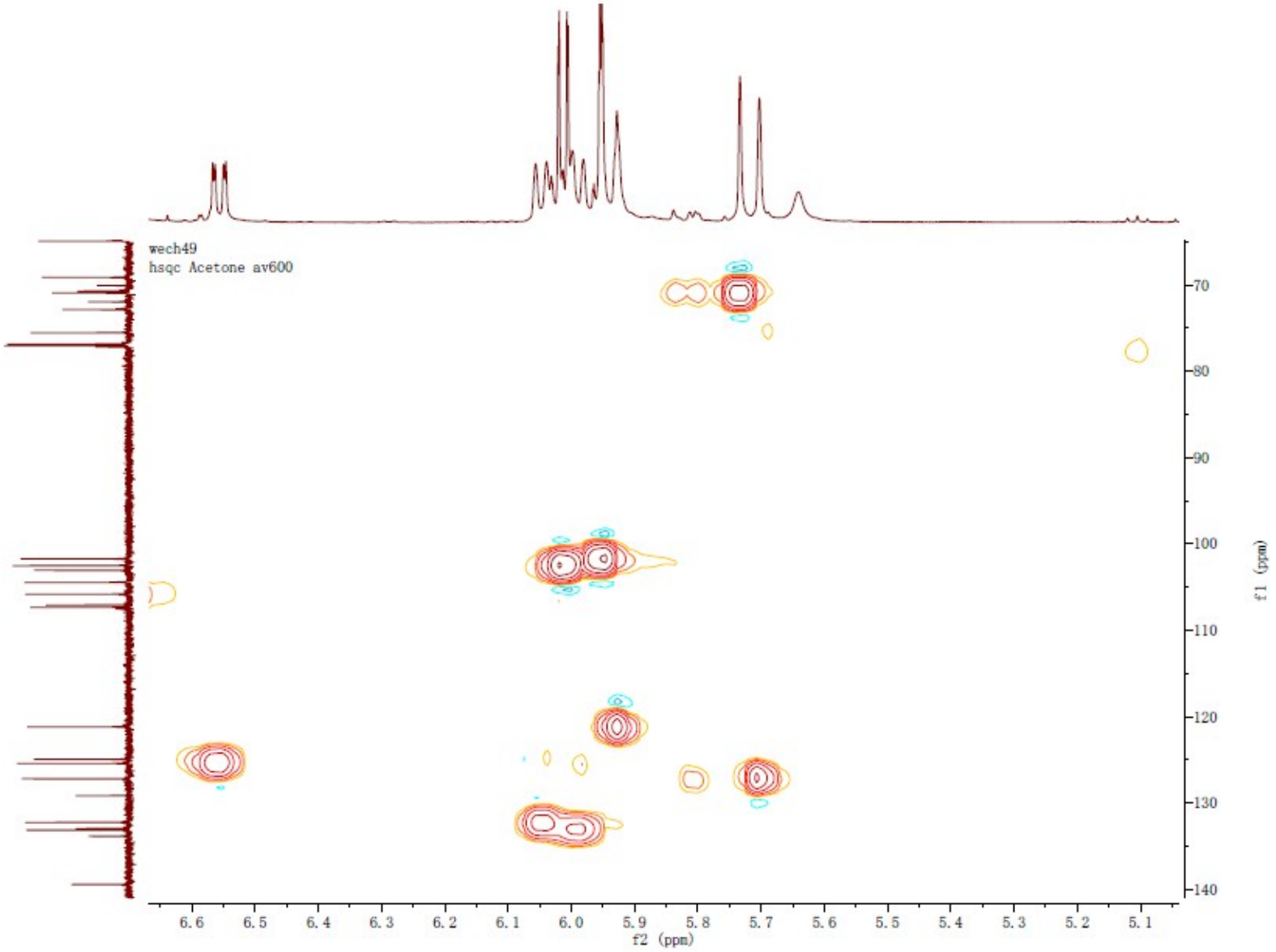


Figure S4. HMBC spectrum of erythrivarine C (**1**)

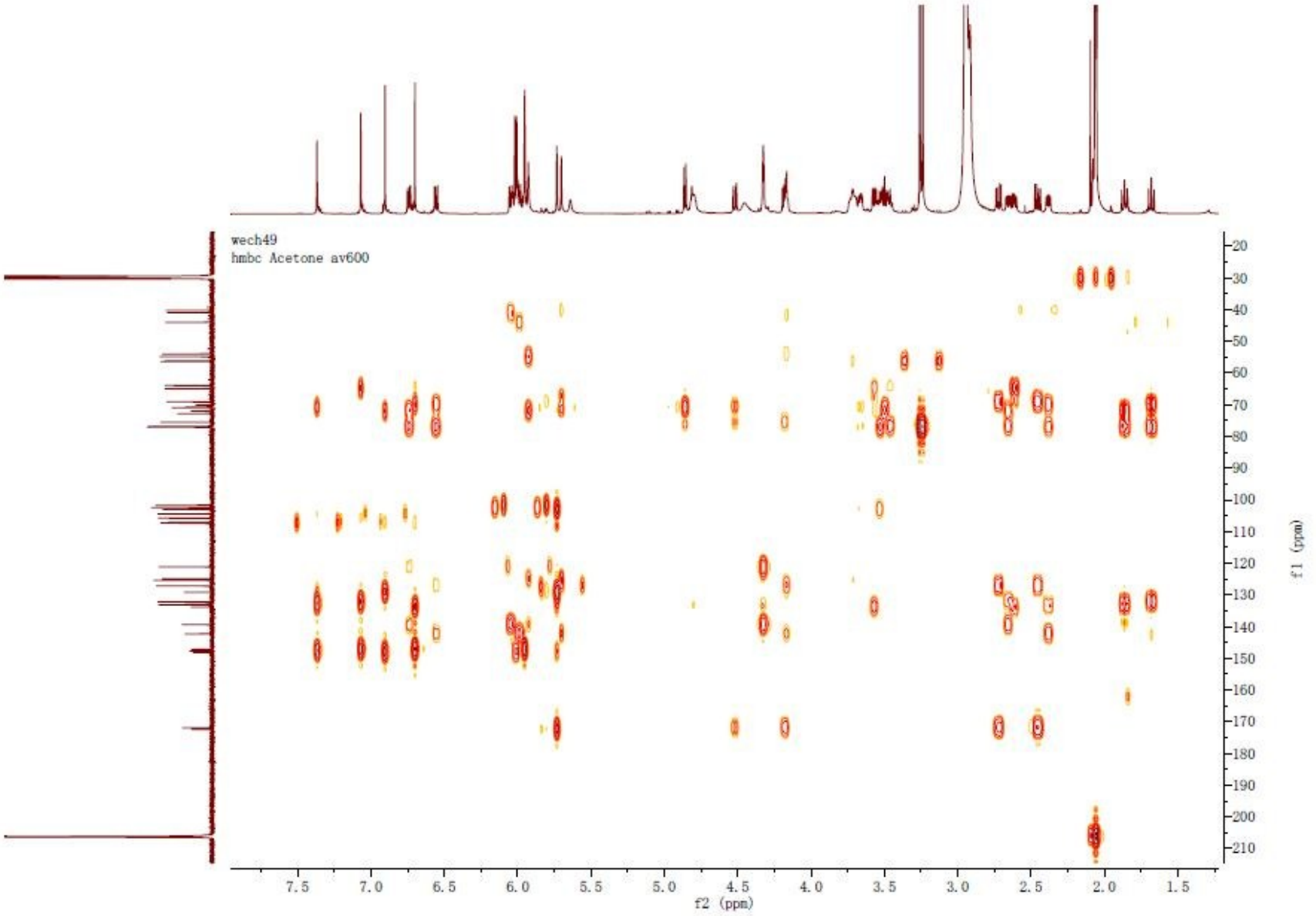


Figure S5. ^{1}H-^{1}H COSY spectrum of erythrivarine C (**1**)

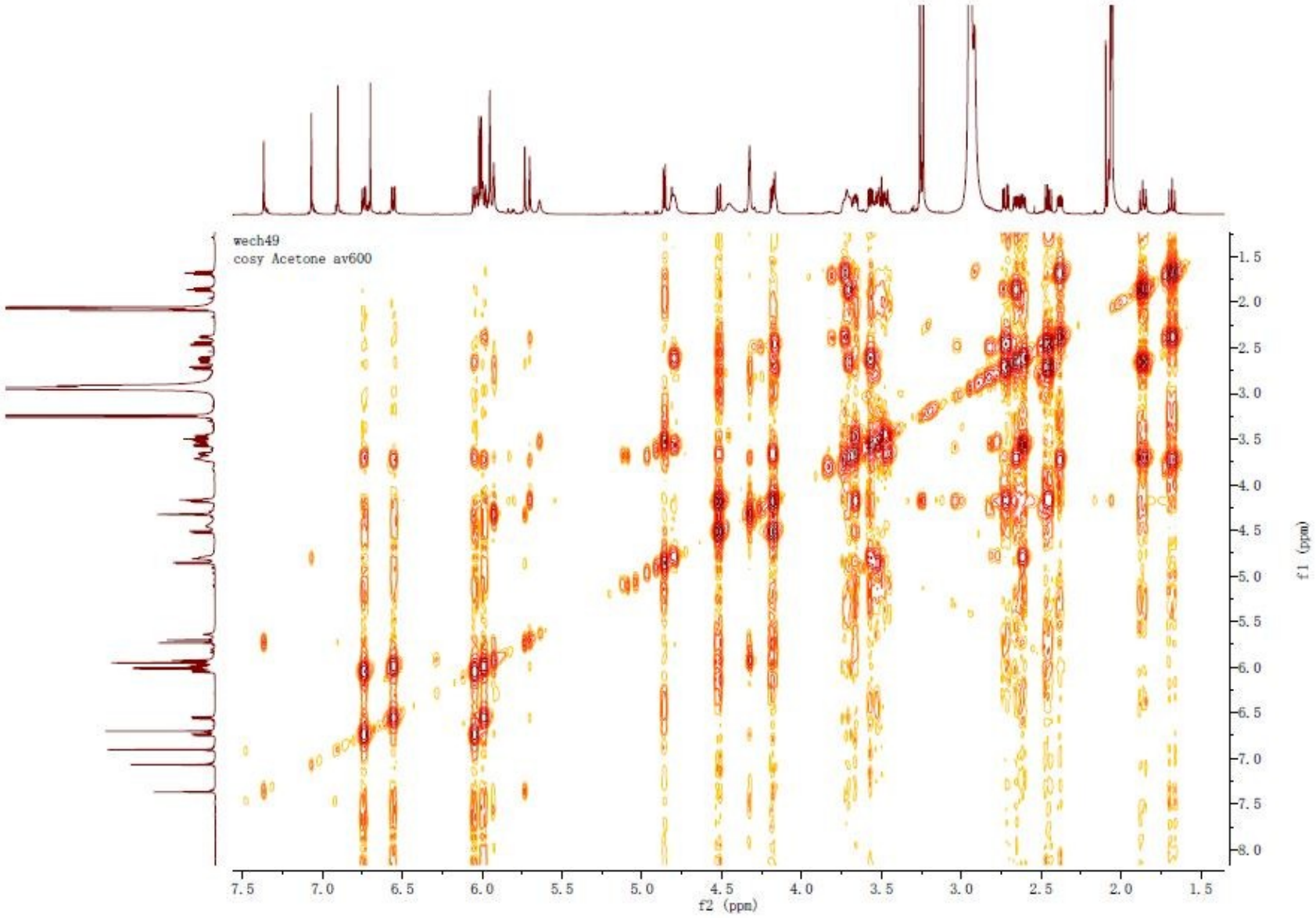


Figure S6. ROESY spectrum of erythrivarine C (**1**)

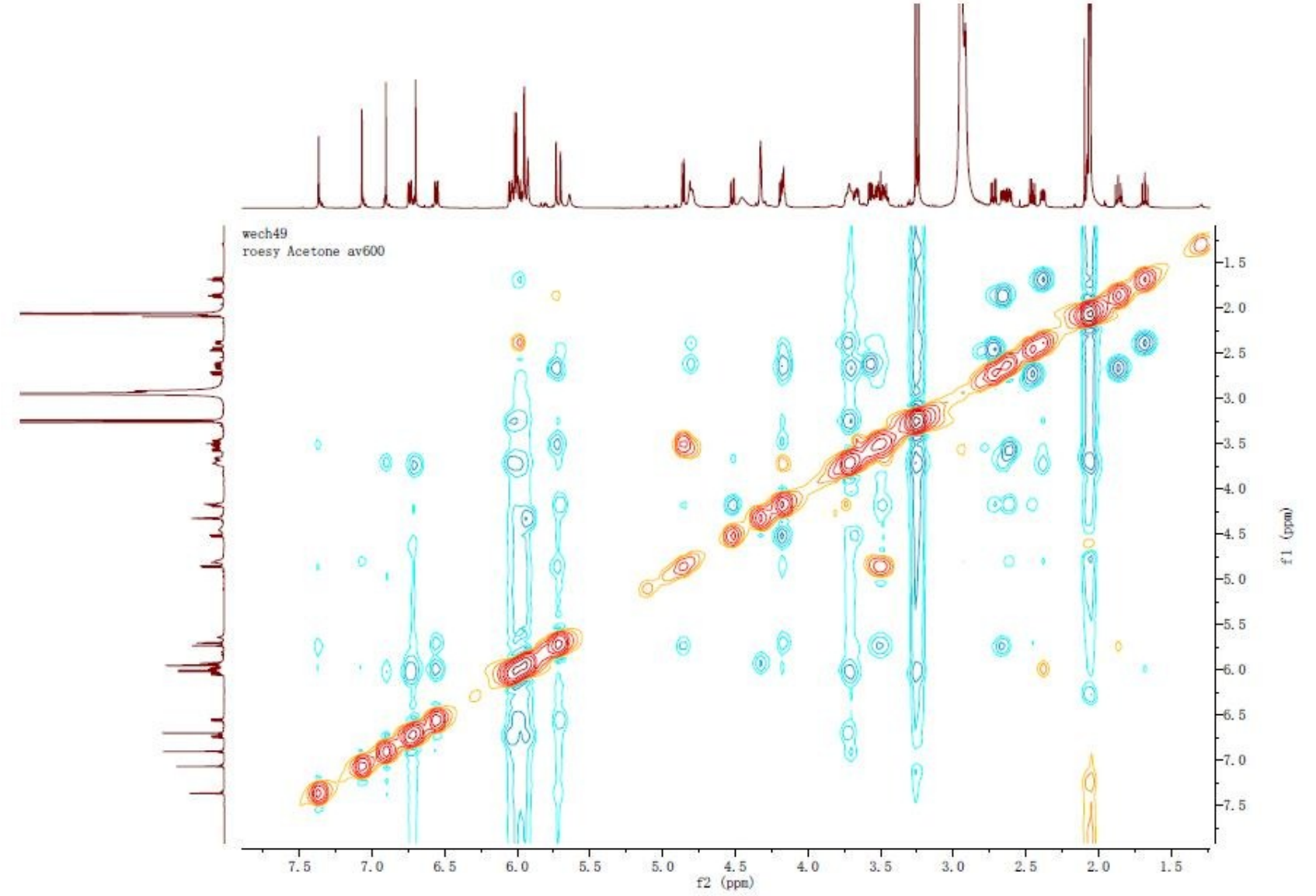


Figure S7. ^{1}H NMR spectrum of erythrivarine D (**2**)

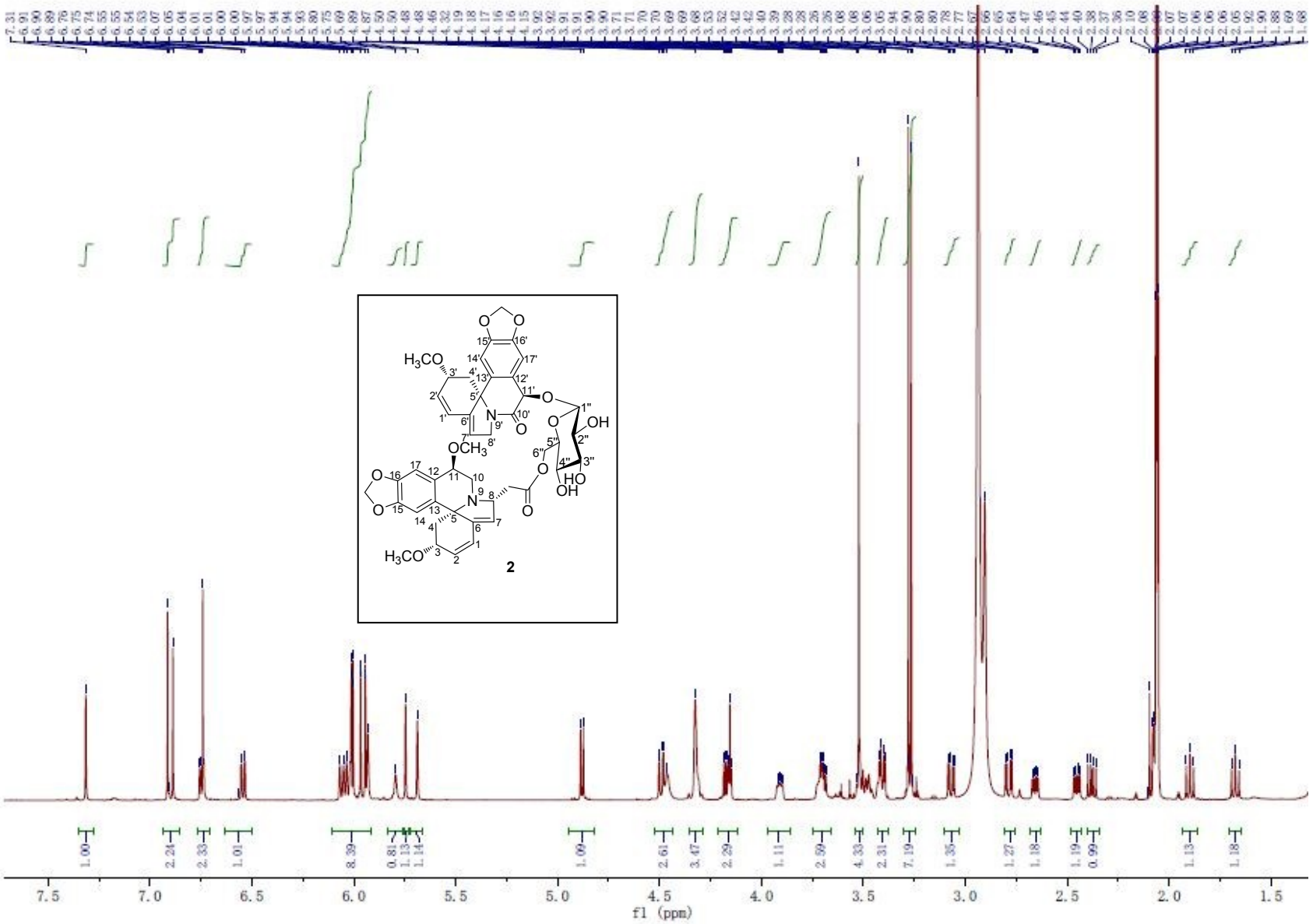


Figure S8. ^{13}C NMR spectrum of erythrivarine D (**2**)

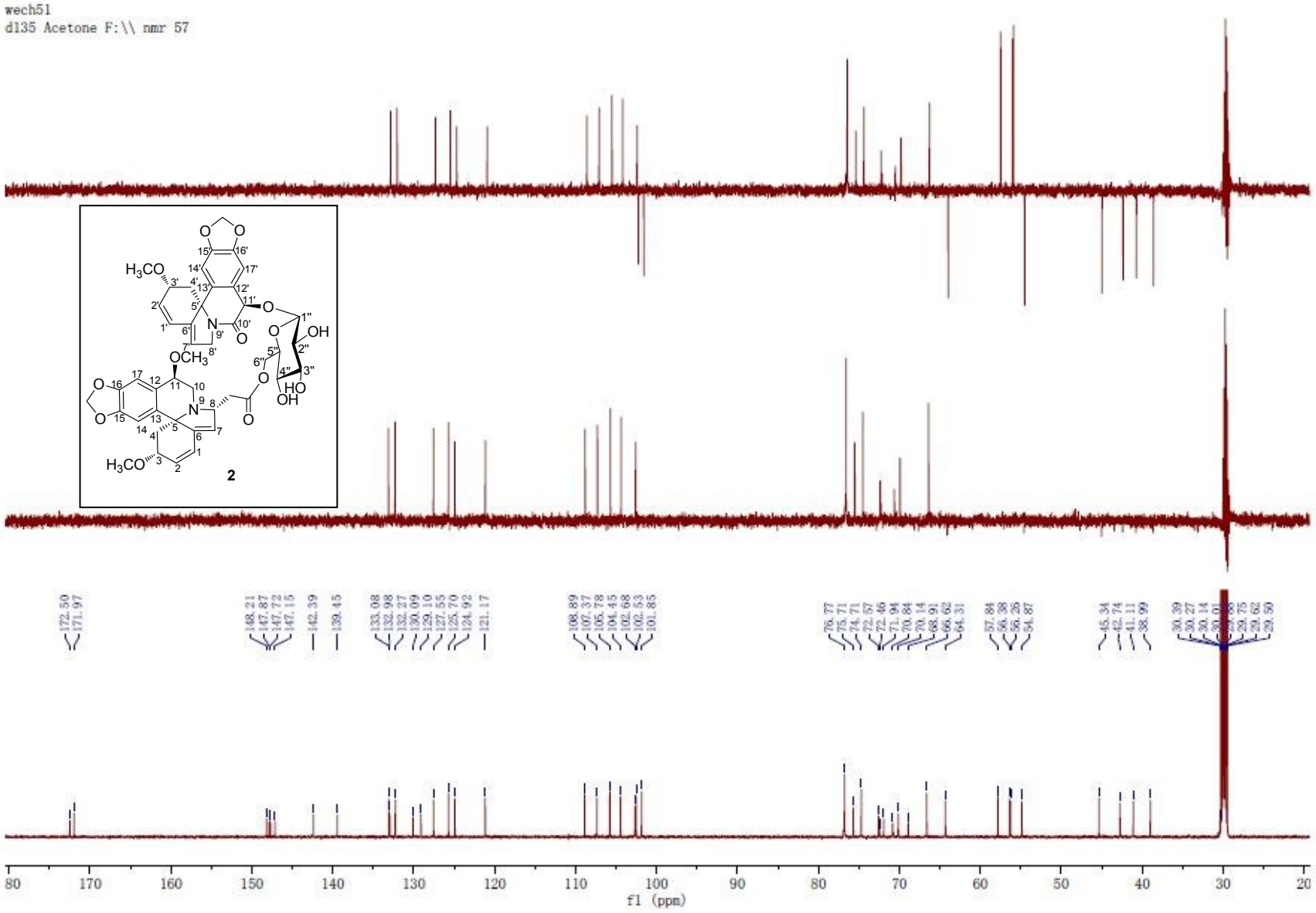


Figure S9. HSQC spectrum of erythrivarine D (**2**)

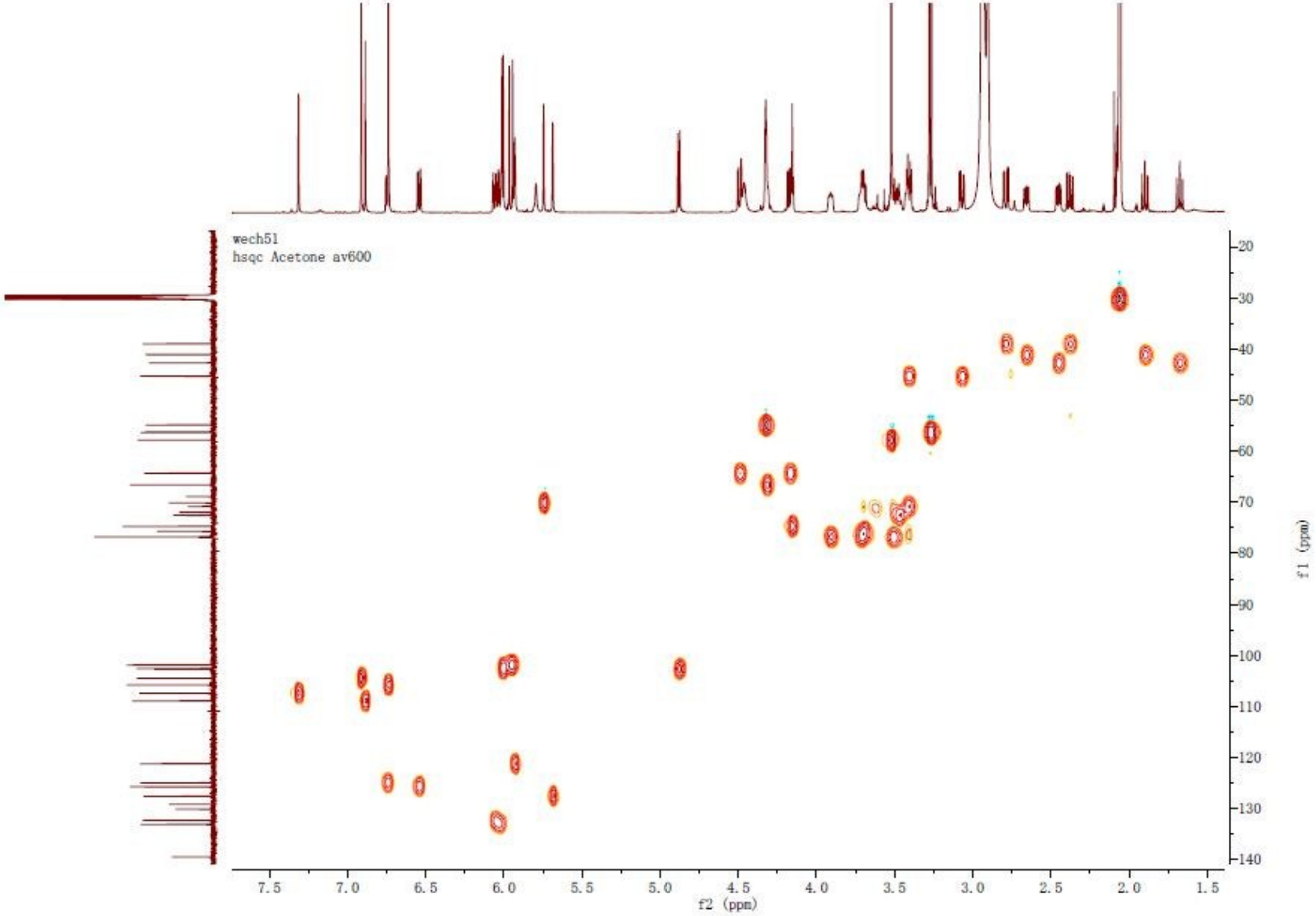


Figure S10. HMBC spectrum of erythrivarine D (**2**)

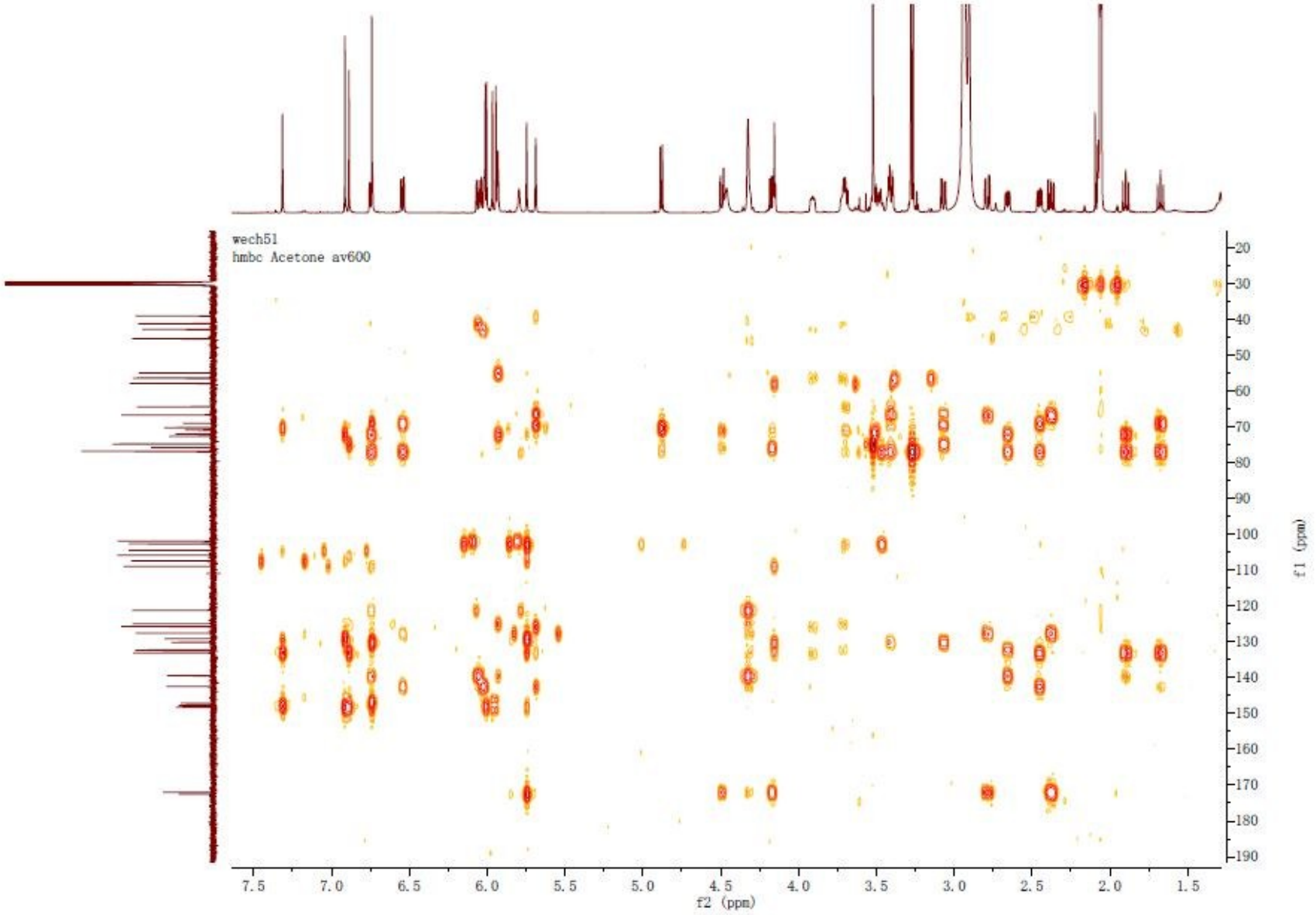


Figure S11. ^{1}H-^{1}H COSY spectrum of erythrivarine D (**2**)

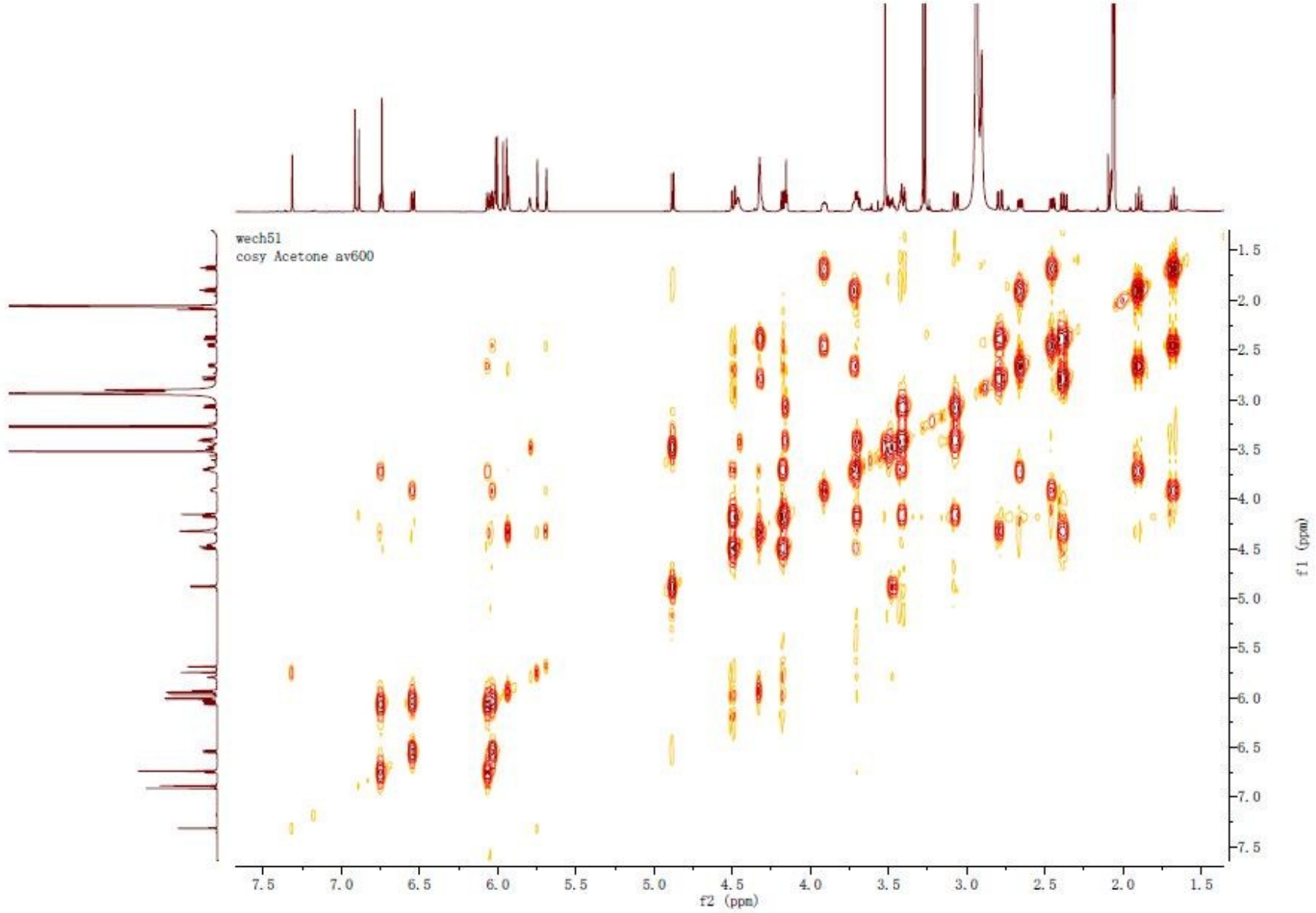
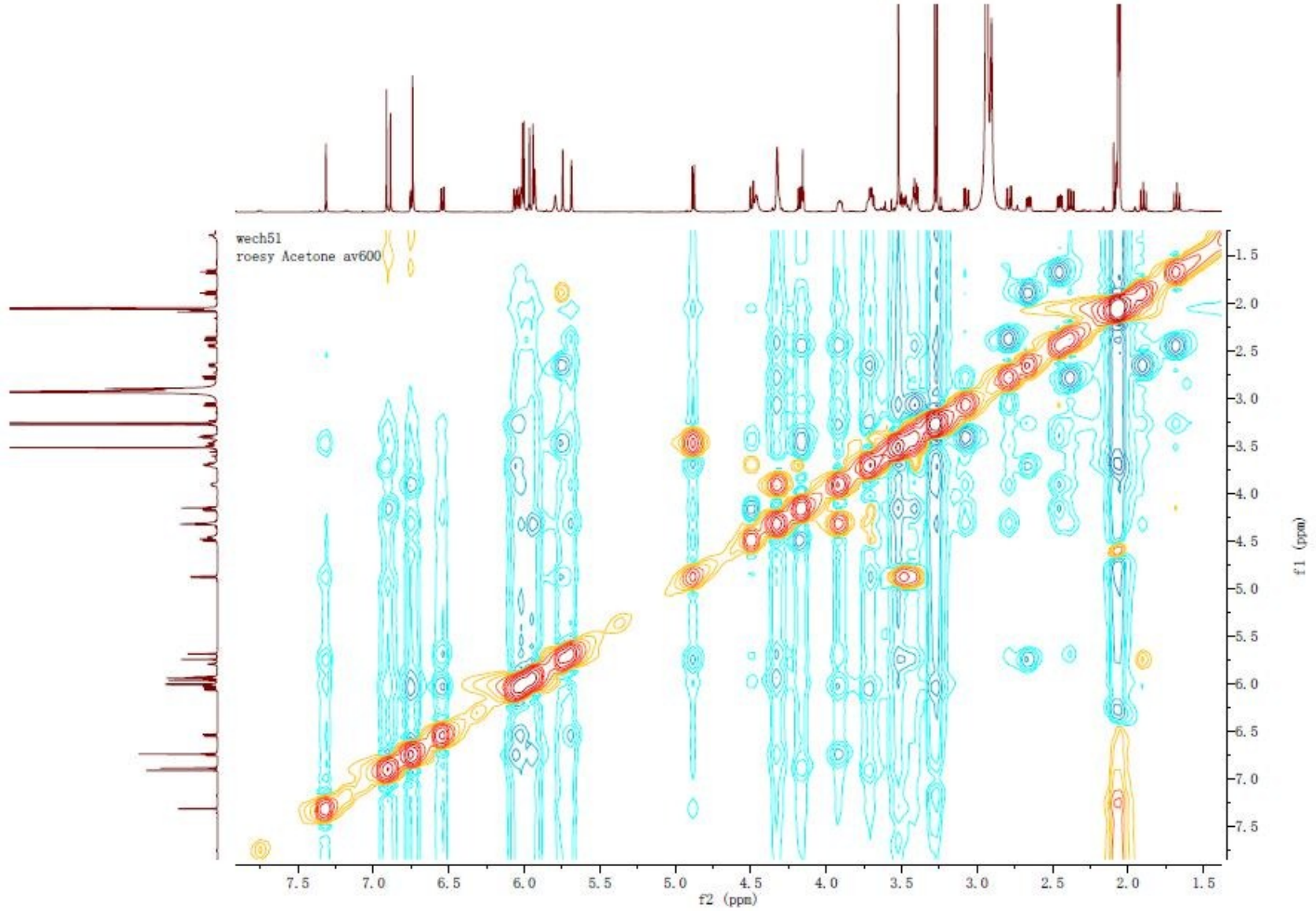
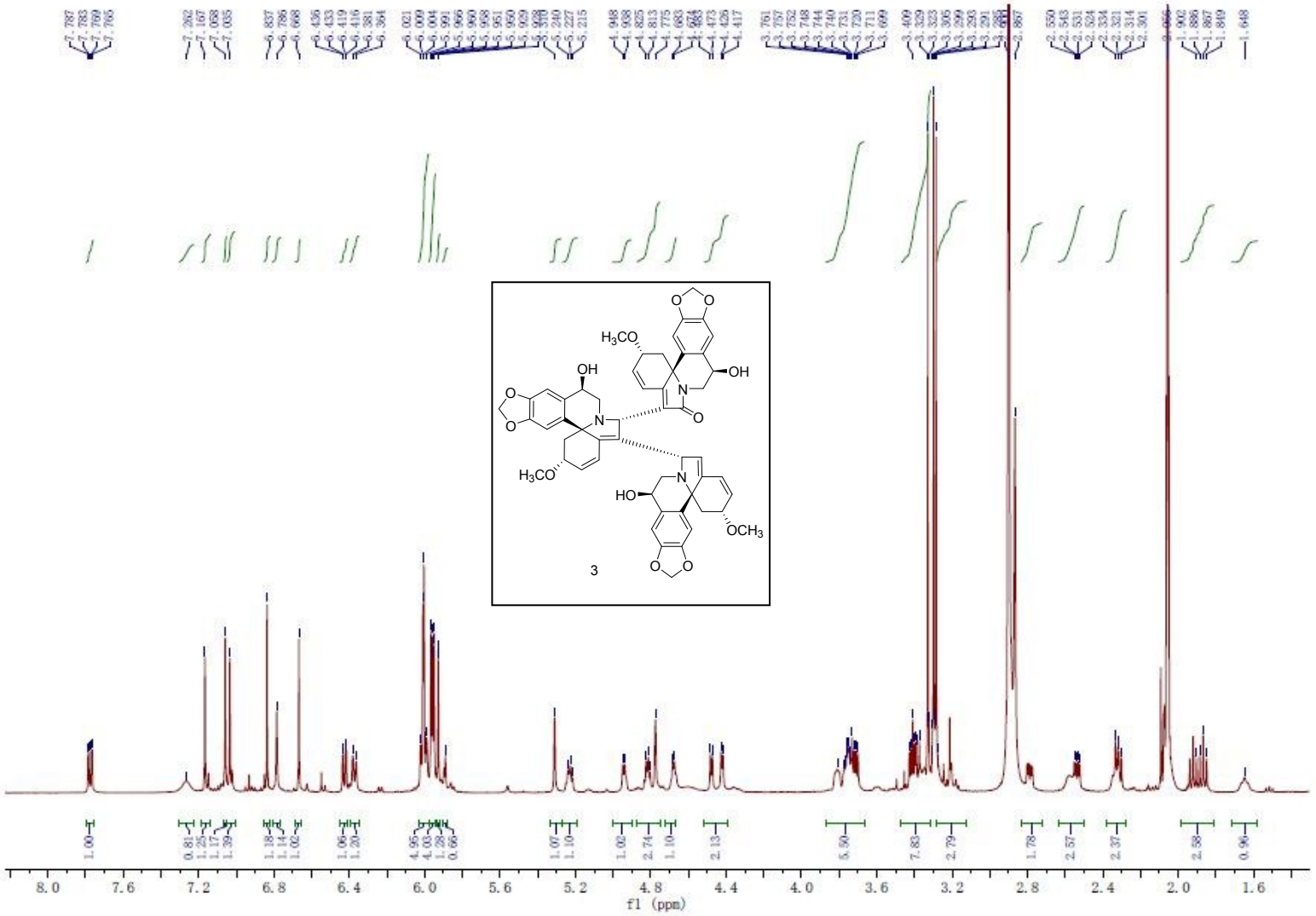


Figure S12. ROESY spectrum of erythrivarine D (**2**)



3、NMR spectroscopic data of trimeric erythrivarines F-G (**3**-**5**)

Figure S13. ^{1}H NMR spectrum of erythrivarine E (**3**)



Expanded ^{1}H NMR spectrum of erythrivarine E (**3**)

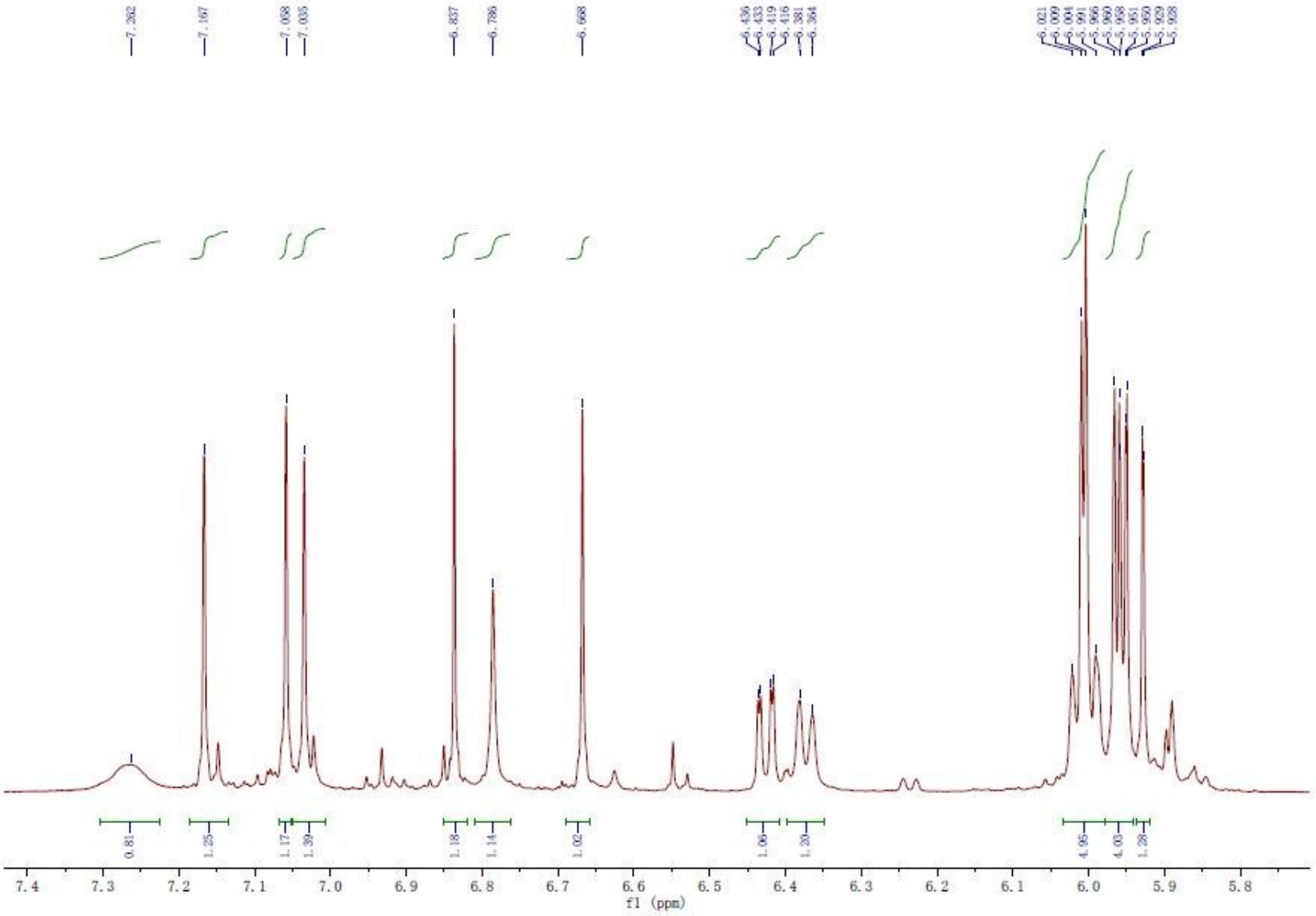


Figure S14. ^{13}C NMR spectrum of erythrivarine E (**3**)

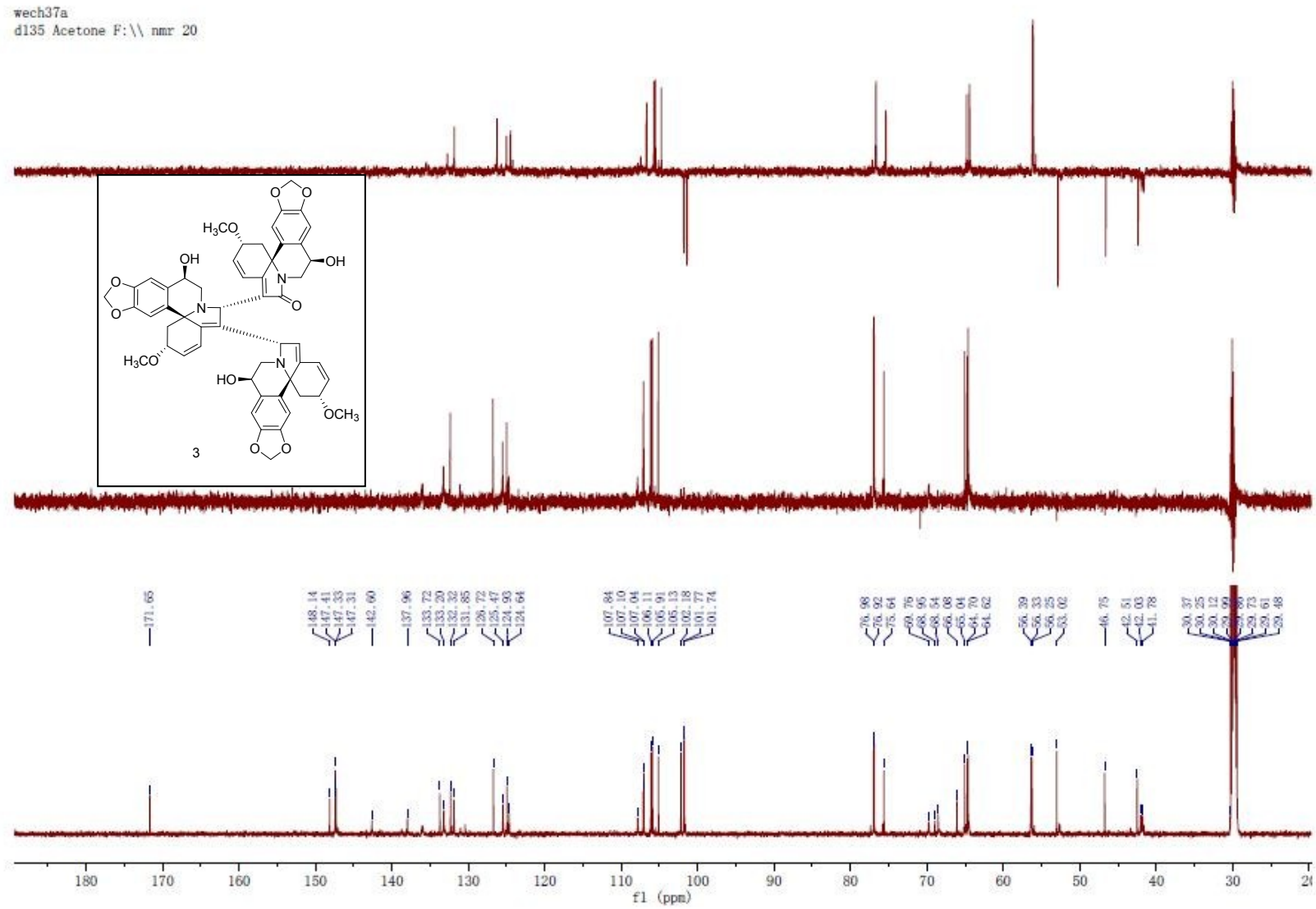
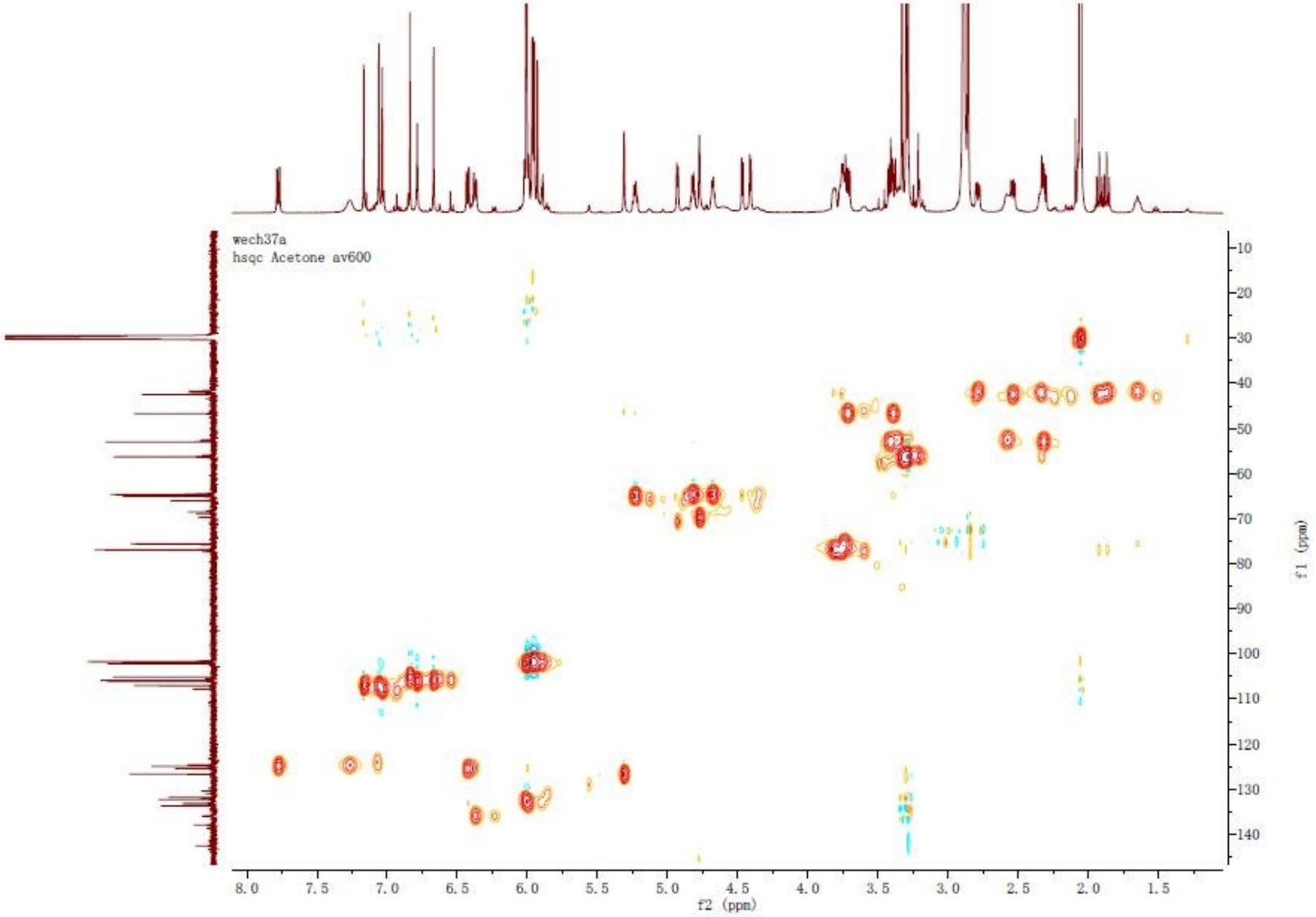


Figure S15. HSQC spectrum of erythrivarine E (**3**)



Expanded HSQC spectrum of erythrivarine E (**3**)

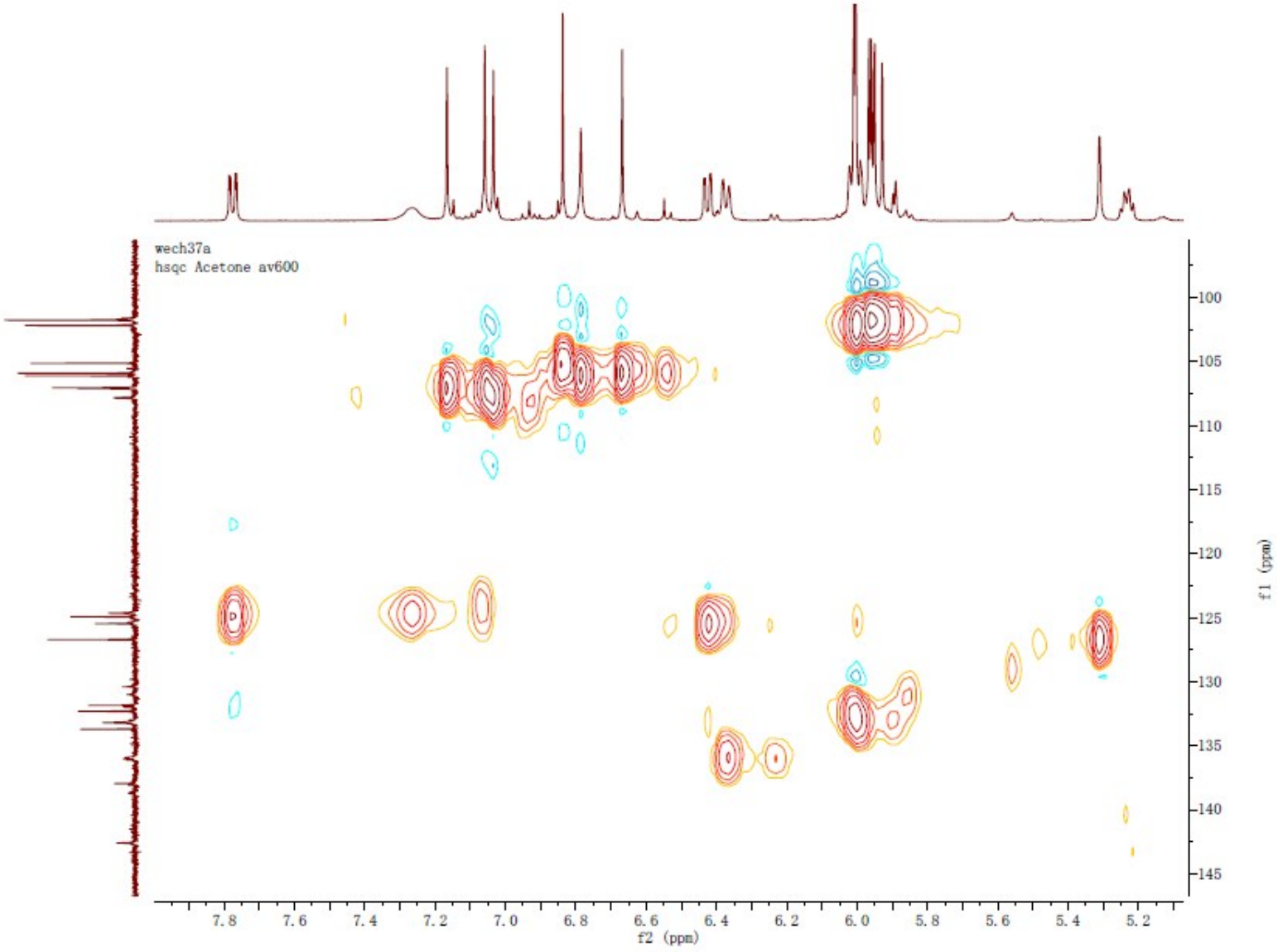


Figure S16. HMBC spectrum of erythrivarine E (**3**)

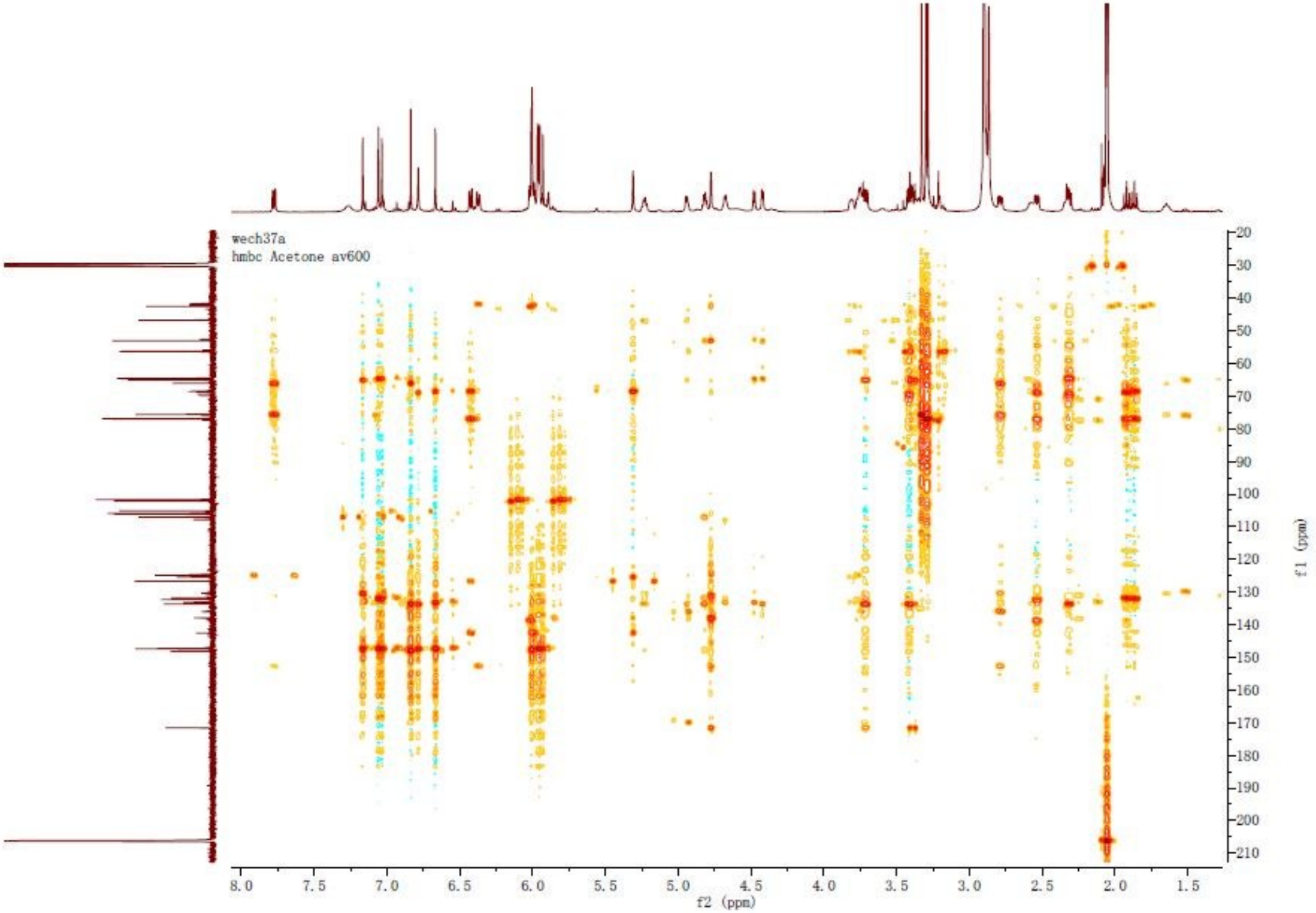


Figure S17. ROESY spectrum of erythrivarine E (**3**)

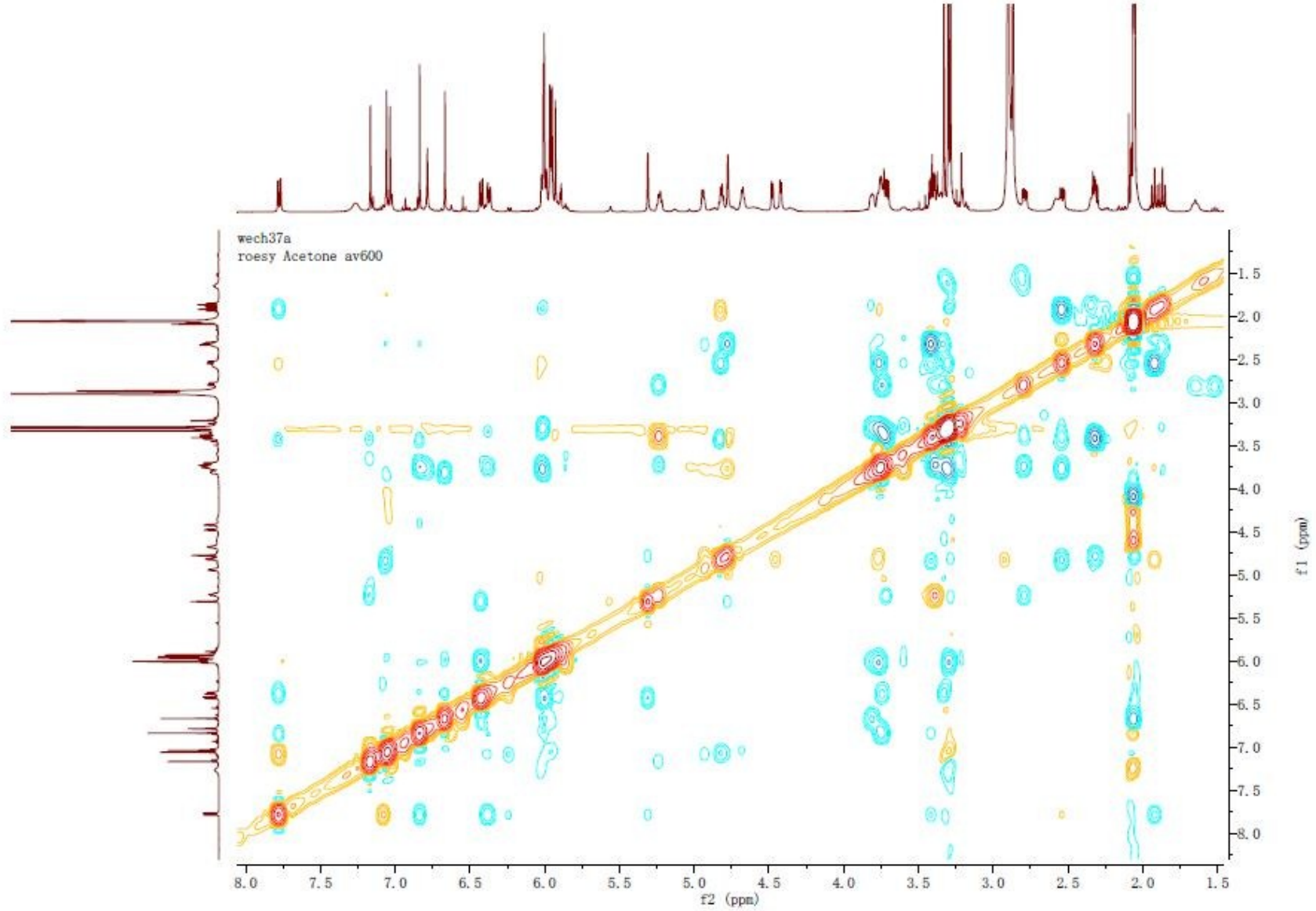
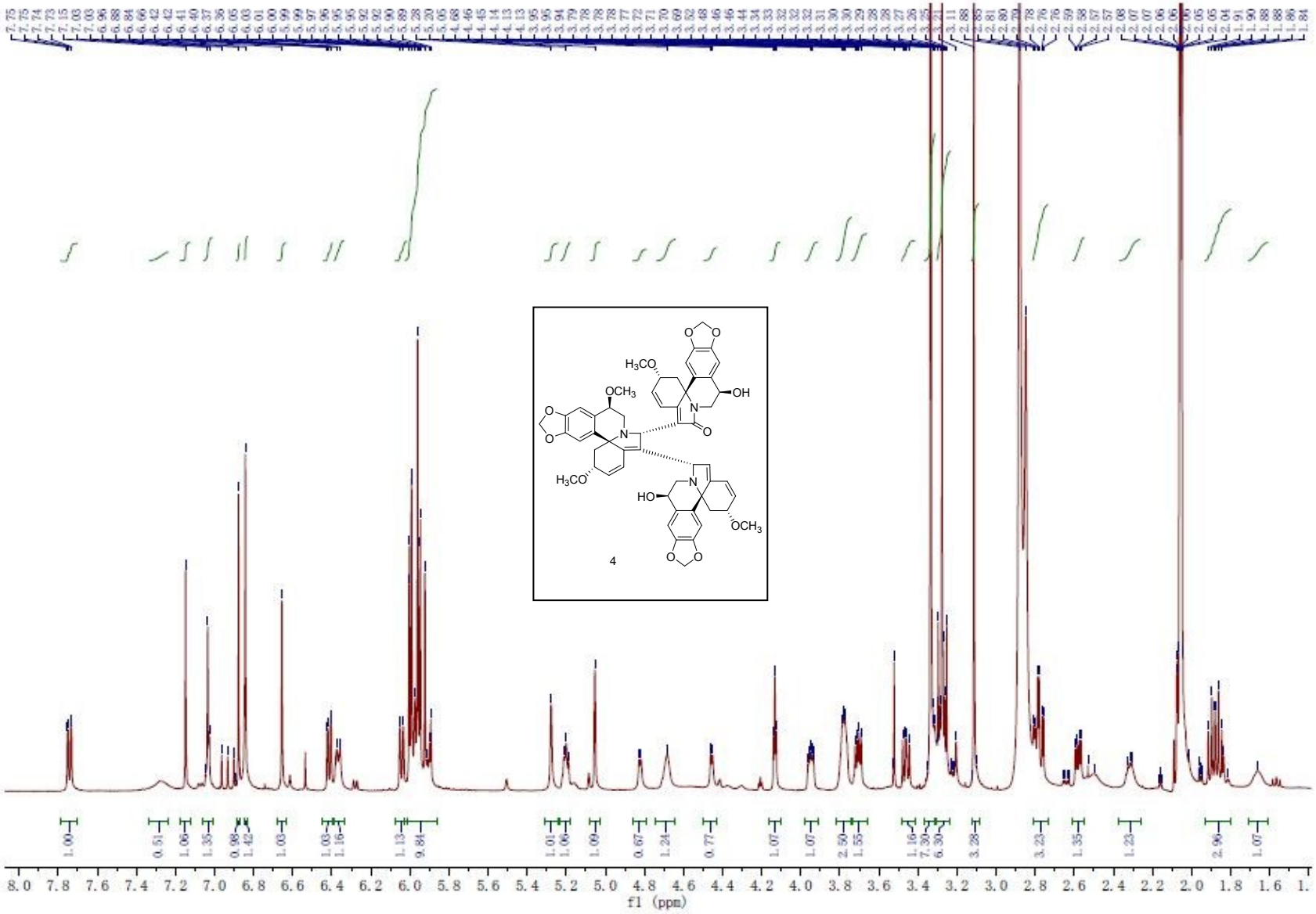


Figure S18. ^{1}H NMR spectrum of erythrivarine F (**4**)



Expanded ^{1}H NMR spectrum of erythrivarine F (**4**)

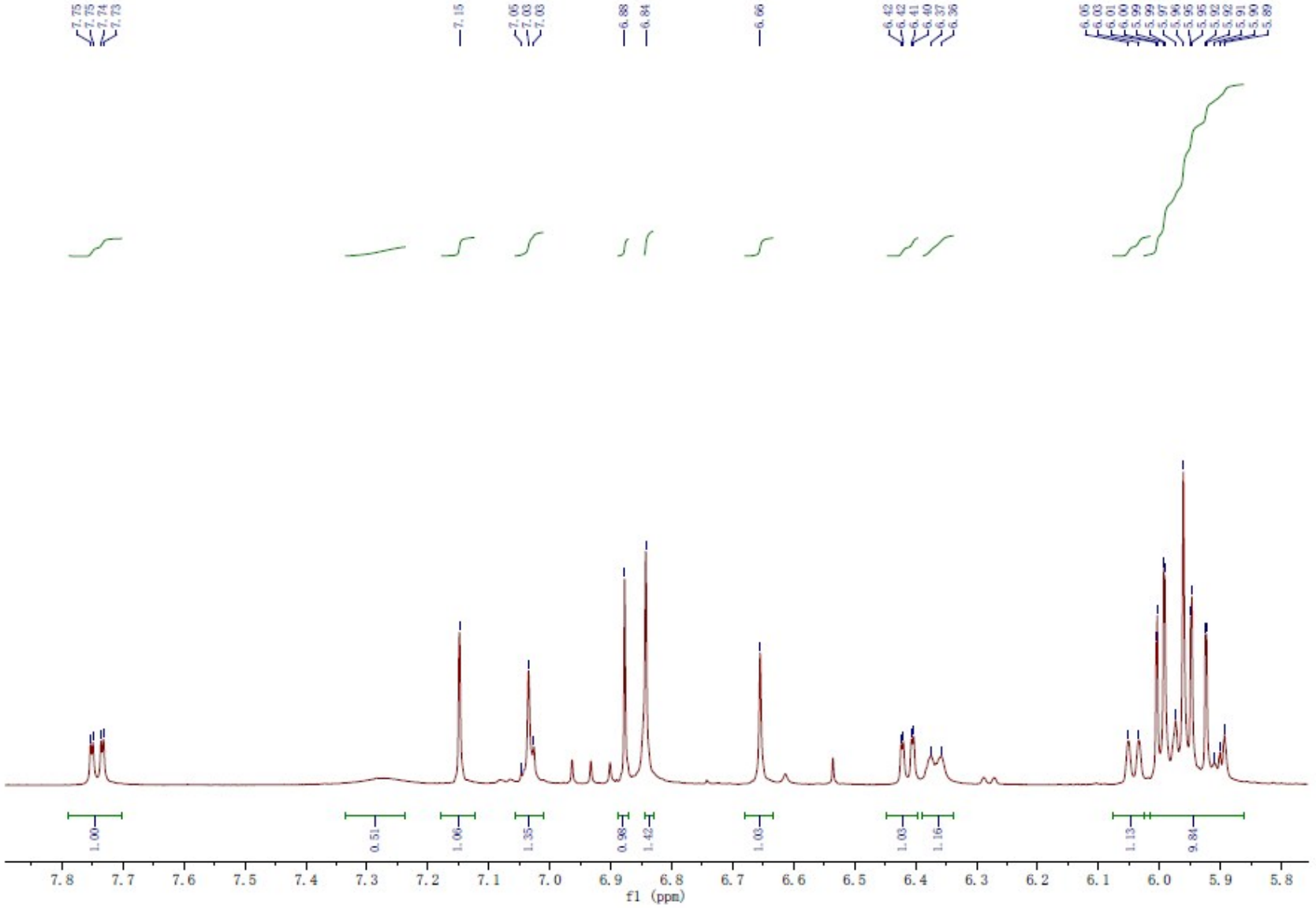


Figure S19. ^{13}C NMR spectrum of erythrivarine F (**4**)

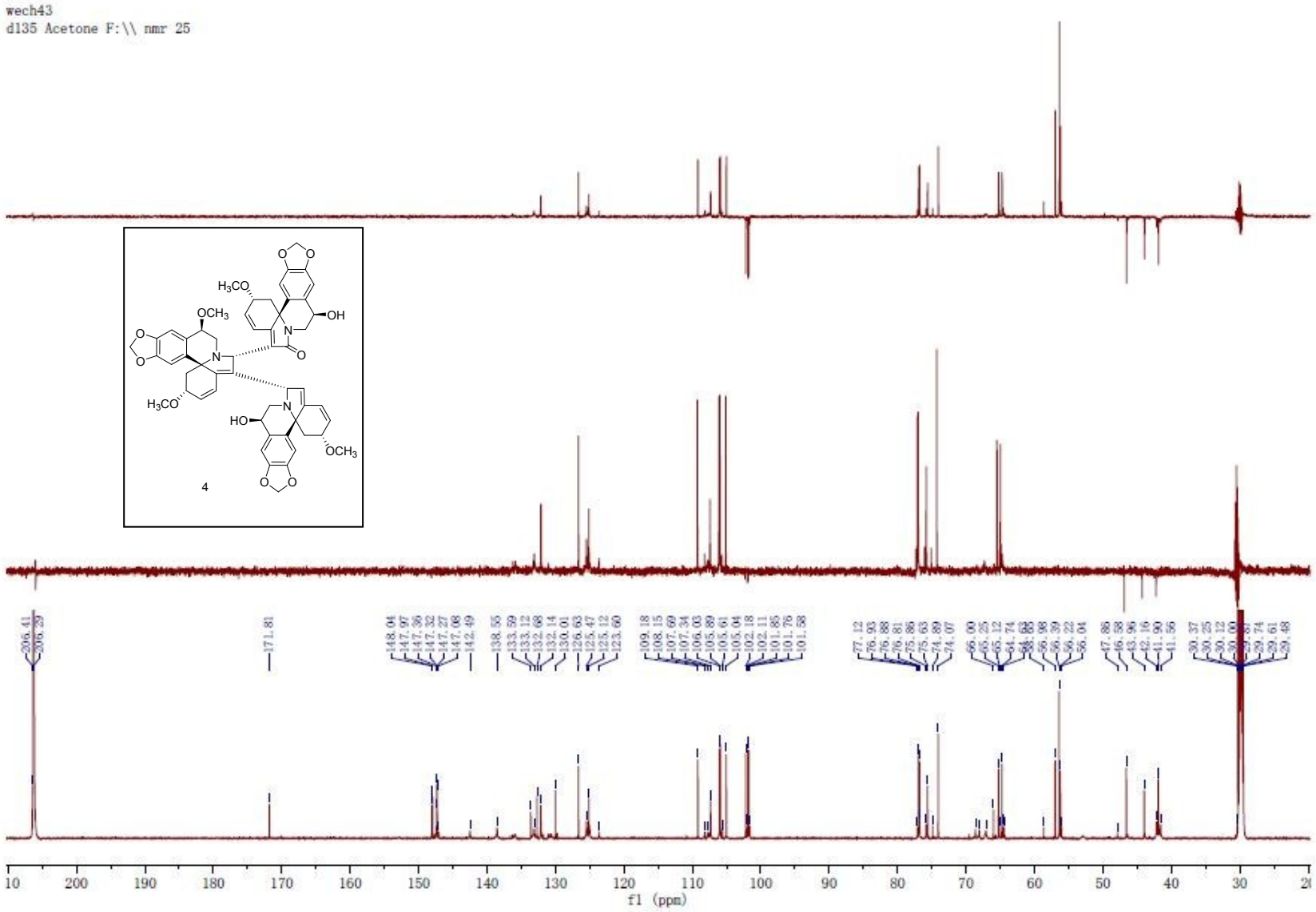
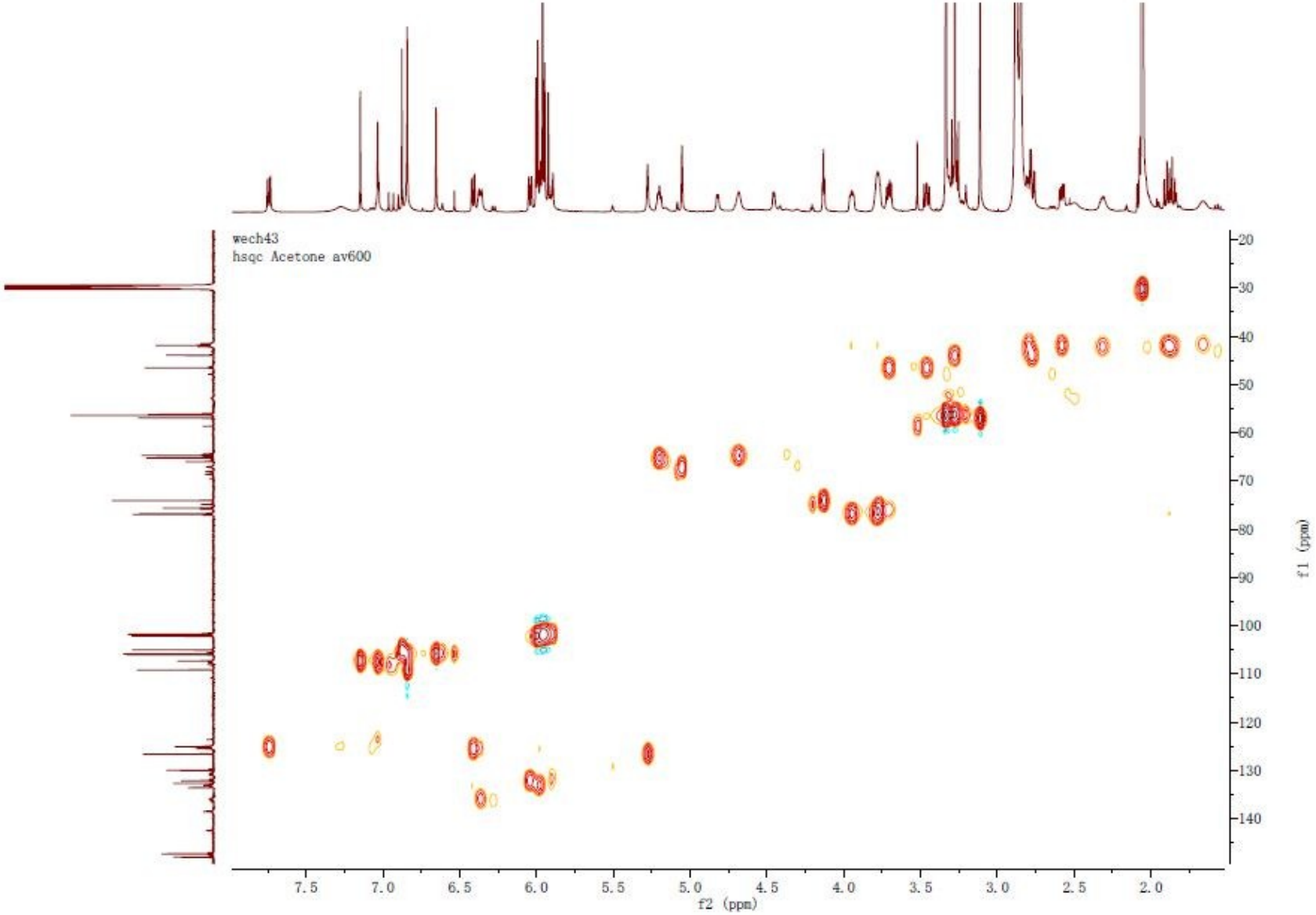


Figure S20. HSQC spectrum of erythrivarine F (**4**)



Expanded HSQC spectrum of erythrivarine F (**4**)

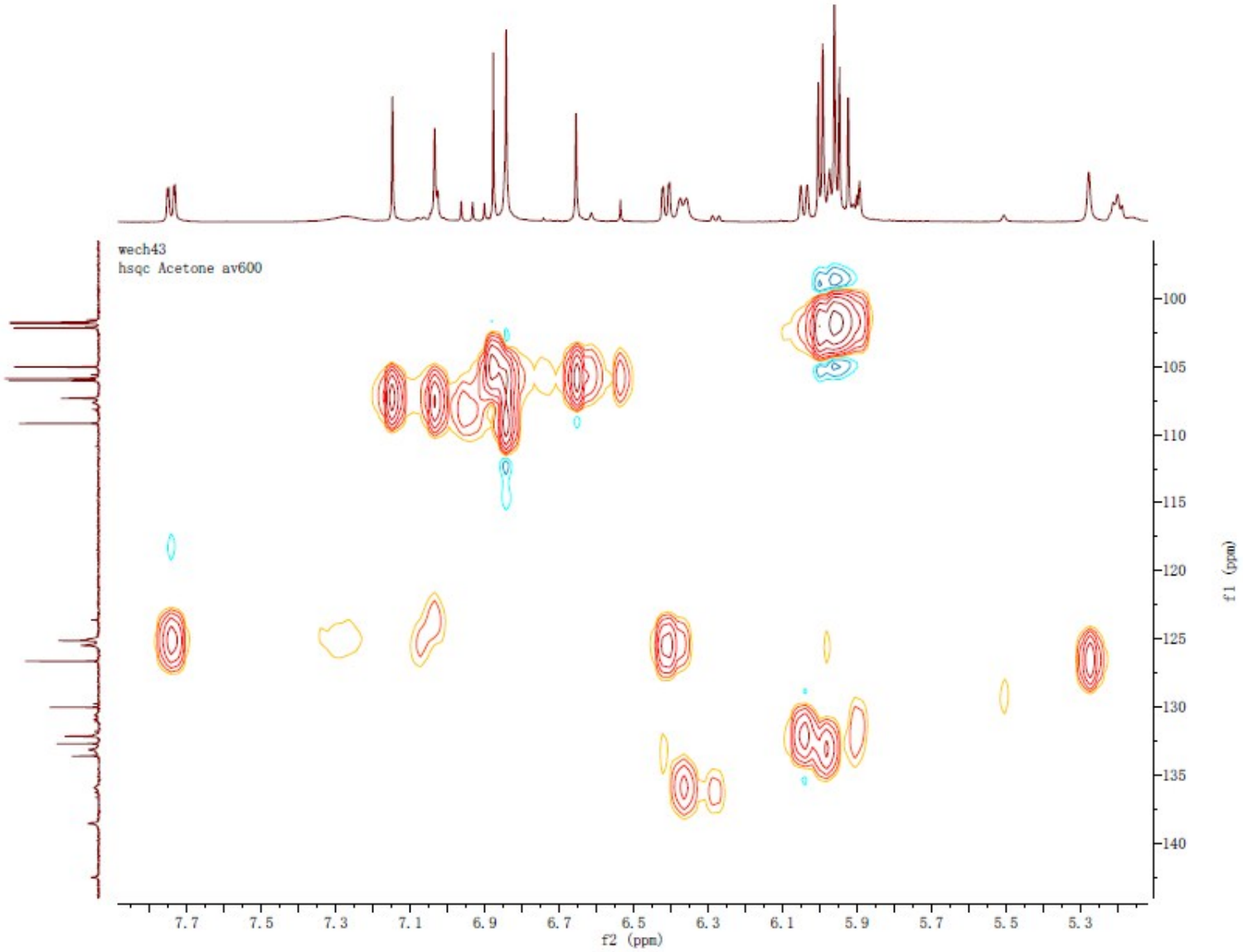


Figure S21. HMBC spectrum of erythrivarine F (**4**)

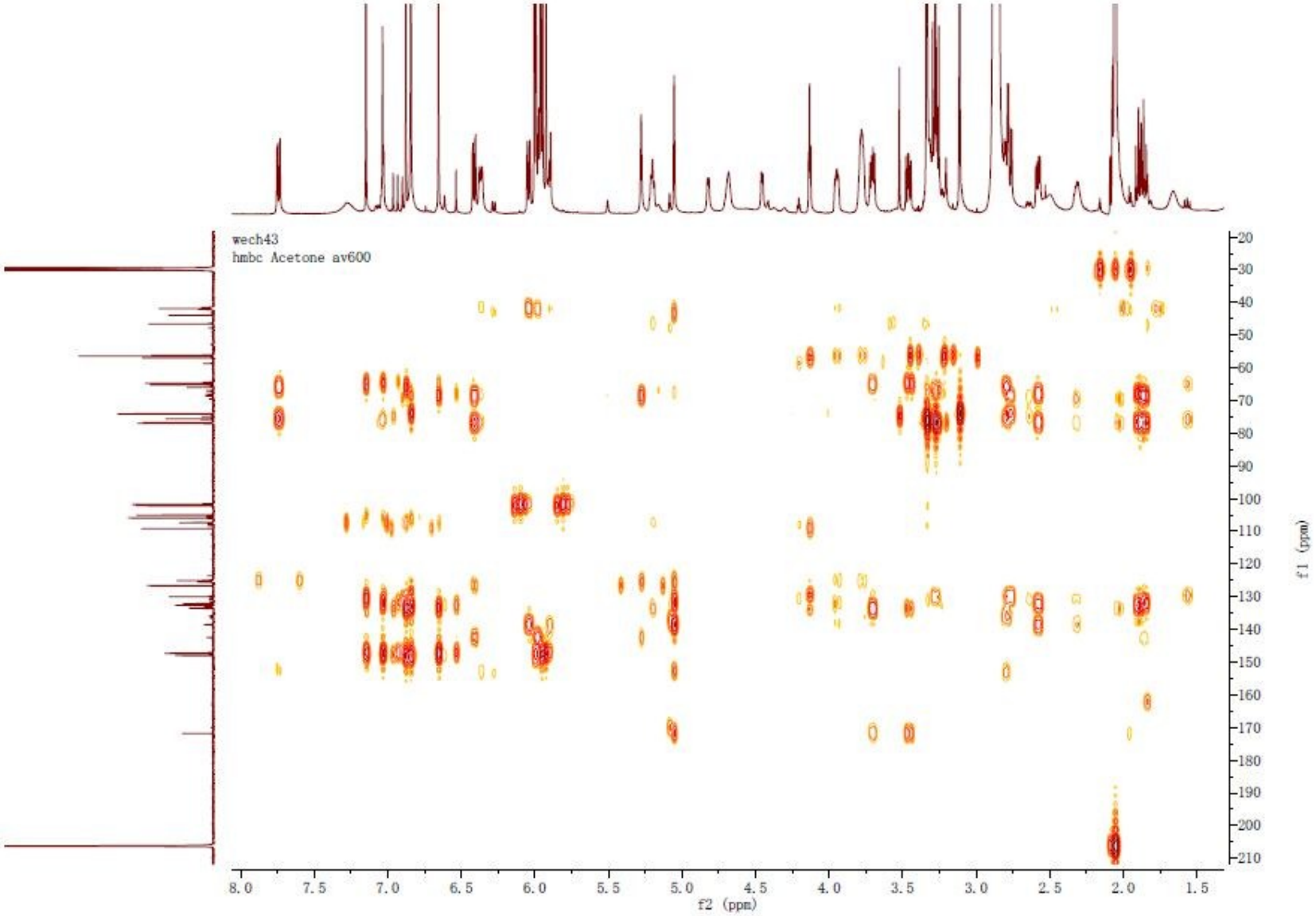


Figure S22. ^{1}H-^{1}H COSY spectrum of erythrivarine F (**4**)

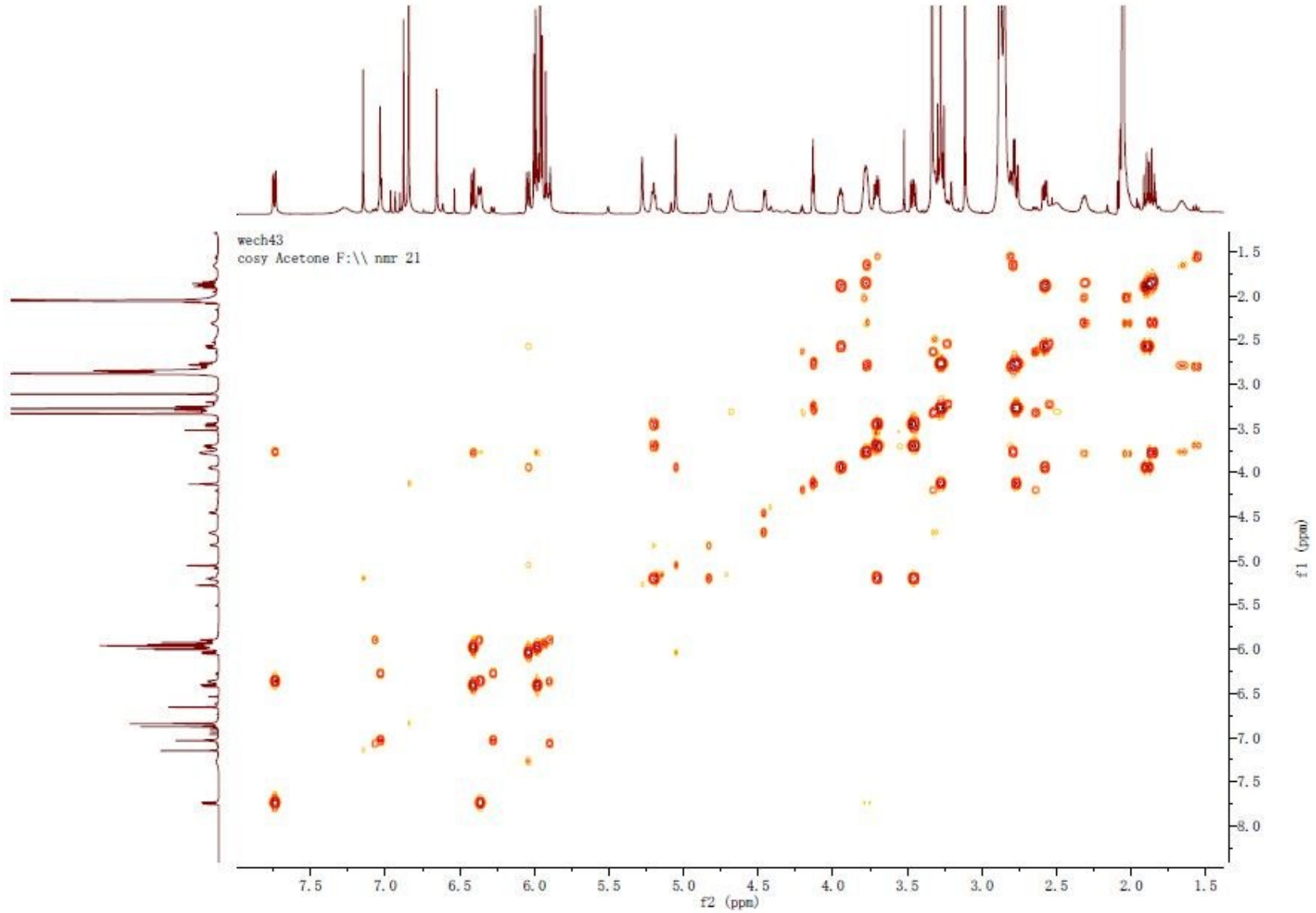


Figure S23. ROESY spectrum of erythrivarine F (**4**)

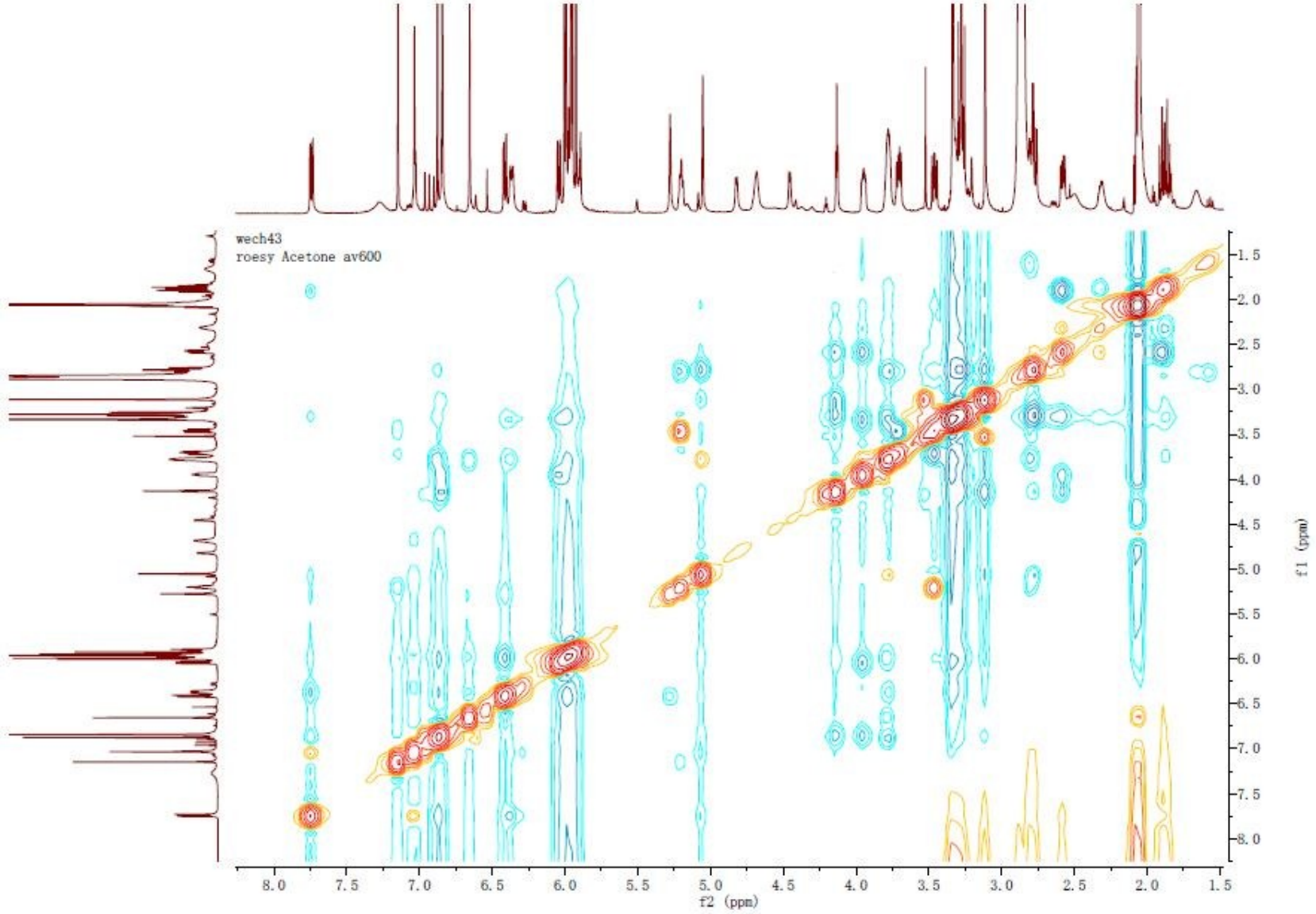
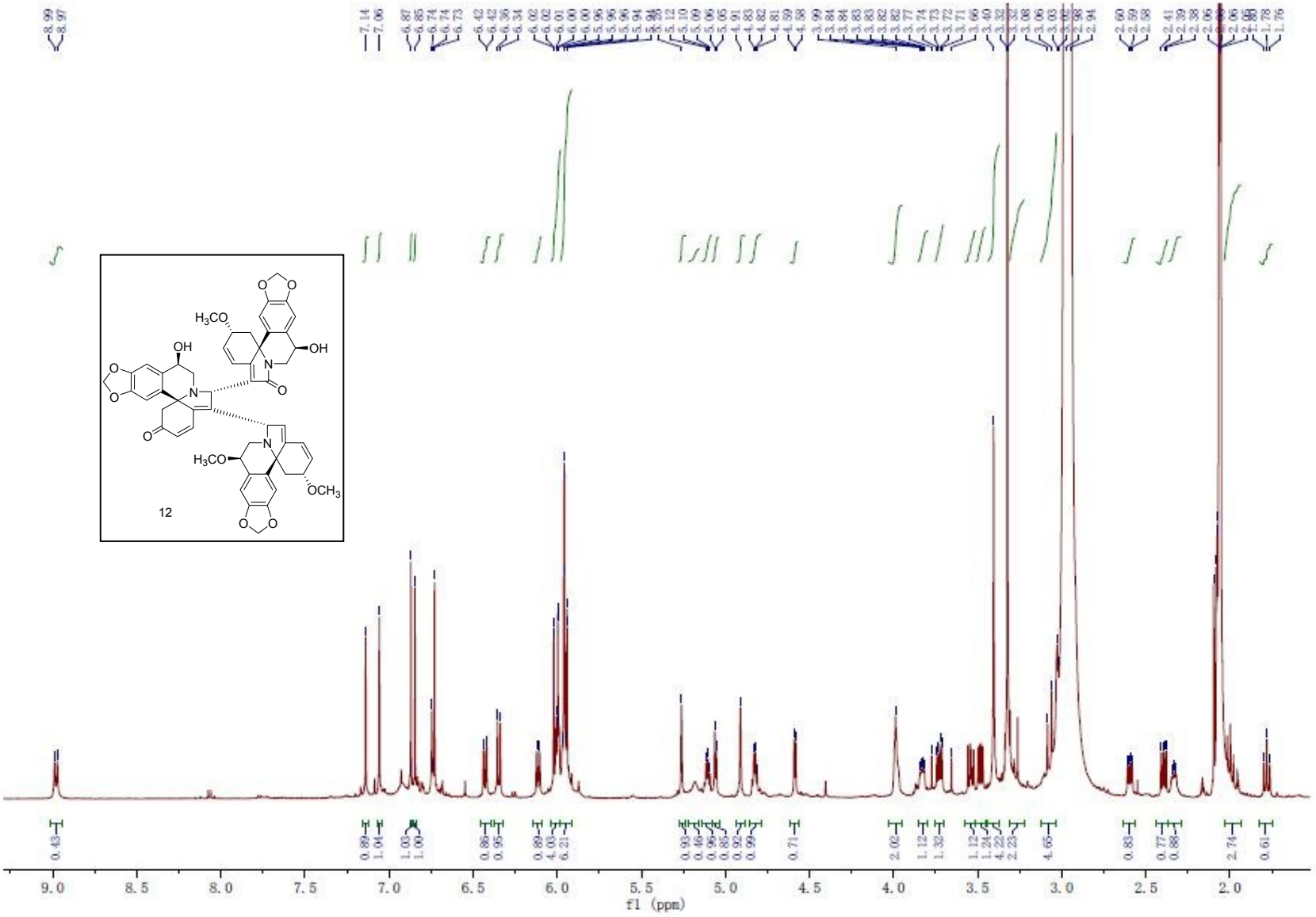


Figure S24. ^{1}H NMR spectrum of erythrivarine G (**5**)



Expanded ^{1}H NMR spectrum of erythrivarine G (**5**)

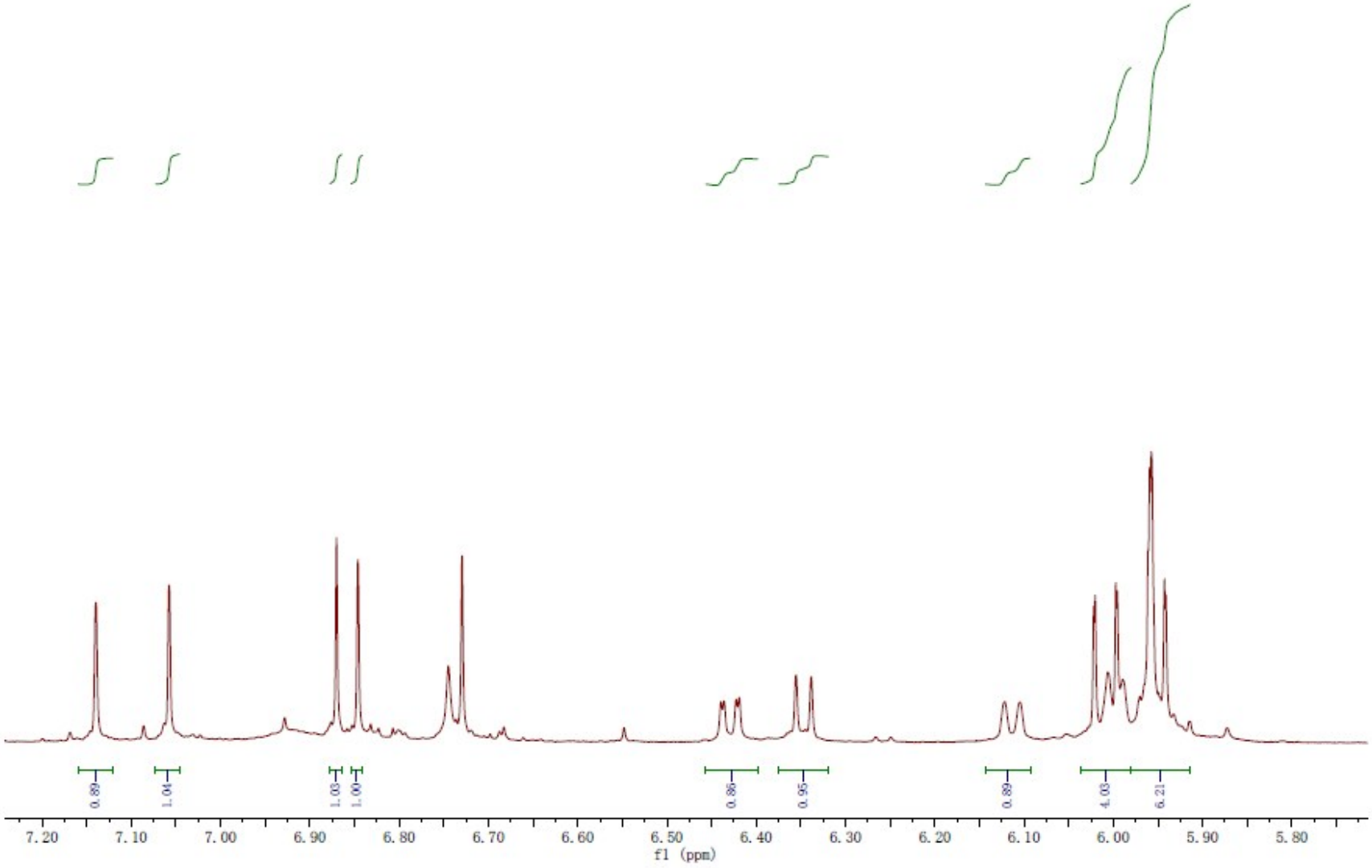


Figure S25. ^{13}C NMR spectrum of erythrivarine G (**5**)

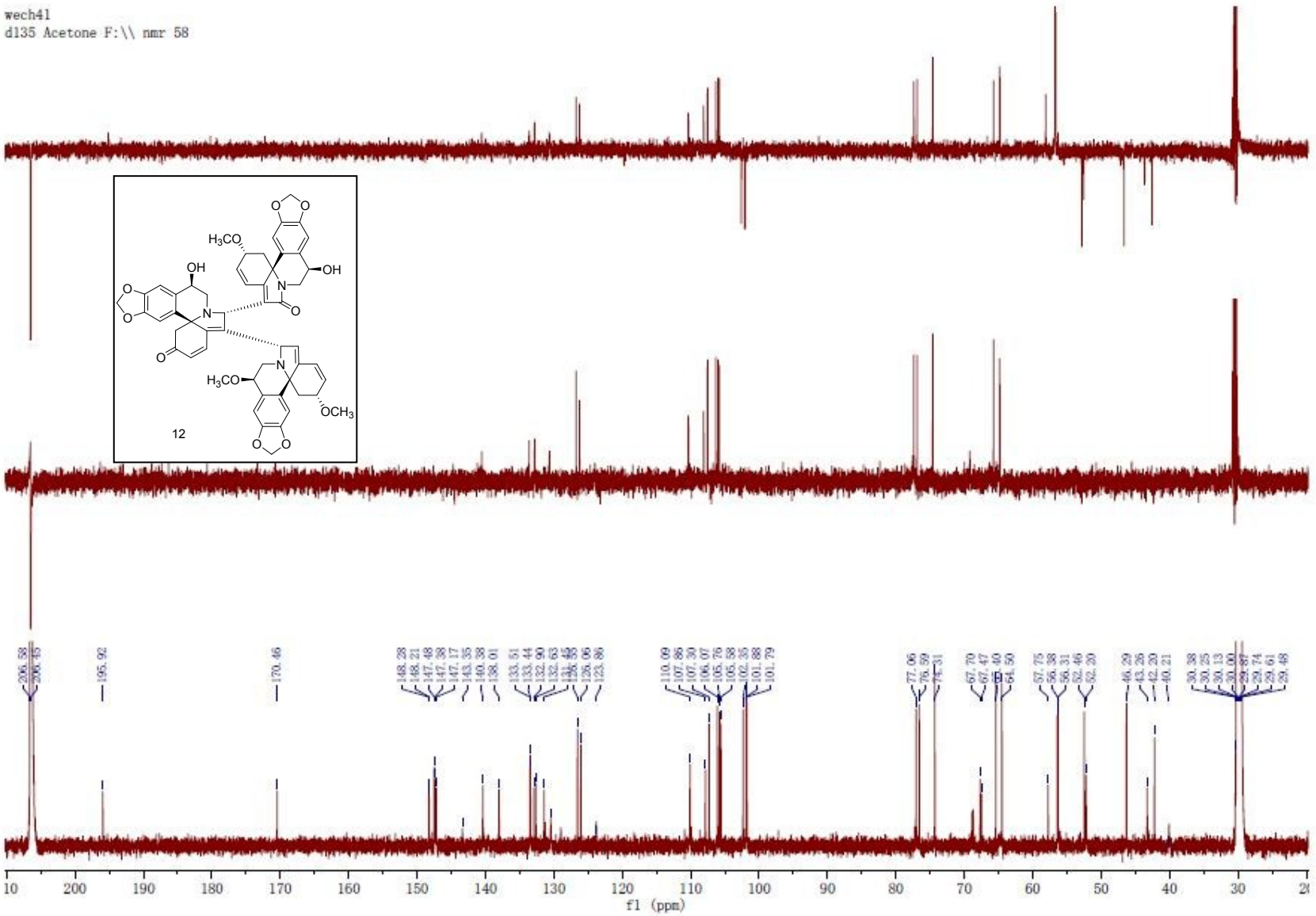
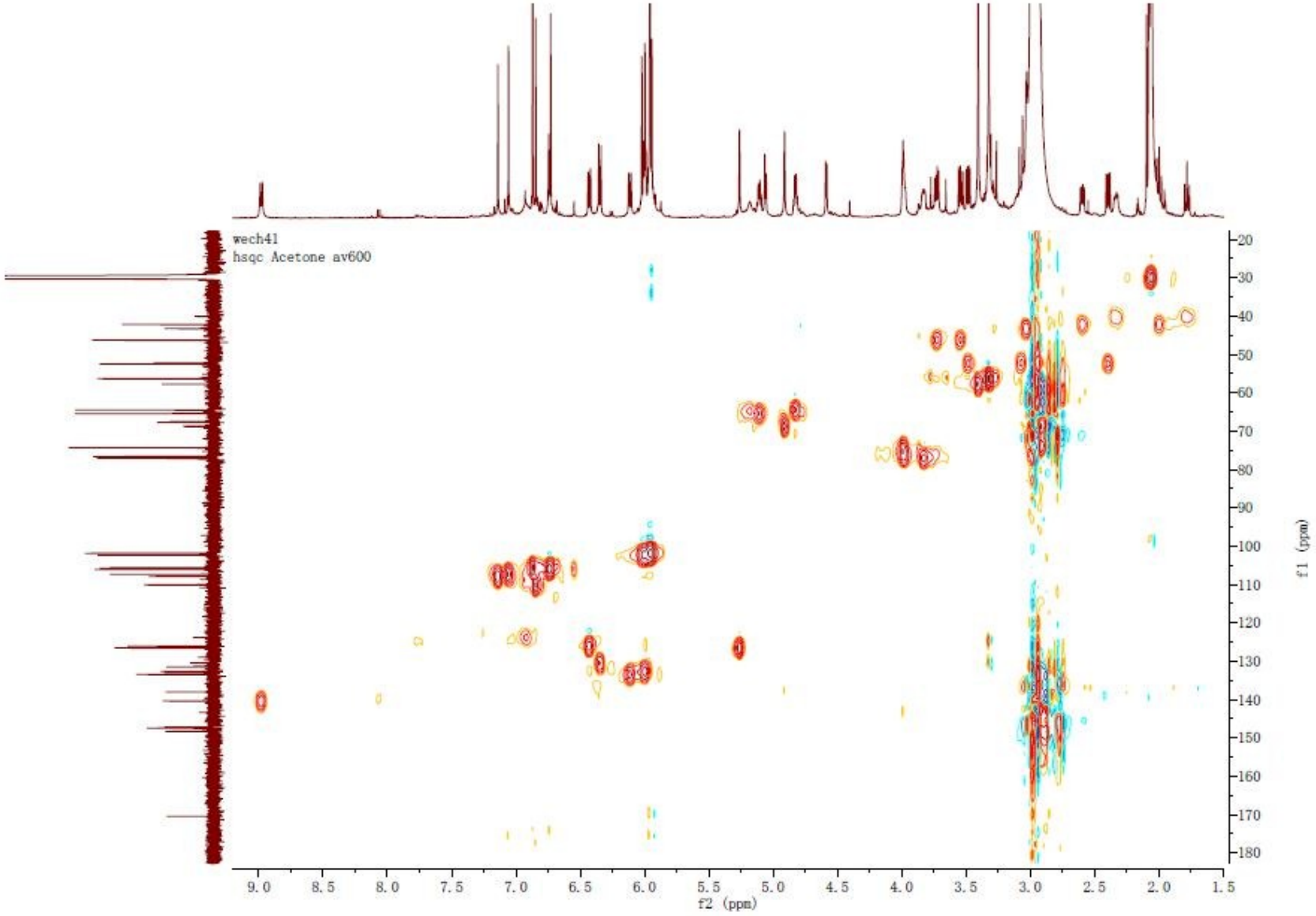


Figure S26. HSQC spectrum of erythrivarine G (**5**)



Expanded HSQC spectrum of erythrivarine G (**5**)

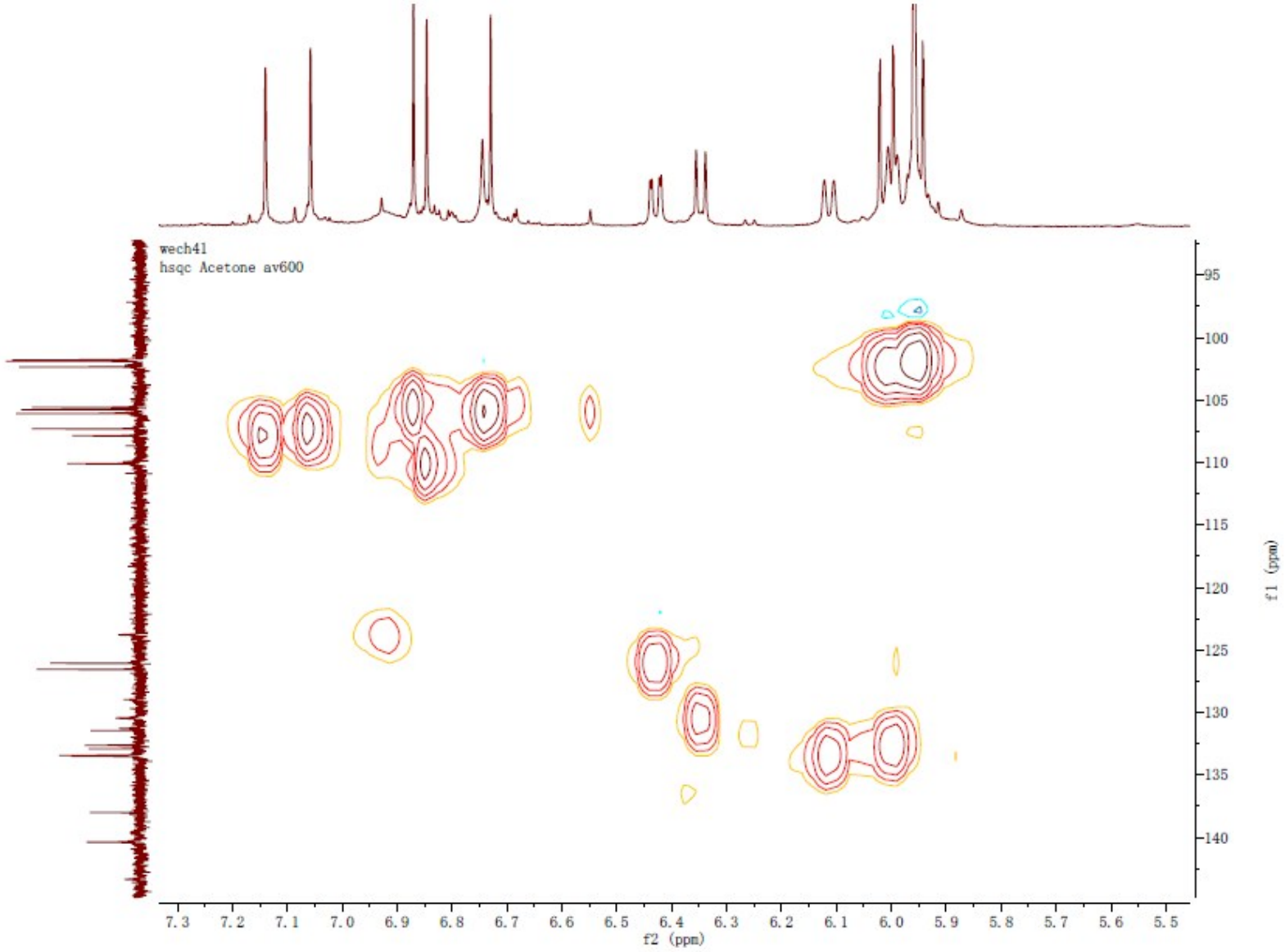


Figure S27. HMBC spectrum of erythrivarine G (**5**)

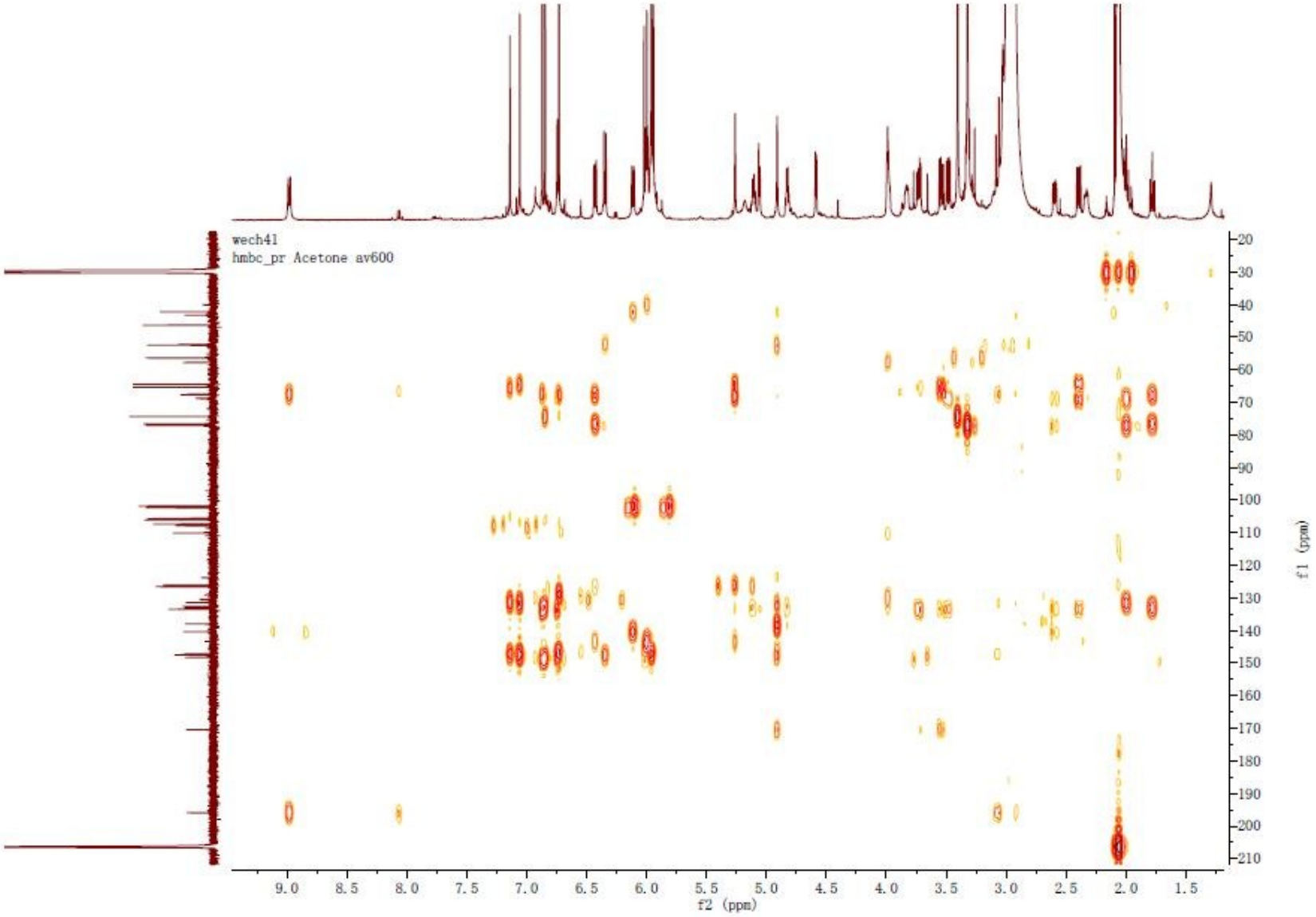


Figure S28. ^{1}H-^{1}H COSY spectrum of erythrivarine G (**5**)

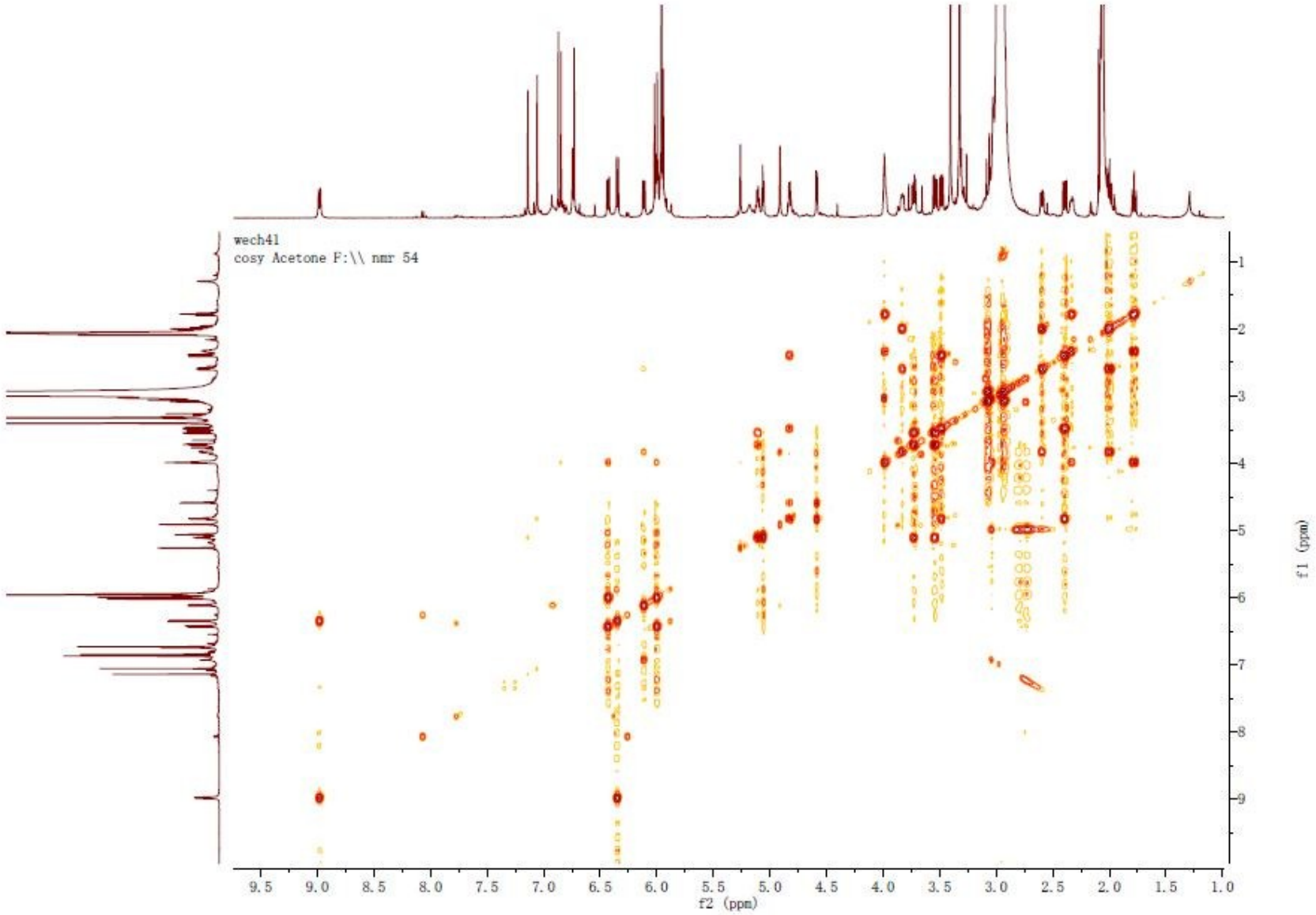
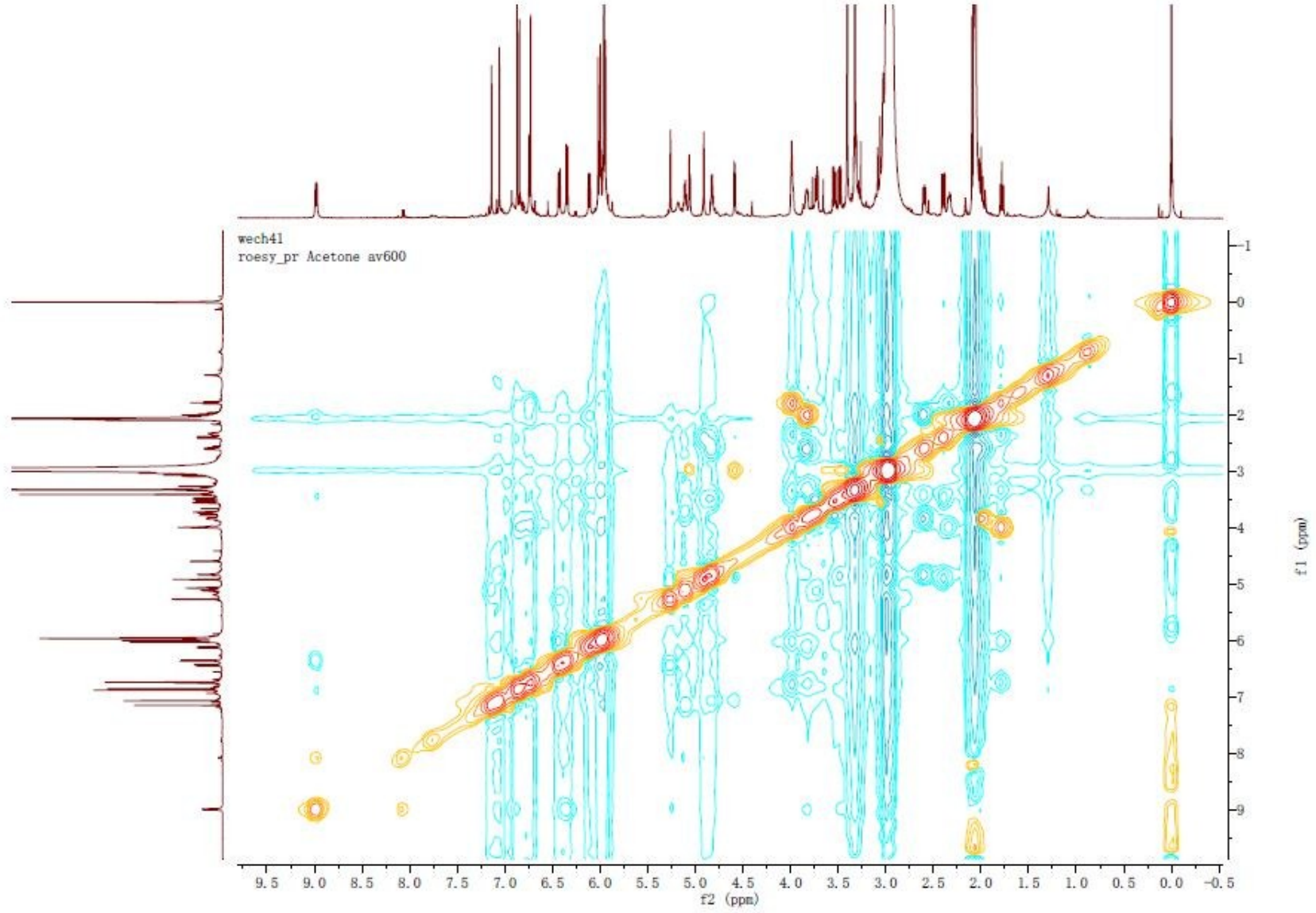


Figure S29. ROESY spectrum of erythrivarine G (**5**)



4、NMR spectroscopic data of erythrinine (**6**) and 8-oxo-erythrinine (**7**)

Figure S30: ^{1}H NMR spectrum of erythrinine (**6**)

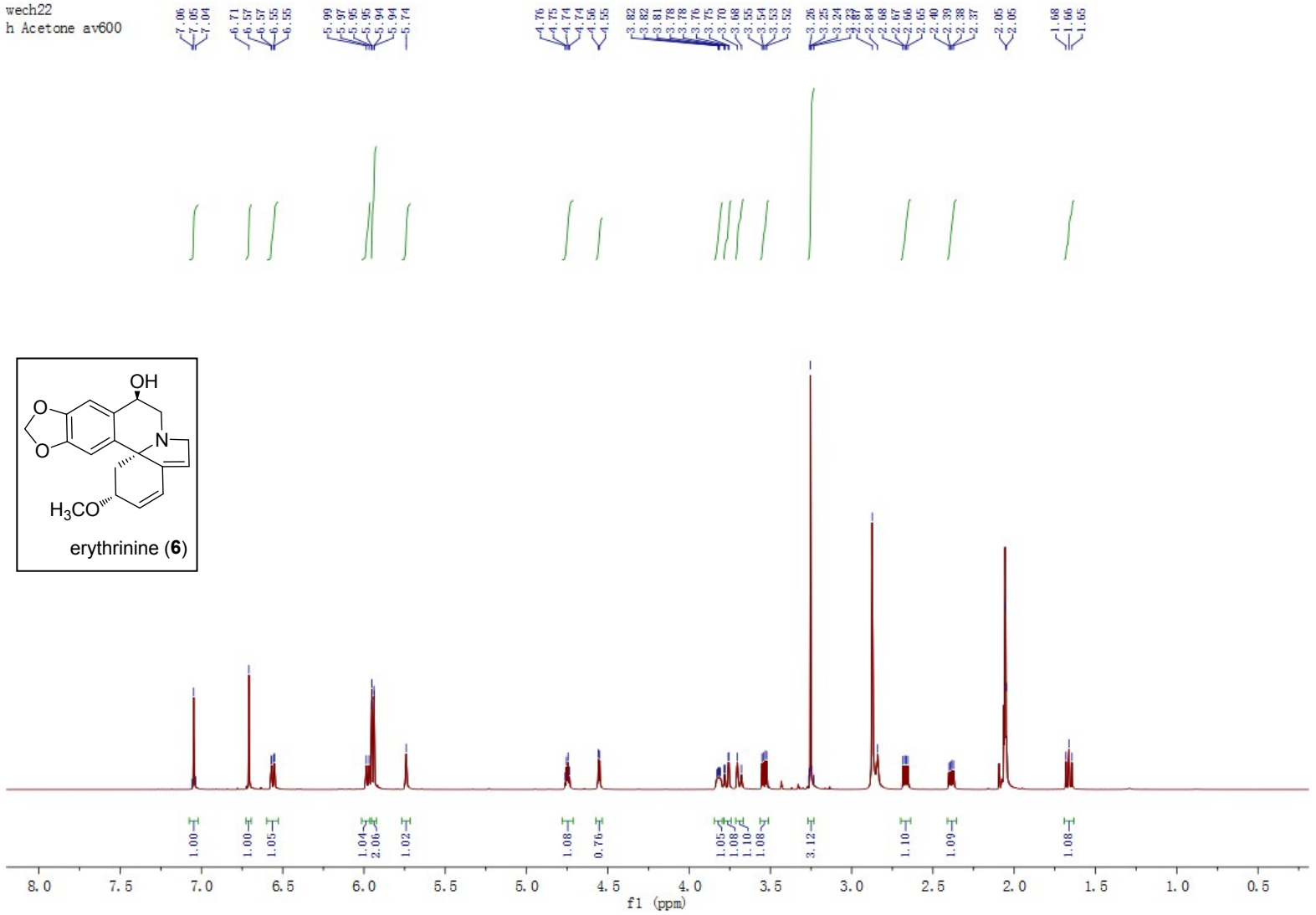


Figure S31: ^{13}C NMR spectrum of erythrinine (**6**)

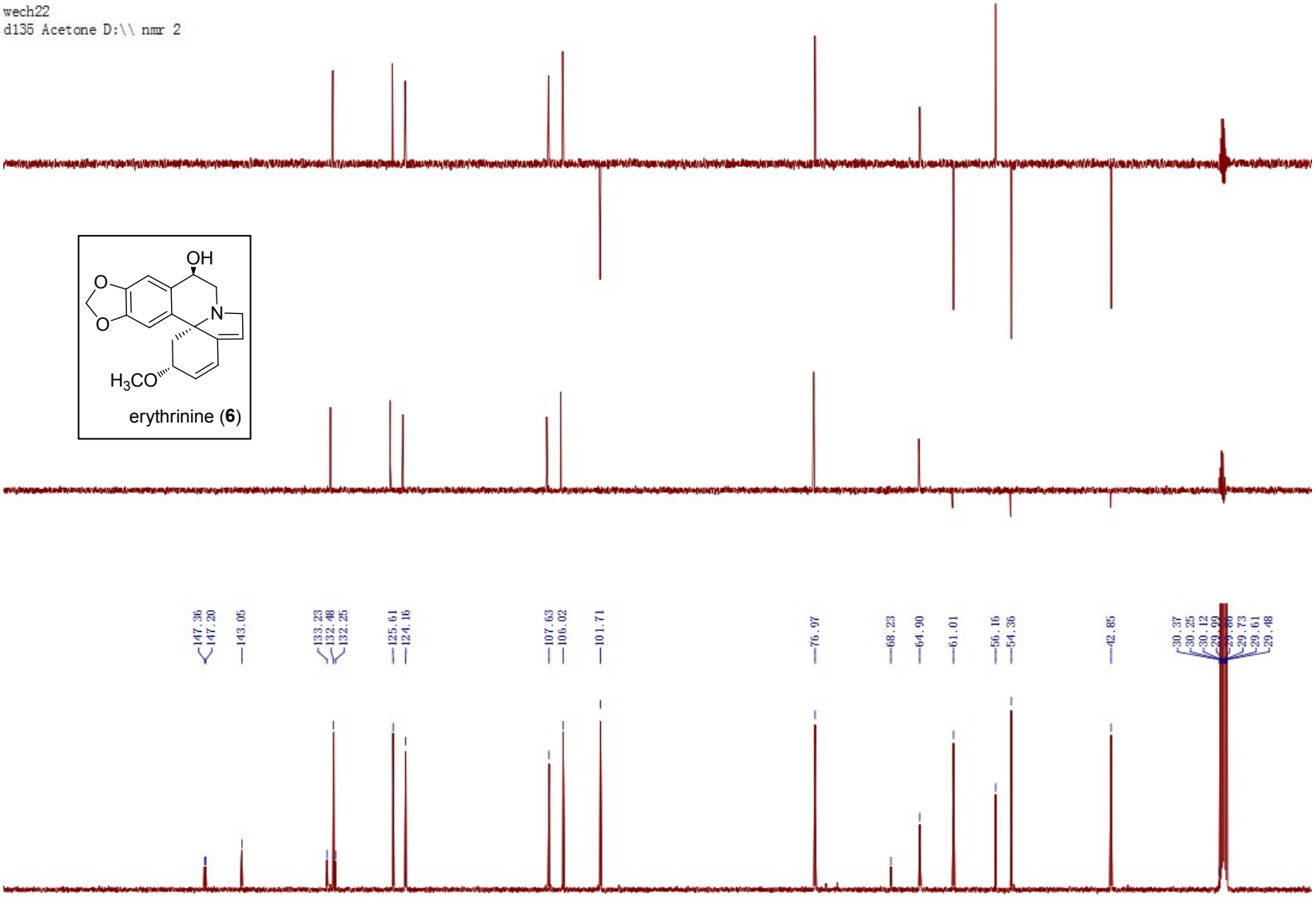


Figure S32: ^{1}H NMR spectrum of 8-oxo-erythrinine (**7**)

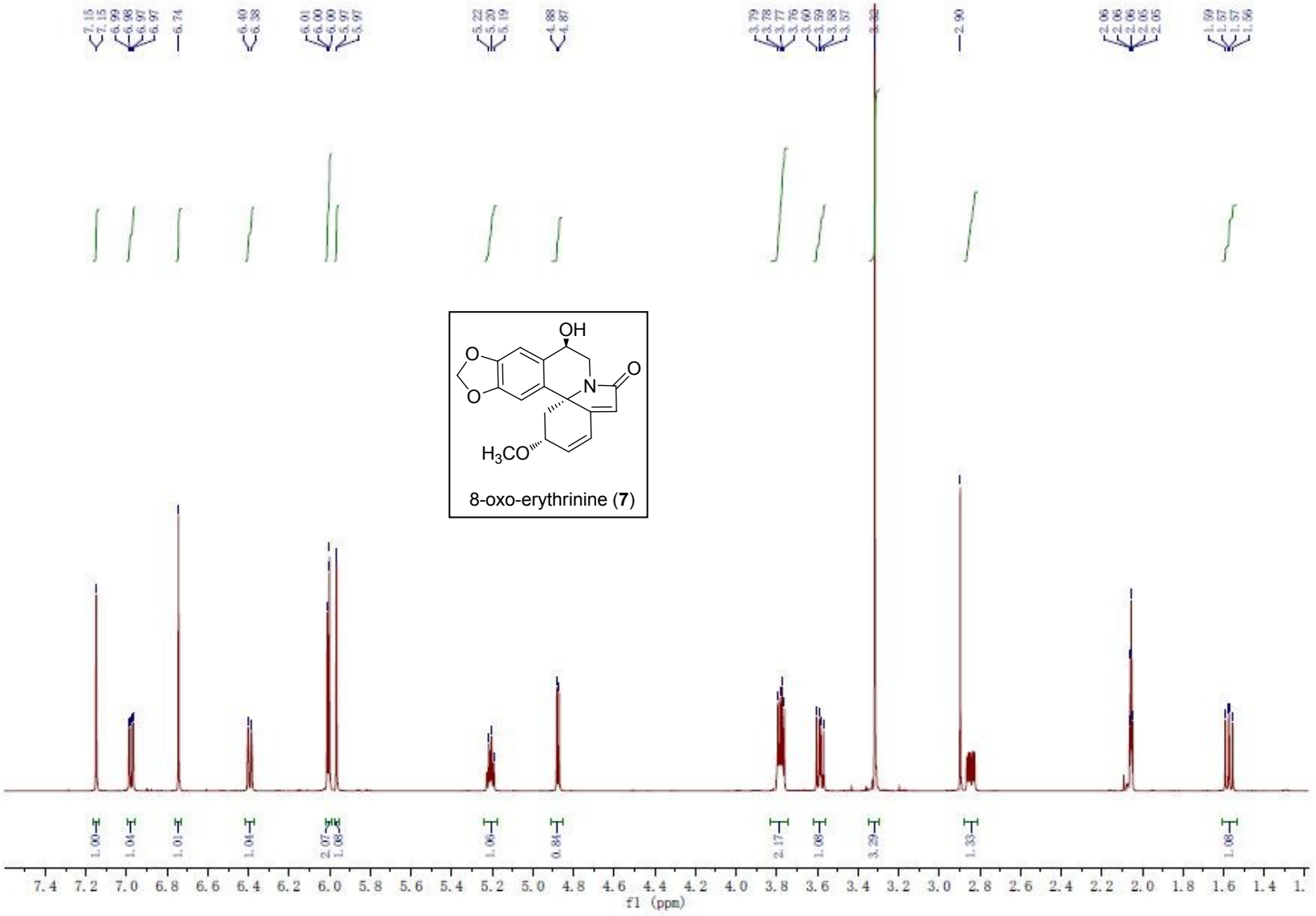
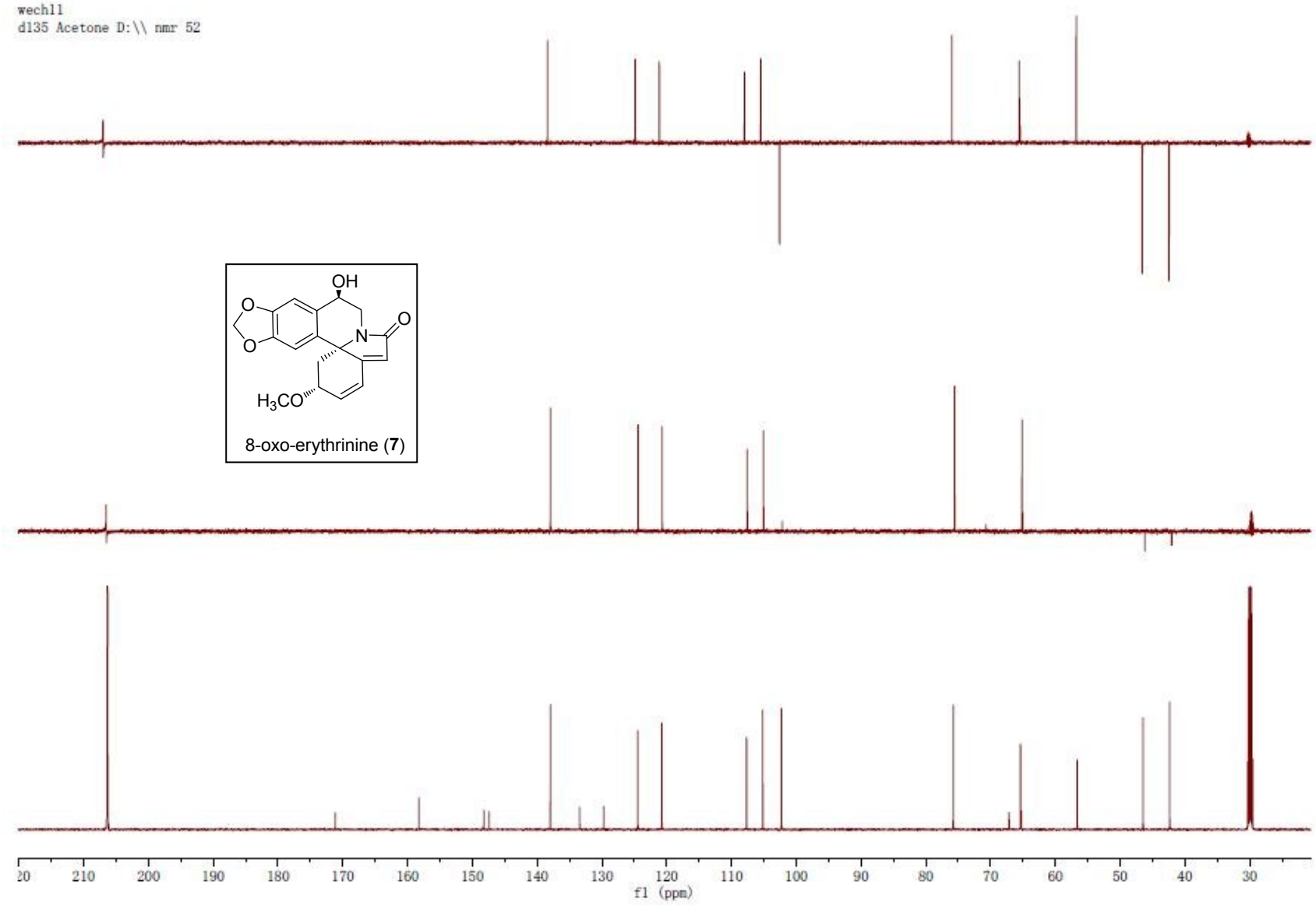


Figure S33. ^{13}C NMR spectrum of 8-oxo-erythrinine (**7**)



5、UPLC-MS-MS analysis of the polymeric alkaloids

Preparation of reference solution

The purified compounds were accurately weighed and further dissolved in methanol respectively to yield the stock solutions at the concentration of 5000 ng/mL, the equal volumes of stock solutions were then mixed well to yield the reference solution containing the compounds at the concentration of 1000 ng/mL.

Preparation of sample solution

The total alkaloid extract was accurately weighed and dissolved in methanol to yield the sample solution at the concentration of 1000 μg/mL.

UPLC conditions

UPLC analyses were performed on a Waters Acquity H CLASS system; the compounds were analyzed by an Acquity UPLC BEH C18 column (2.1 × 50 mm, 1.7 μm, Serial NO. 021132332157 96) using ACN-H_2O (10 % ACN – 100 % ACN in 1.5 mins, linear mode) as eluent.

MS conditions

MS analyses were performed on a Waters Xevo TQD ESI-MS instrument. The compounds were analyzed using the MRM mode. The parameters (Cone voltage and collision energy) were tuned respectively for each compound (Table S1).

Table S1: The parameters for MS/MS analysis

	Compound	Parent (m/z)	Daughter (m/z)	Dwell (s)	Cone (V)	Collision (V)
1	Erythrivarine C	843.3856	262.0836	0.063	42	66
2	Erythrivarine D	857.3374	466.0262	0.063	42	36
3	Erythrivarine E	949.7628	311.9421	0.063	60	30
4	Erythrivarine F	964.5174	280.0855	0.063	56	44
5	Erythrivarine G	948.4223	262.0193	0.063	50	50

Figure S34. The characteristic peak obtained by ESI-MS-MS of erythrivarine C (**1**)


Sample 1 265 (1.458)
MRM of 5 Channels ES+
3.83e3
100
%
0
843.39
857.34
948.42
949.76
964.52
m/z
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965

Figure S35. The characteristic peak obtained by ESI-MS-MS of erythrivarine D (**2**)


Sample 1 277 (1.524)
MRM of 5 Channels ES+
3.02e3
100
%
0
857.34
843.39
948.42
949.76
964.52
m/z
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965

Figure S36 The characteristic peak obtained by ESI-MS-MS of erythrivarine E (**3**)


Sample 1 293 (1.612)
MRM of 5 Channels ES+
8.94e3
100
%
0
949.76
948.42
964.52
843.39
857.34
m/z
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965

Figure S37. The characteristic peak obtained by ESI-MS-MS of erythrivarine F (**4**)


Sample 1 308 (1.695)
MRM of 5 Channels ES+
964.52 1.03e4
100
%
0
843.39
857.34
948.42
949.76
m/z
845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965

Figure S38. The characteristic peak obtained by ESI-MS-MS of erythrivarine G (**5**)


Sample 1 331 (1.821)
MRM of 5 Channels ES+
2.09e3
100
%
0
948.42
843.39
857.34
949.76
964.52
m/z
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965

6、The CD and UV chromatography of the unit of erythrivarine C (**1**)