Supplementary material for

Cytotoxic dibohemamines D-F from *Streptomyces* sp.

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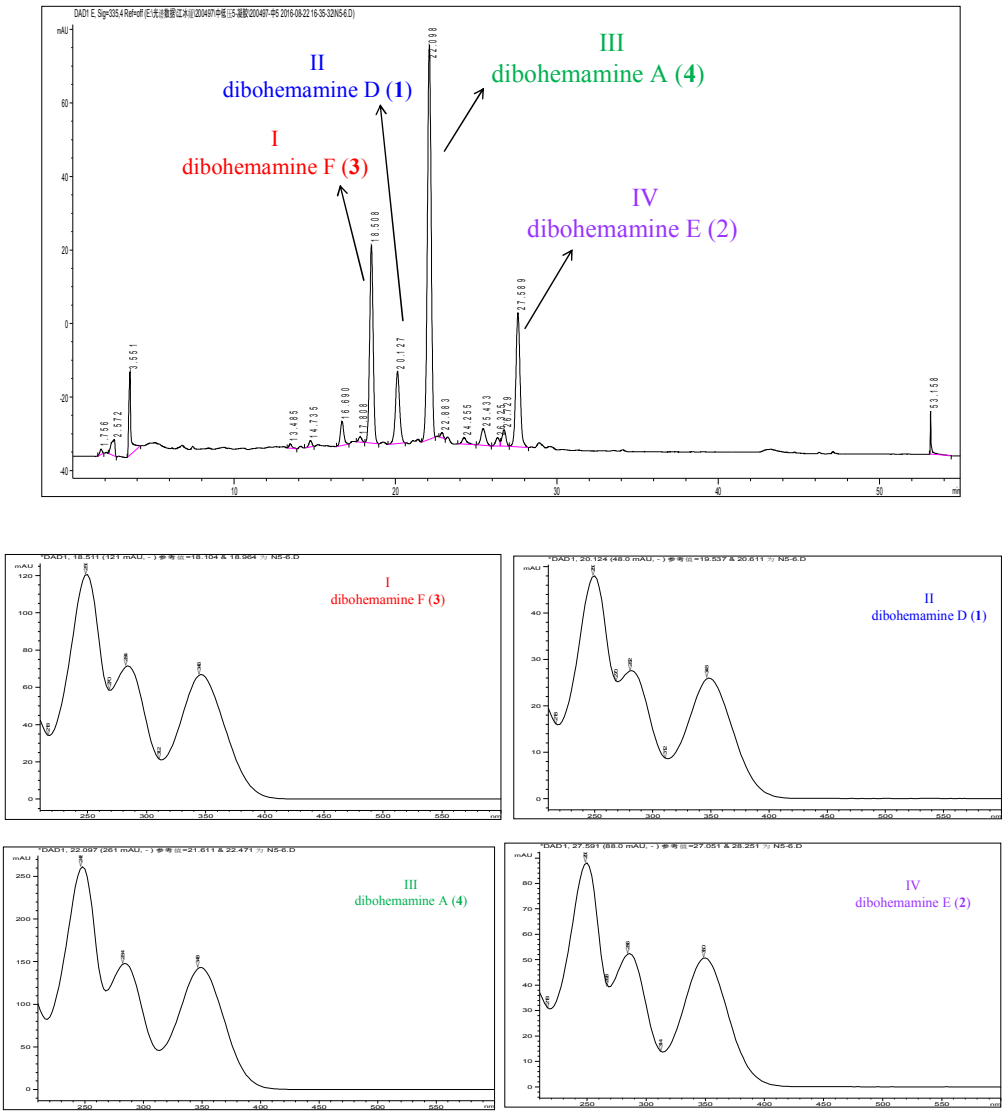
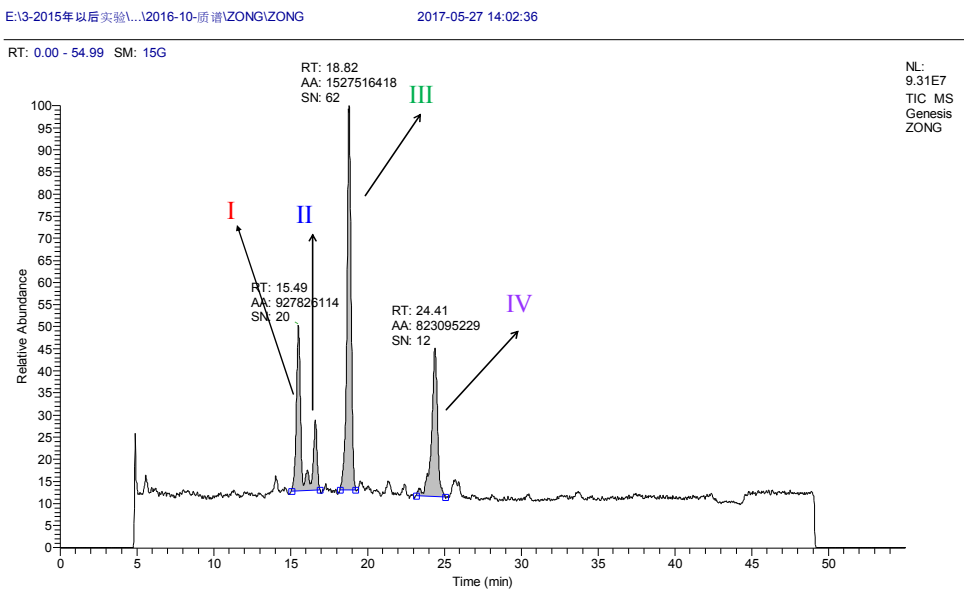


Figure S1 HPLC of an ODS column fraction F6-4 from EtOAc extract of *Streptomyces* sp. CPCC 200497. HPLC parameters: Diamonsil C18(2) (4.6 × 150 mm, 5 μm); mobile phase MeCN-H_2O, 1.0 ml/min, 30-60% in 40 min; wavelength 254 nm; 27 °C.

Four peaks (I, II, III and IV) with UV-Visible absorption profiles very similar to bohemamines appeared.[1-2]

[1] Nettleton, D. E. Jr.; Balitz, D. M.; Doyle, T. W.; Bradner, W. T.; Johnson, D. L.; O'Herron, F. A.; Schreiber, R. H.; Coon, A. B.; Moseley, J. E.; Myllymaki, R. W. *J. Nat. Prod*. **1980**, *43*, 242-258.

[2] Bugni, T. S.; Woolery, M.; Kauffman, C. A.; Jensen, P. R.; Fenical, W. *J. Nat. Prod*. **2006**, *69*, 1626-1628.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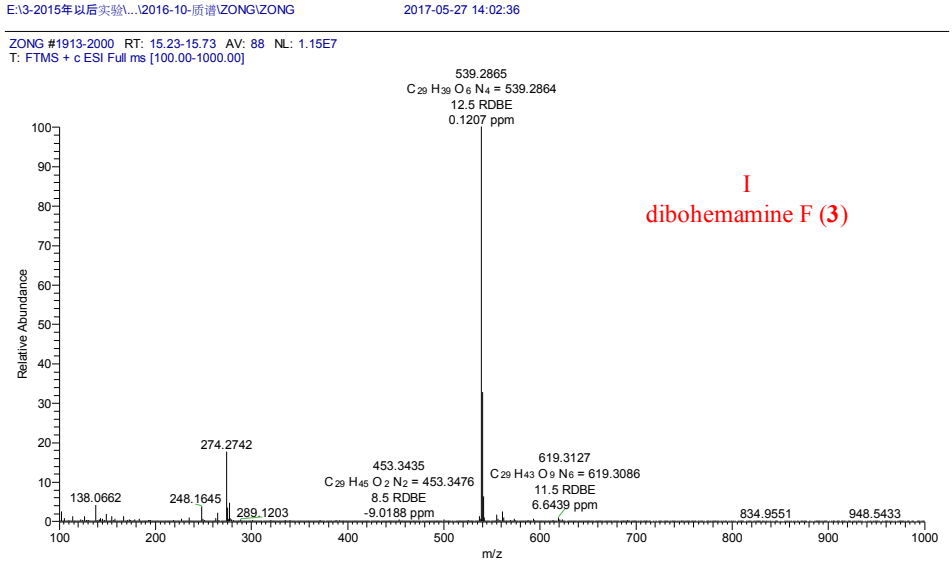
SN: 62
III
NL:
9.31E7
TIC MS
Genesis
ZONG
I
II
RT: 15.49
AA: 927826114
SN: 20
RT: 24.41
AA: 823095229
SN: 12
IV
Relative Abundance
Time (min)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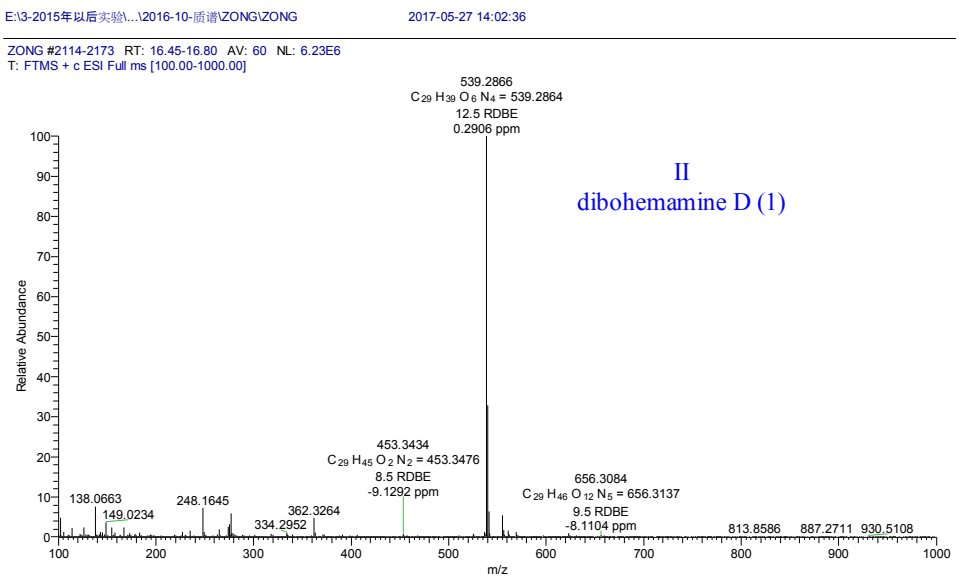
539.2865
C29 H39 O6 N4 = 539.2864
12.5 RDBE
0.1207 ppm
I
dibohemamine F (3)
274.2742
453.3435
C29 H45 O2 N2 = 453.3476
8.5 RDBE
-9.0188 ppm
619.3127
C29 H43 O9 N6 = 619.3086
11.5 RDBE
6.6439 ppm
138.0662
248.1645
289.1203
834.9551
948.5433
Relative Abundance
m/z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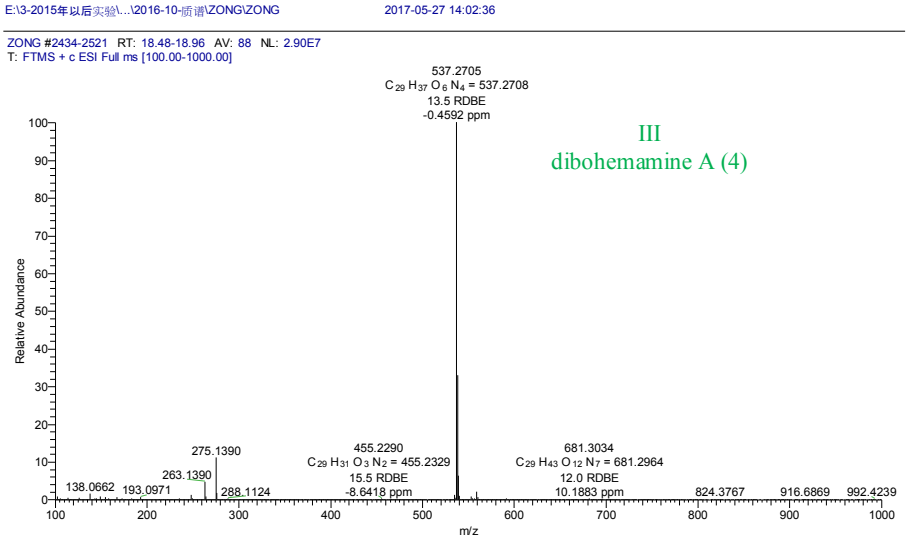
539.2866
C29 H39 O6 N4 = 539.2864
12.5 RDBE
0.2906 ppm
II
dibohemamine D (1)
453.3434
C29 H45 O2 N2 = 453.3476
8.5 RDBE
-9.1292 ppm
656.3084
C29 H46 O12 N5 = 656.3137
9.5 RDBE
-8.1104 ppm
138.0663
149.0234
248.1645
334.2952
362.3264
813.8586
887.2711
930.5108
Relative Abundance
m/z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537.2705
C29 H37 O6 N4 = 537.2708
13.5 RDBE
-0.4592 ppm
III
dibohemamine A (4)
455.2290
C29 H31 O3 N2 = 455.2329
15.5 RDBE
-8.6418 ppm
681.3034
C29 H43 O12 N7 = 681.2964
12.0 RDBE
10.1883 ppm
275.1390
263.1390
138.0662
193.0971
288.1124
824.3767
916.6869
992.4239
Relative Abundance
m/z

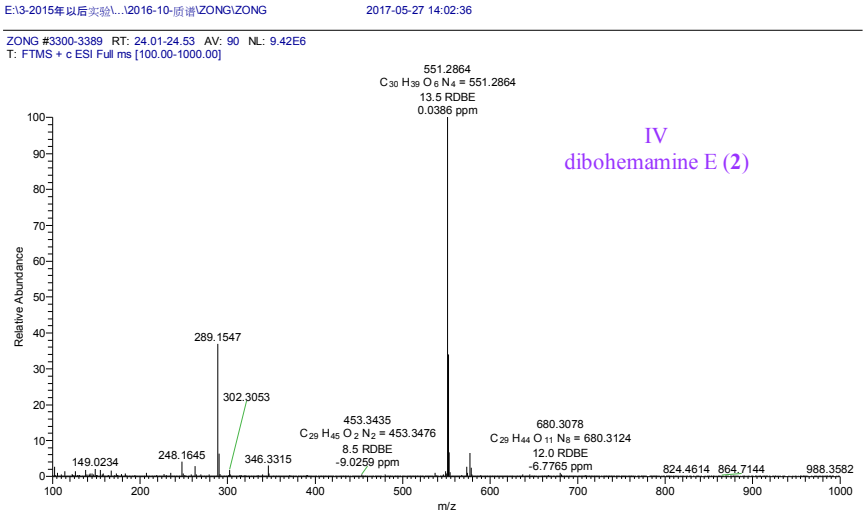


Figure S2 LC-ESI(+)HRMS of an ODS column fraction F6-4 from EtOAc extract of *Streptomyces* sp. CPCC 200497. (HRMS by Orbitrap XL from Thermo Fisher Scientific)

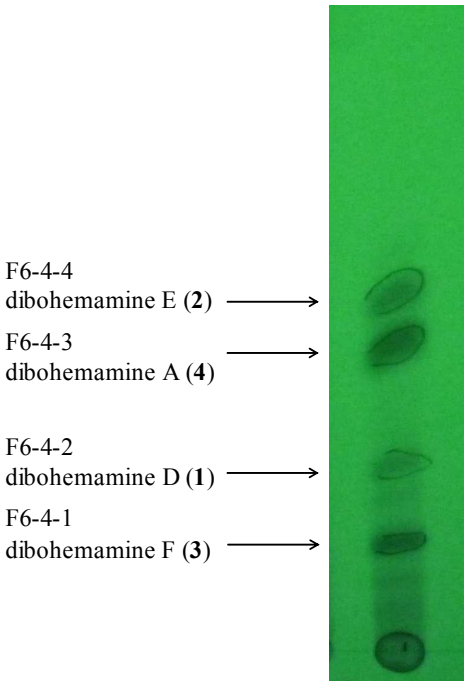


Figure S3 Silica gel TLC of an ODS column fraction F6-4 from EtOAc extract of *Streptomyces* sp. CPCC 200497

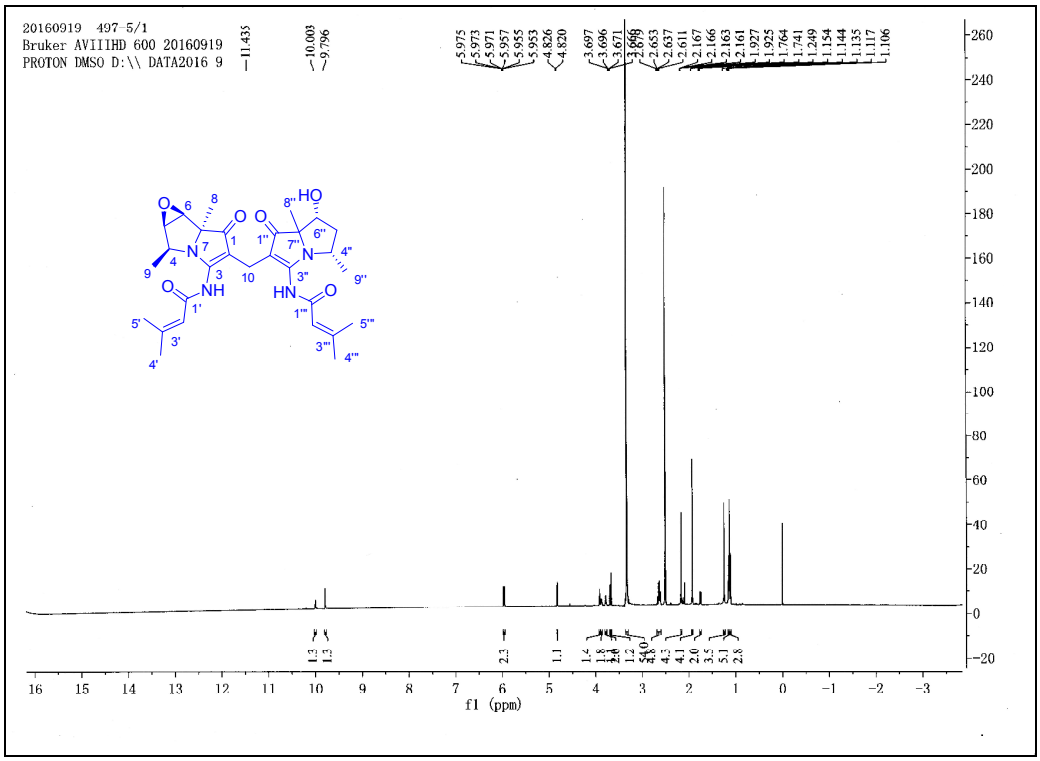


Figure S4 ^{1}H-NMR spectrum of dibohemamine D (**1**) in DMSO-d_6.

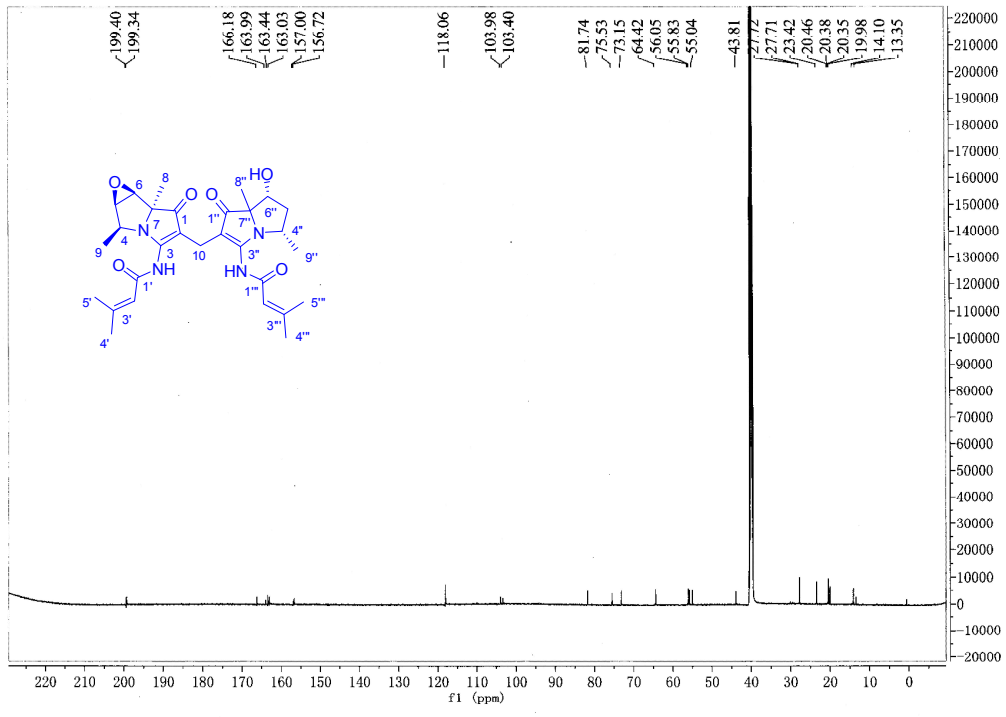


Figure S5 ^{13}C-NMR spectrum of dibohemamine D (**1**) in DMSO-d_6.

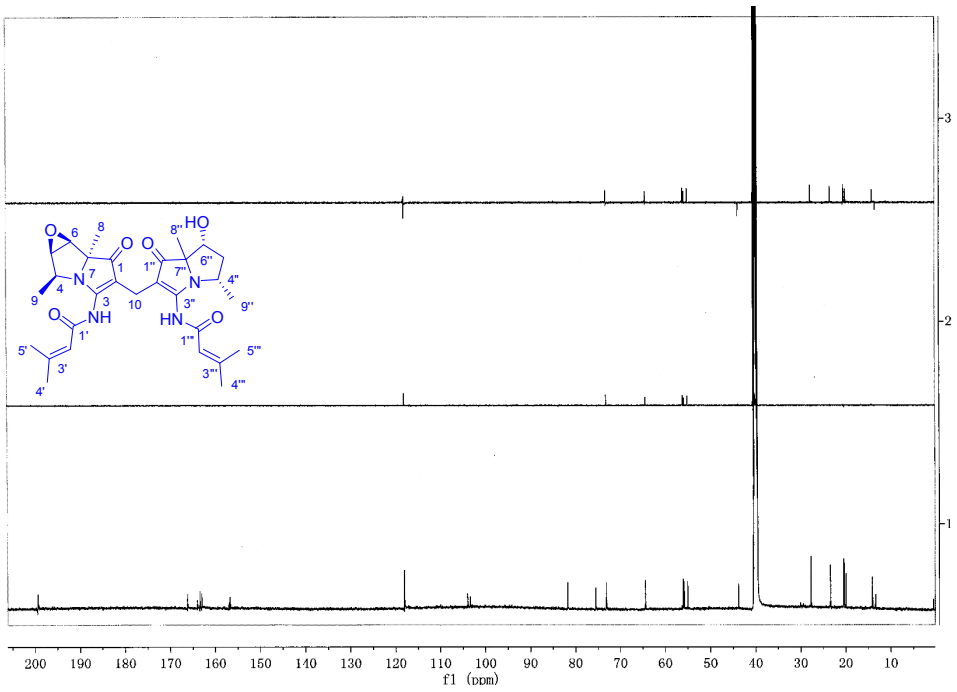


Figure S6 DEPT spectrum of dibohemamine D (**1**) in DMSO-d_6.

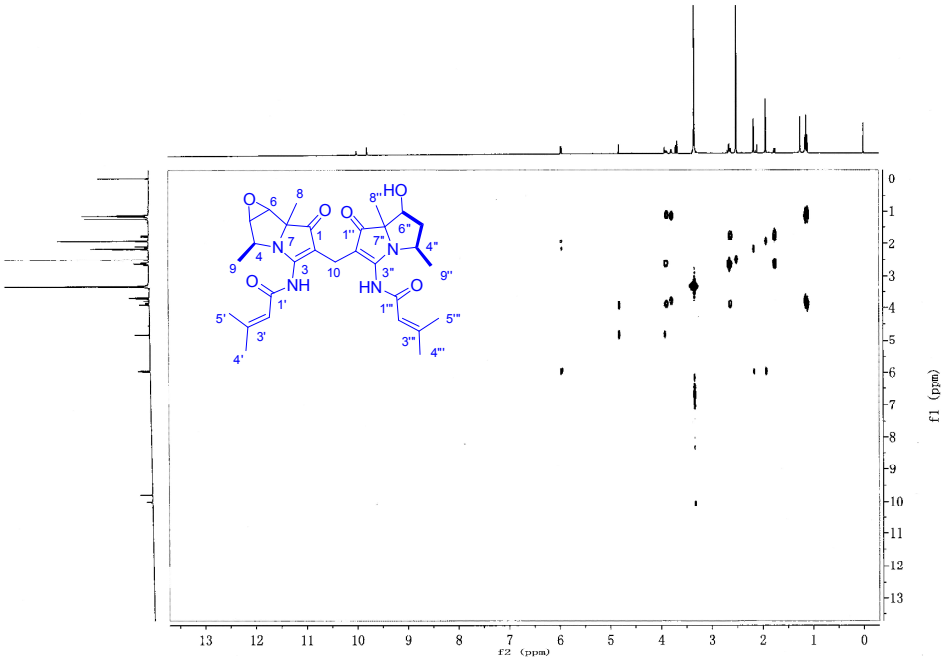


Figure S7 ^{1}H-^{1}H COSY spectrum of dibohemamine D (**1**) in DMSO-d_6.

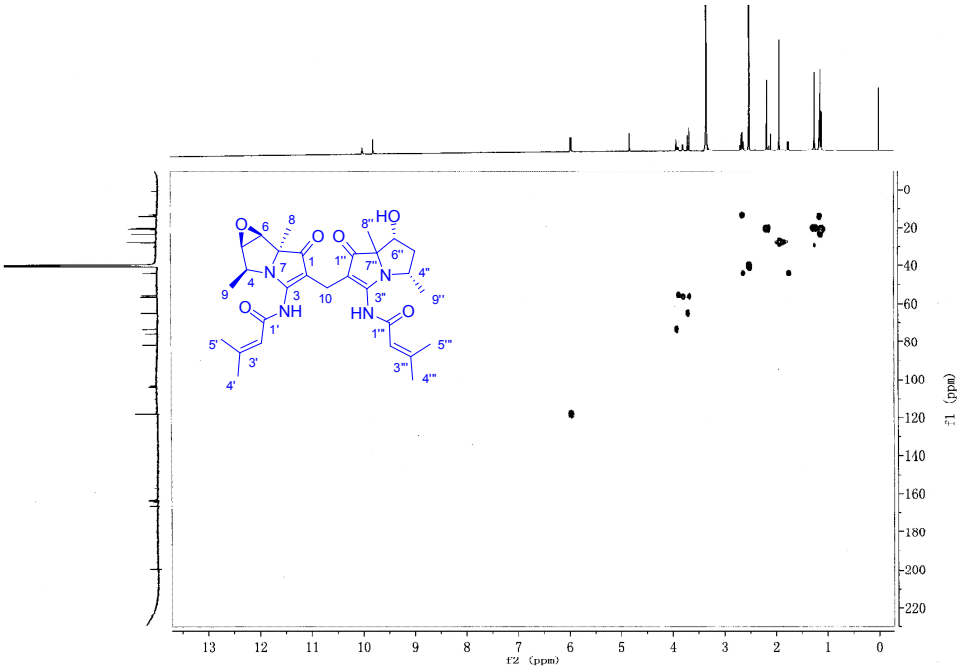


Figure S8 gHSQC spectrum of dibohemamine D (**1**) in DMSO-d_6.

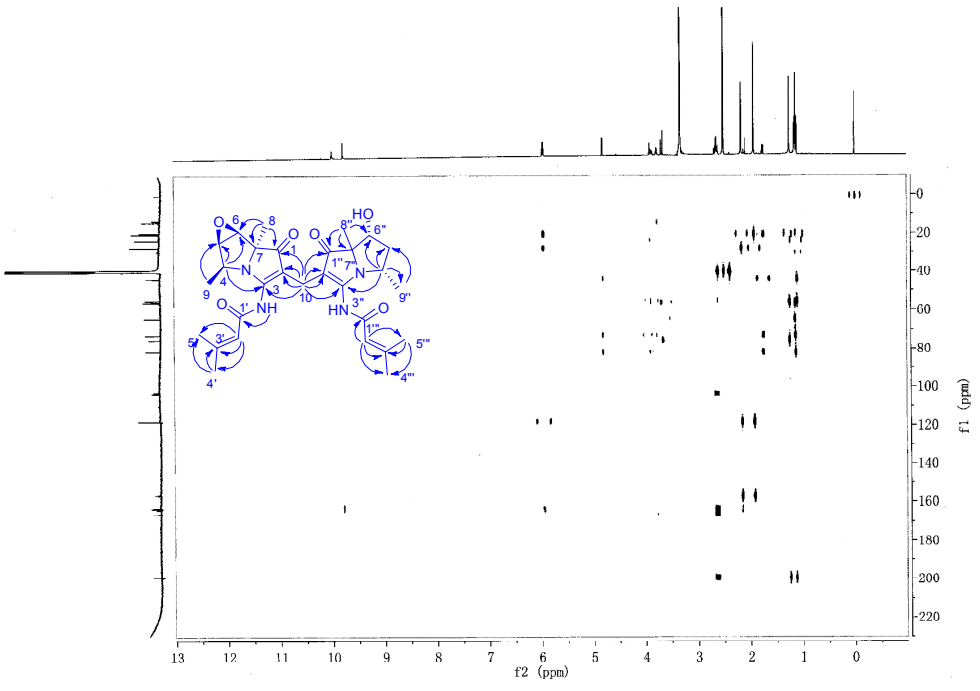


Figure S9 HMBC spectrum of dibohemamine D (**1**) in DMSO-d_6.

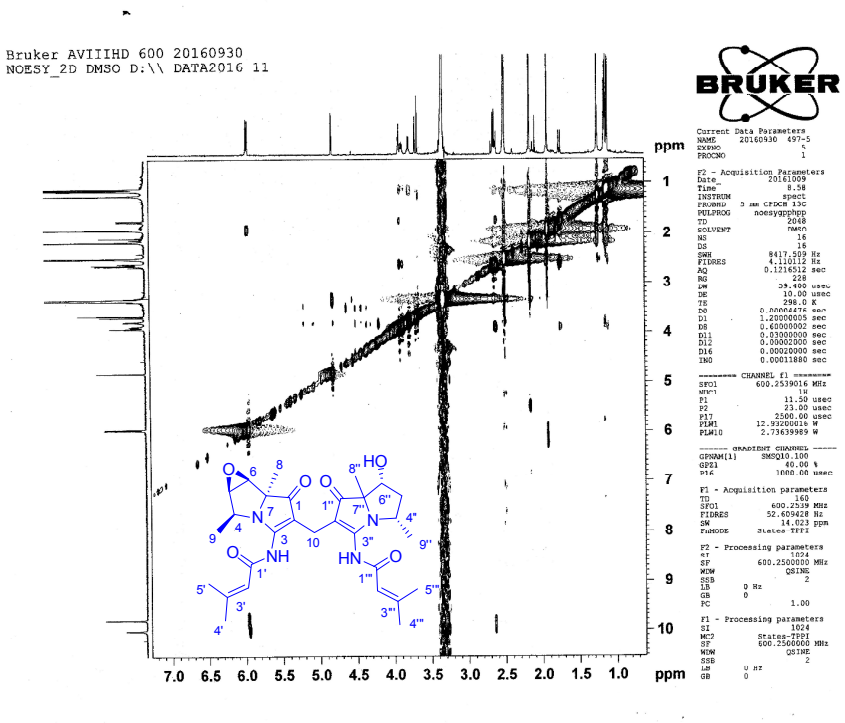


Figure S10 NOESY spectrum of dibohemamine D (**1**) in DMSO-d_6.

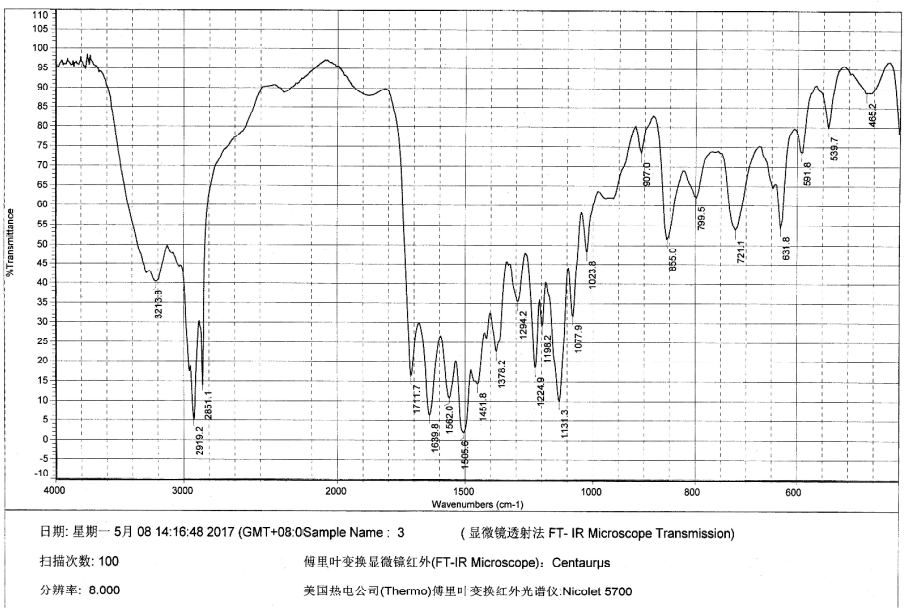


Figure S11 The IR spectrum of dibohemamine D (**1**).

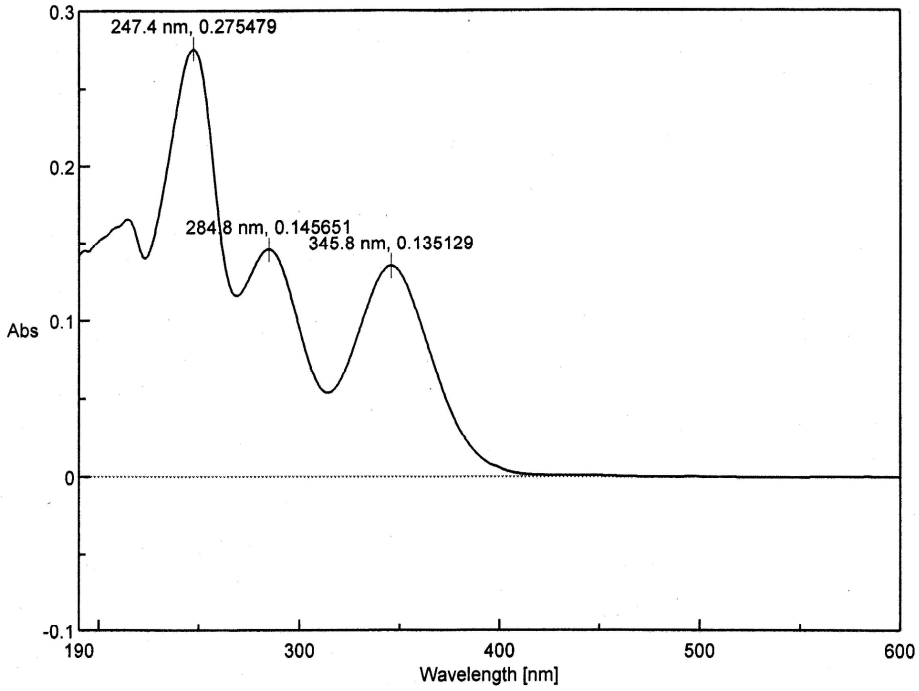


Figure S12 The UV spectrum of dibohemamine D (**1**) in MeOH.

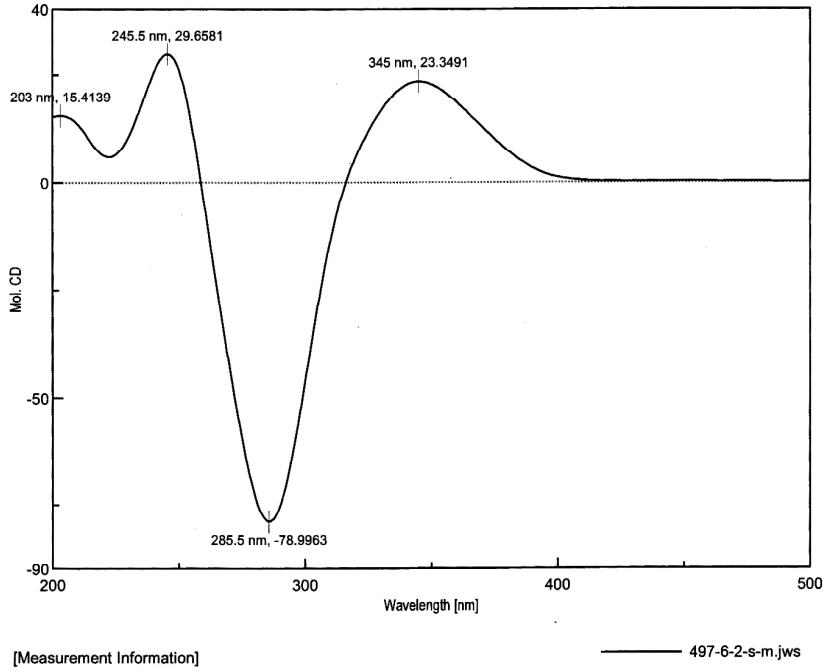


Figure S13 The CD spectrum of dibohemamine D (**1**) in MeOH.

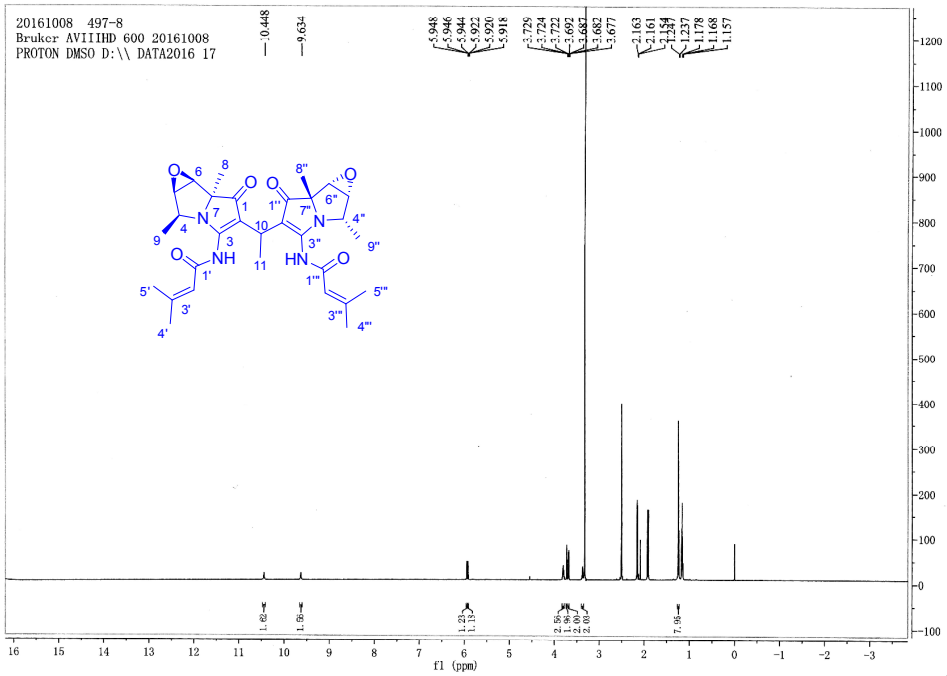


Figure S14 ^{1}H-NMR spectrum of dibohemamine E (**2**) in DMSO-d_6.

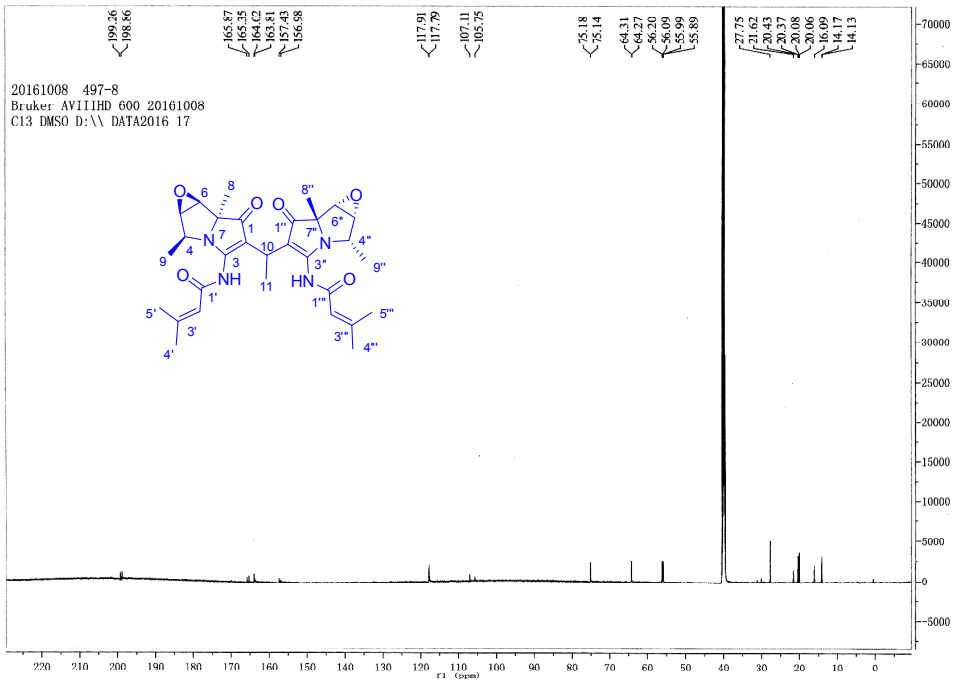


Figure S15 ^{13}C-NMR spectrum of dibohemamine E (**2**) in DMSO-d_6.

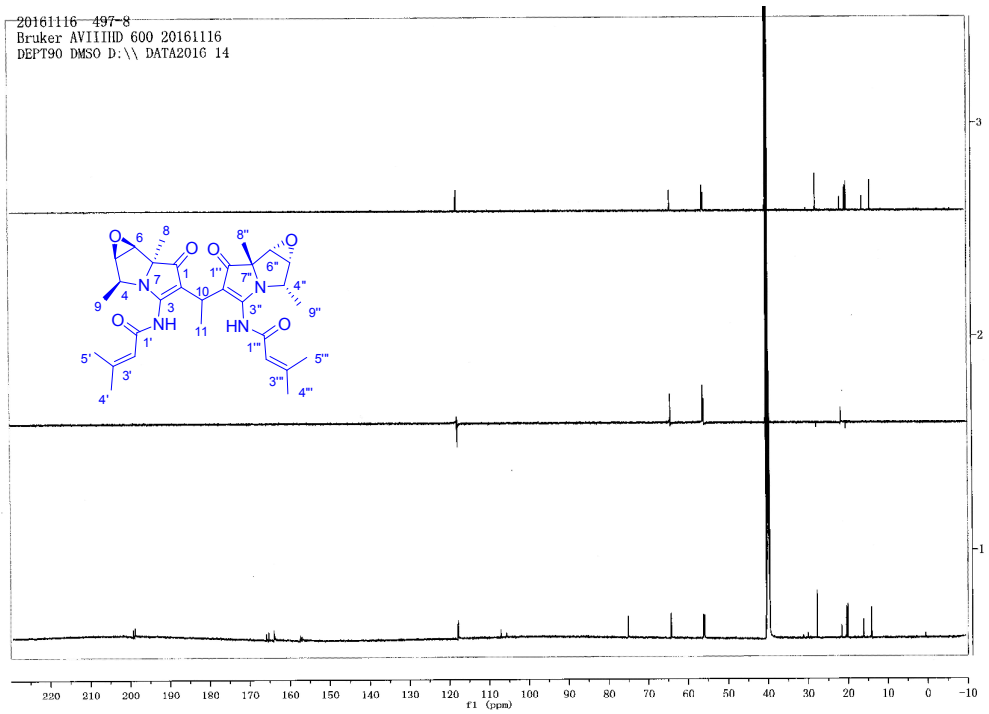


Figure S16 DEPT spectrum of dibohemamine E (**2**) in DMSO-d_6.

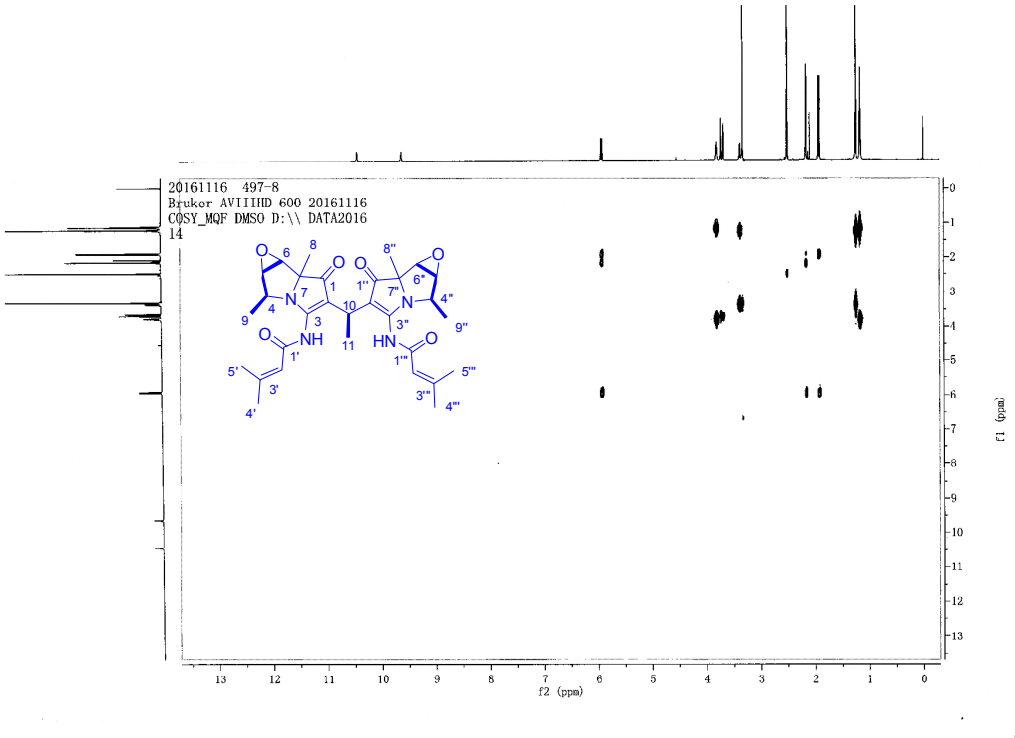


Figure S17 ^{1}H-^{1}H COSY spectrum of dibohemamine E (**2**) in DMSO-d_6.

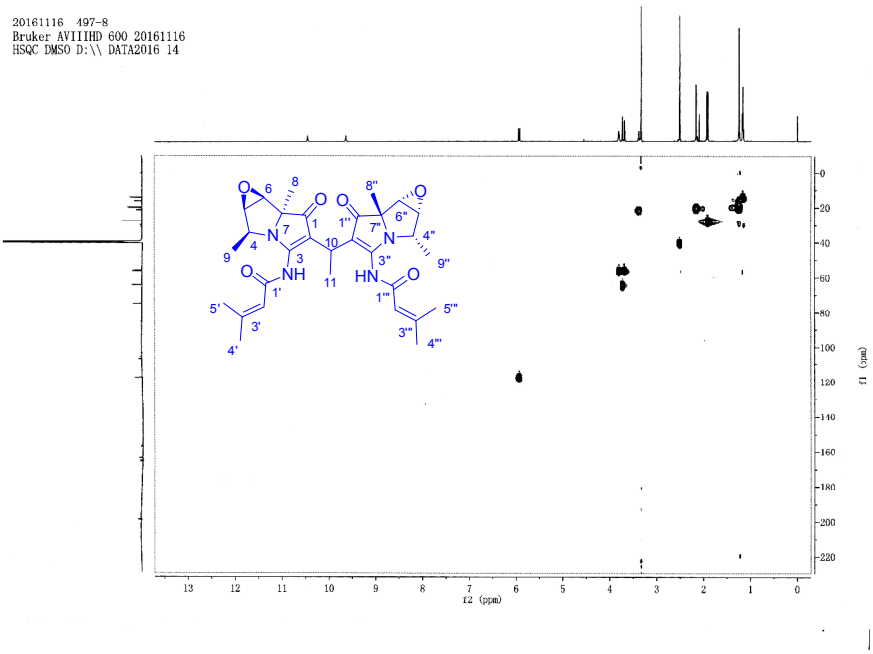


Figure S18 gHSQC spectrum of dibohemamine E (**2**) in DMSO-d_6.

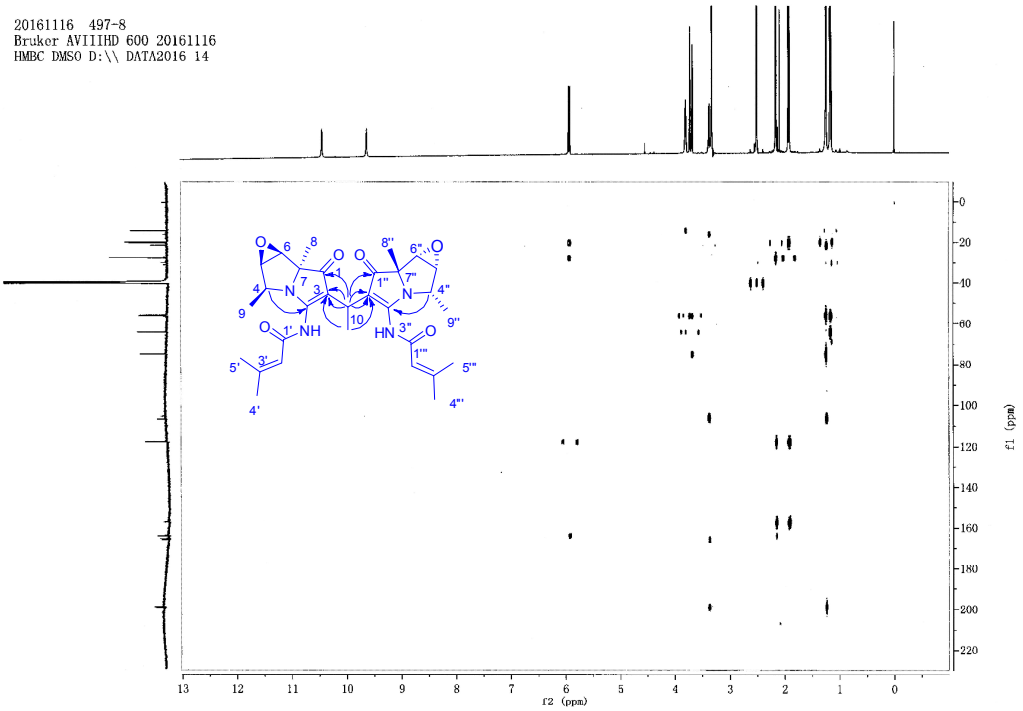


Figure S19 HMBC spectrum of dibohemamine E (**2**) in DMSO-d_6.

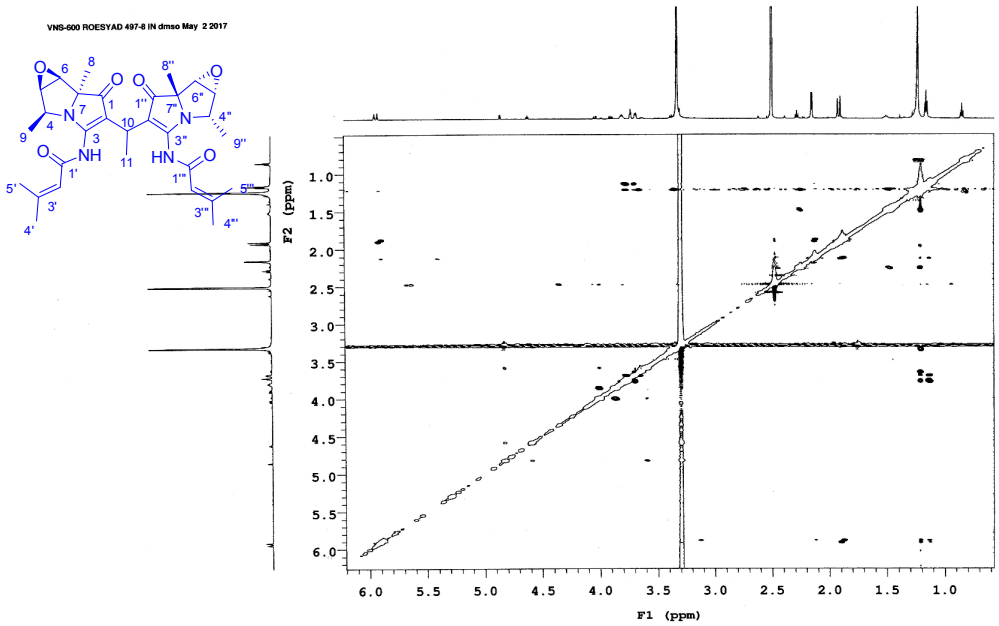
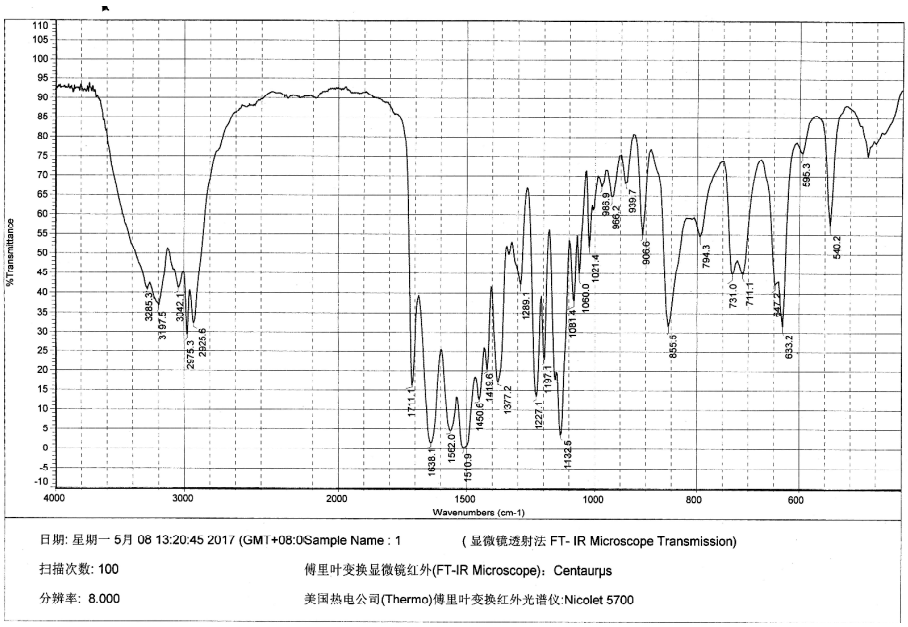


Figure S20 ROSEY spectrum of dibohemamine E (**2**) in DMSO-d_6.



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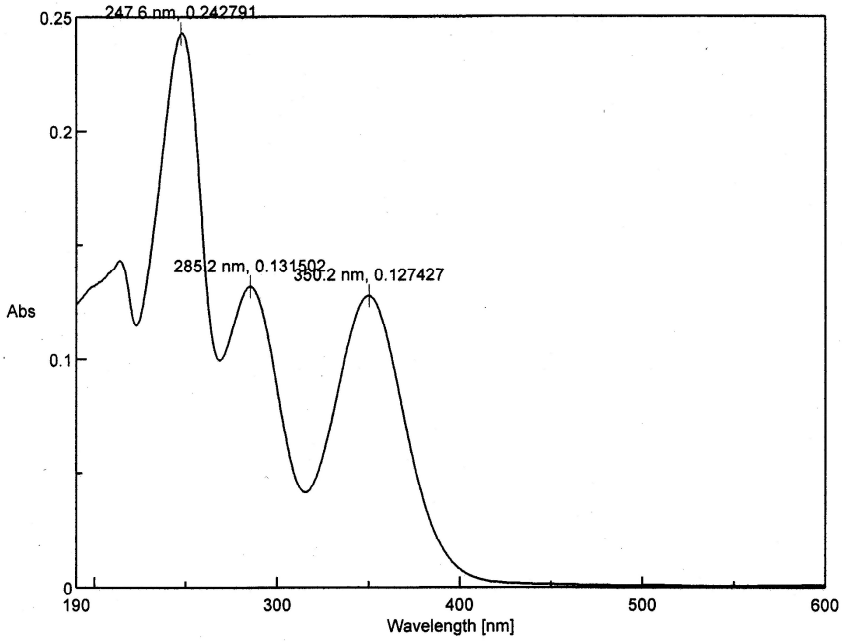
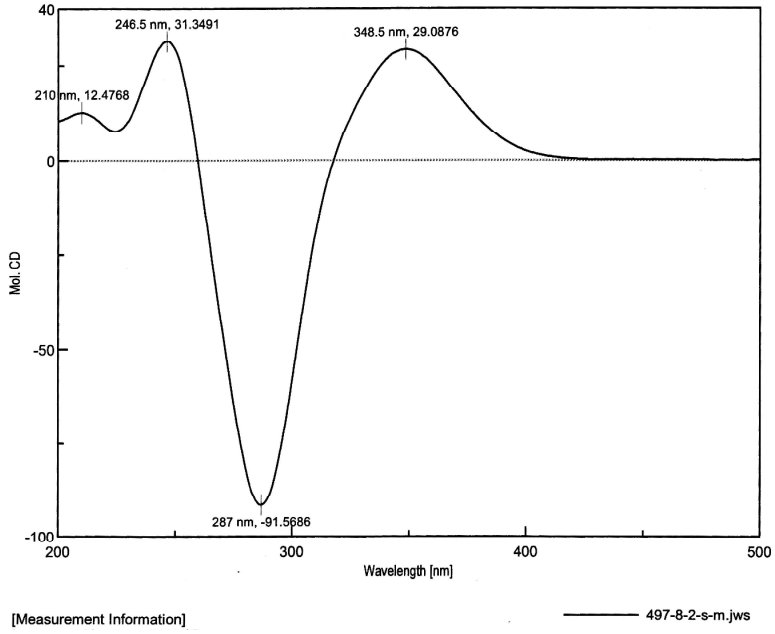


Figure S22. The UV spectrum of dibohemamine D (**1**) in MeOH.



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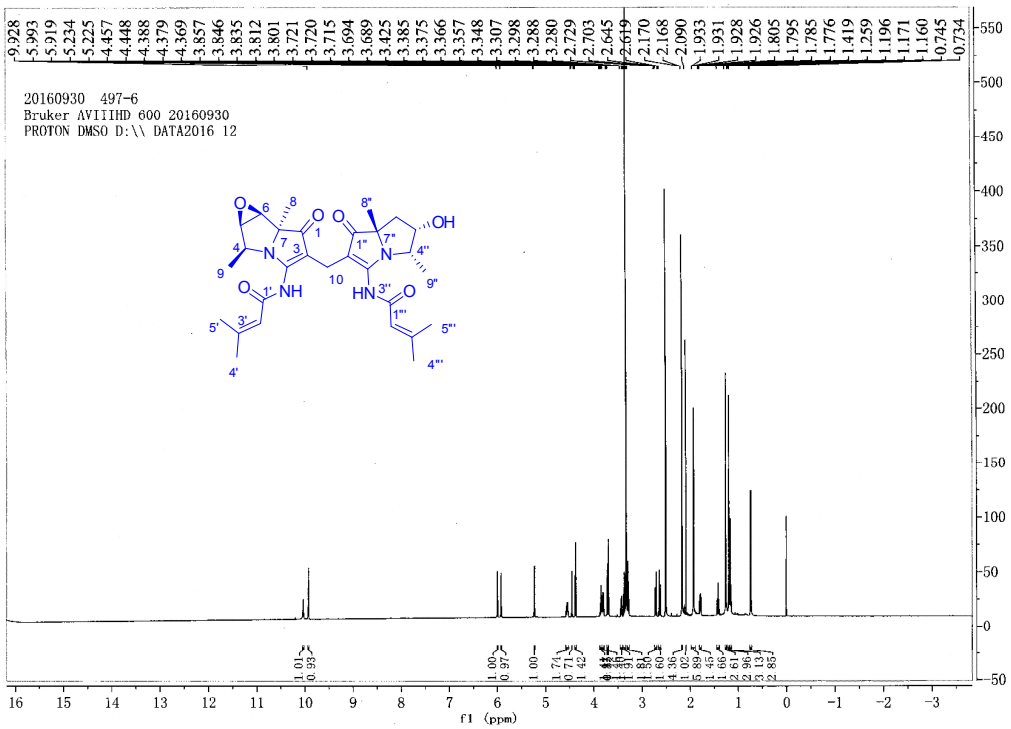


Figure S24 ^{1}H-NMR spectrum of dibohemamine F (**3**) in DMSO-d_6.

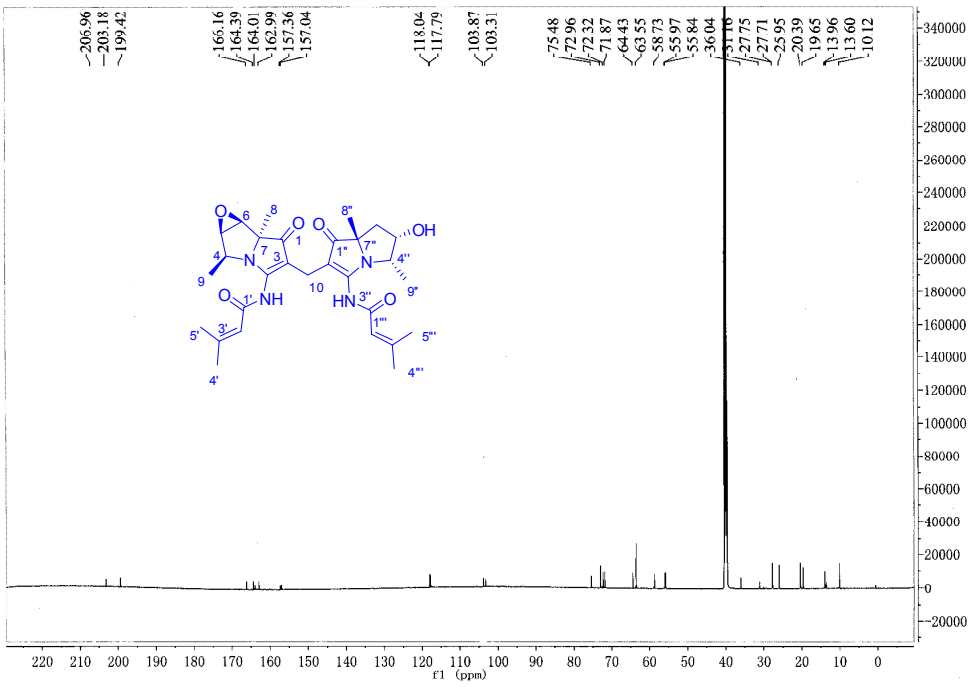


Figure S25 ^{13}C-NMR spectrum of dibohemamine F (**3**) in DMSO-d_6.

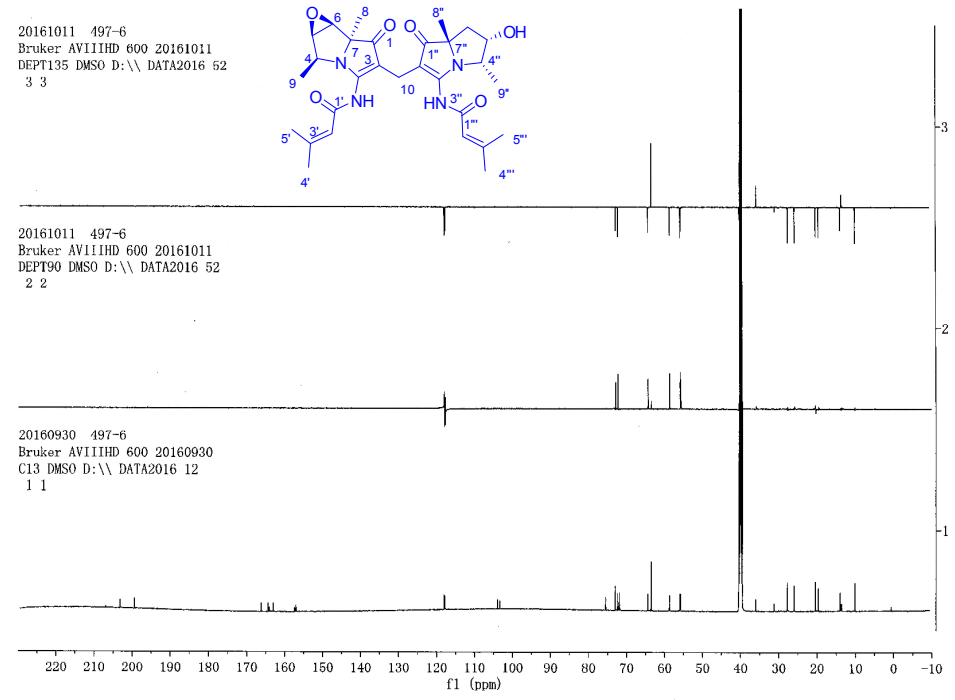


Figure S26 DEPT spectrum of dibohemamine F (**3**) in DMSO-d_6.

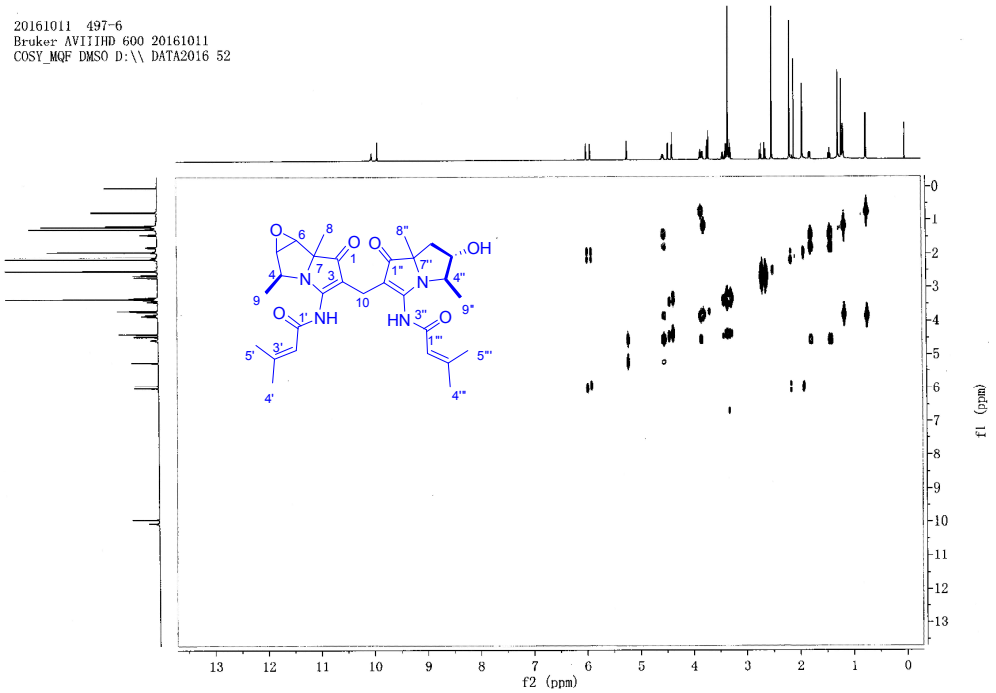


Figure S27 ^{1}H-^{1}H COSY spectrum of dibohemamine F (**3**) in DMSO-d_6.

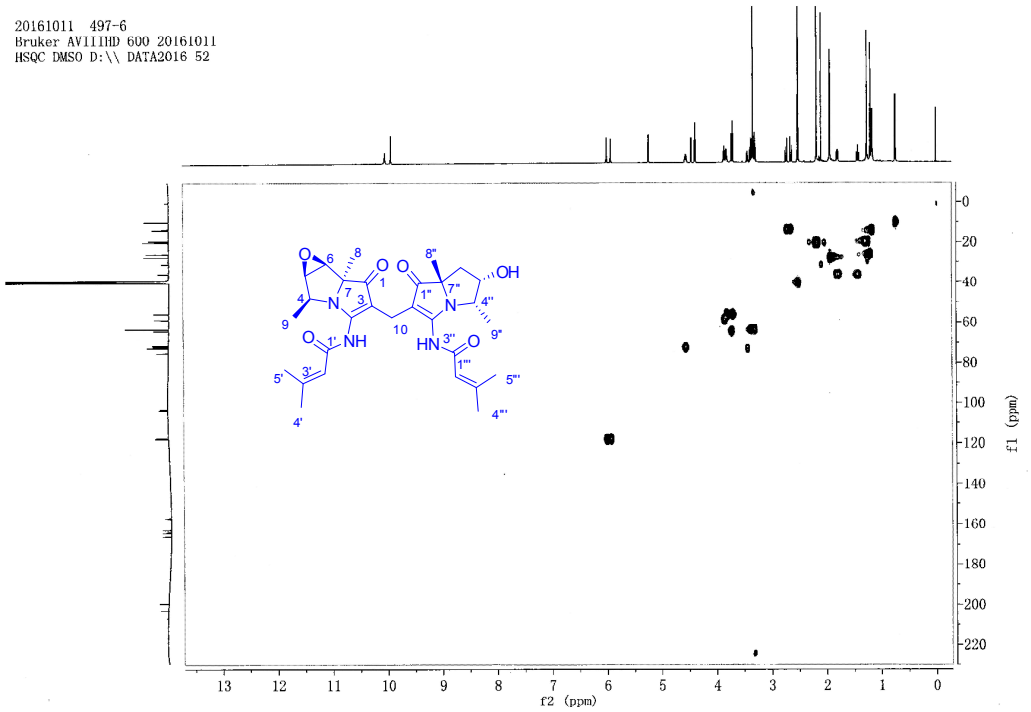


Figure S28 gHSQC spectrum of dibohemamine F (**3**) in DMSO-d_6.

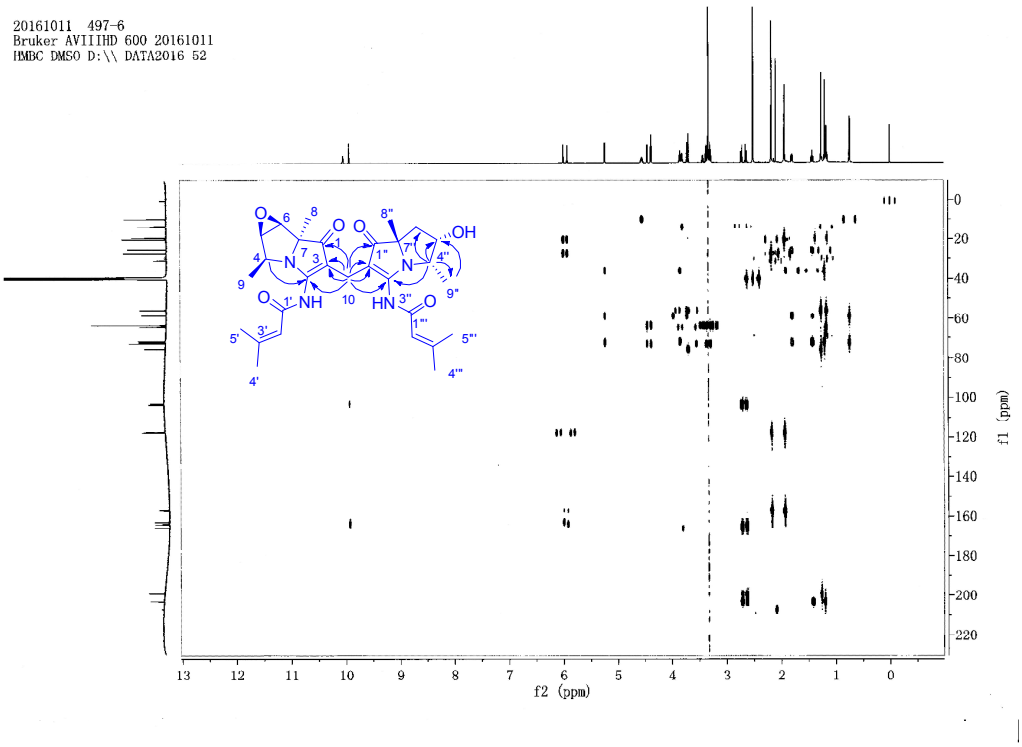


Figure S29 HMBC spectrum of dibohemamine F (**3**) in DMSO-d_6.

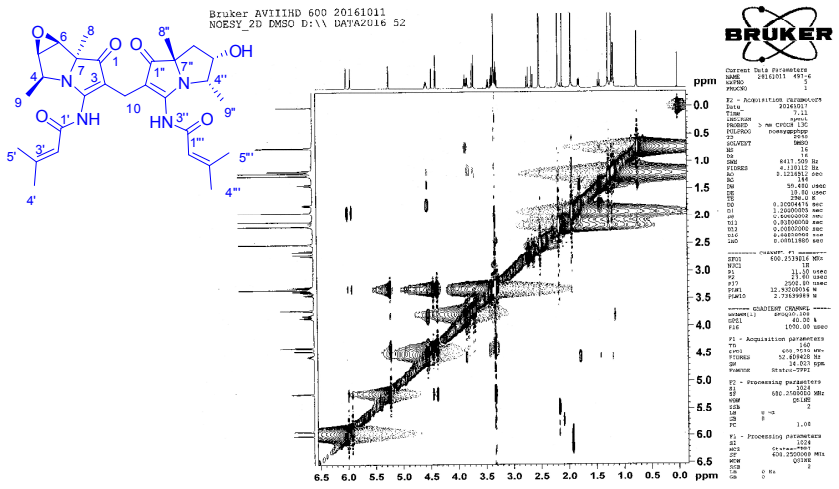


Figure S30 NOESY spectrum of dibohemamine F (**3**) in DMSO-d_6.

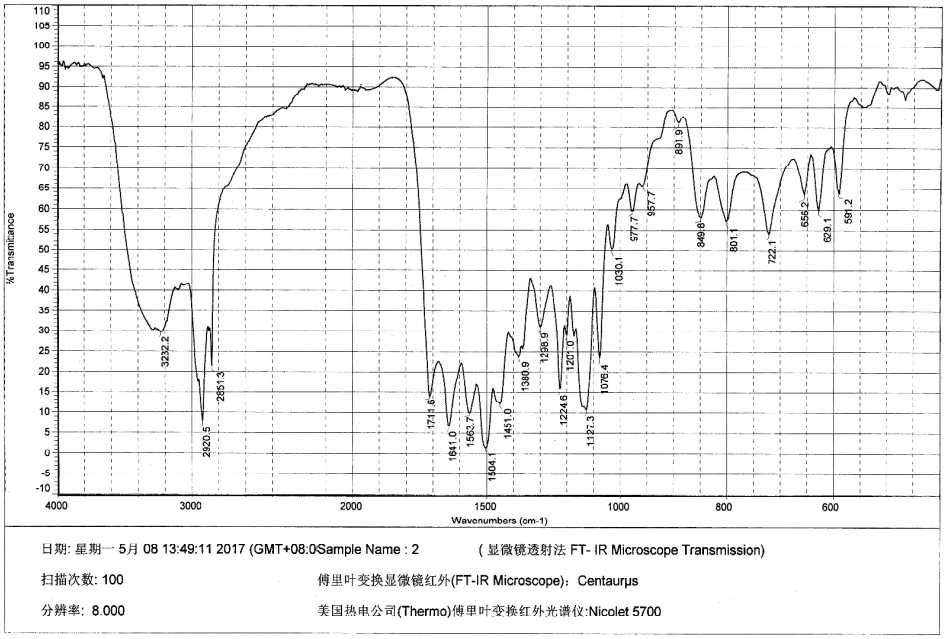


Figure S31 IR spectrum of dibohemamine F (**3**).

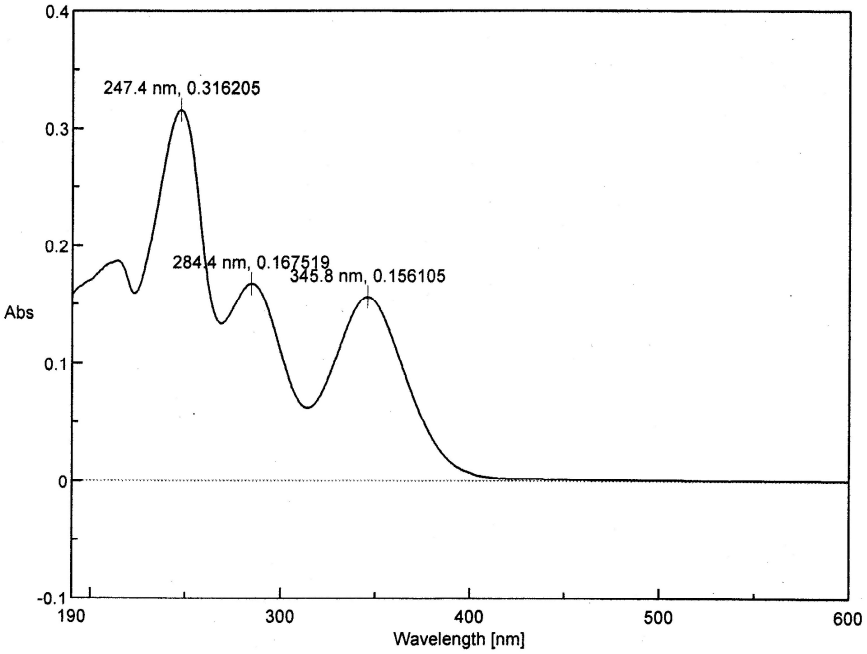


Figure S32 UV spectrum of dibohemamine F (**3**) in MeOH.

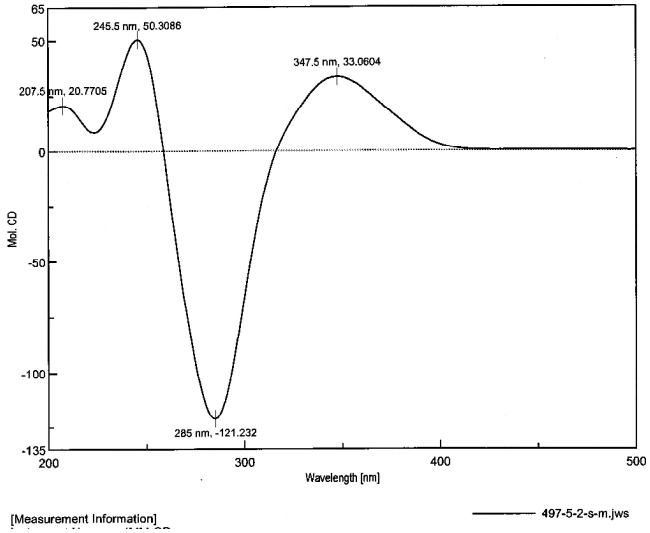


Figure S33 The CD spectrum of dibohemamine F (**3**) in MeOH.

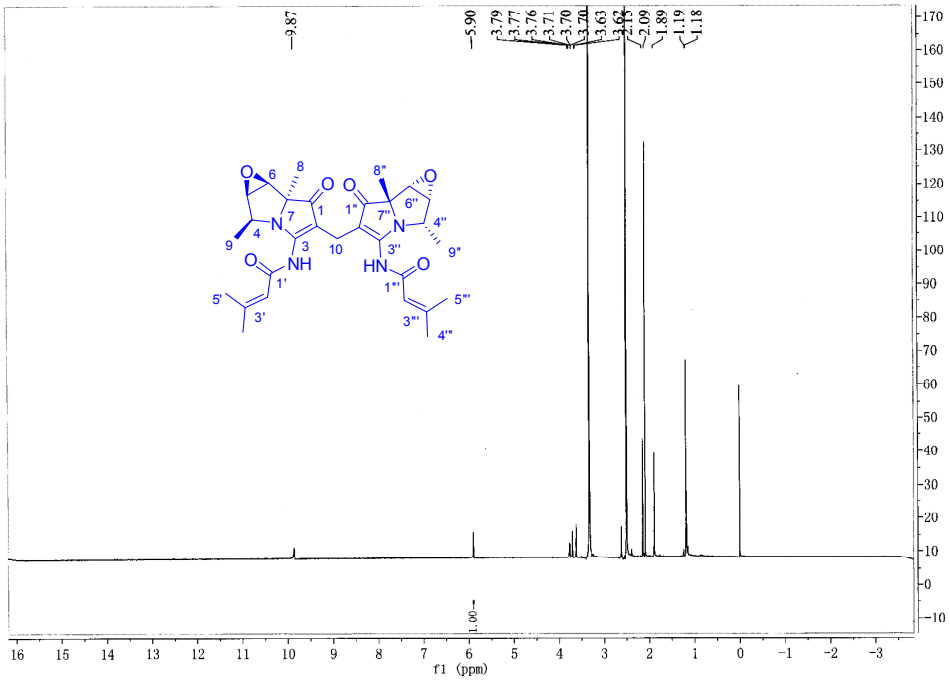


Figure S34 ^{1}H-NMR spectrum of dibohemamine A (**4**) in DMSO-d_6.

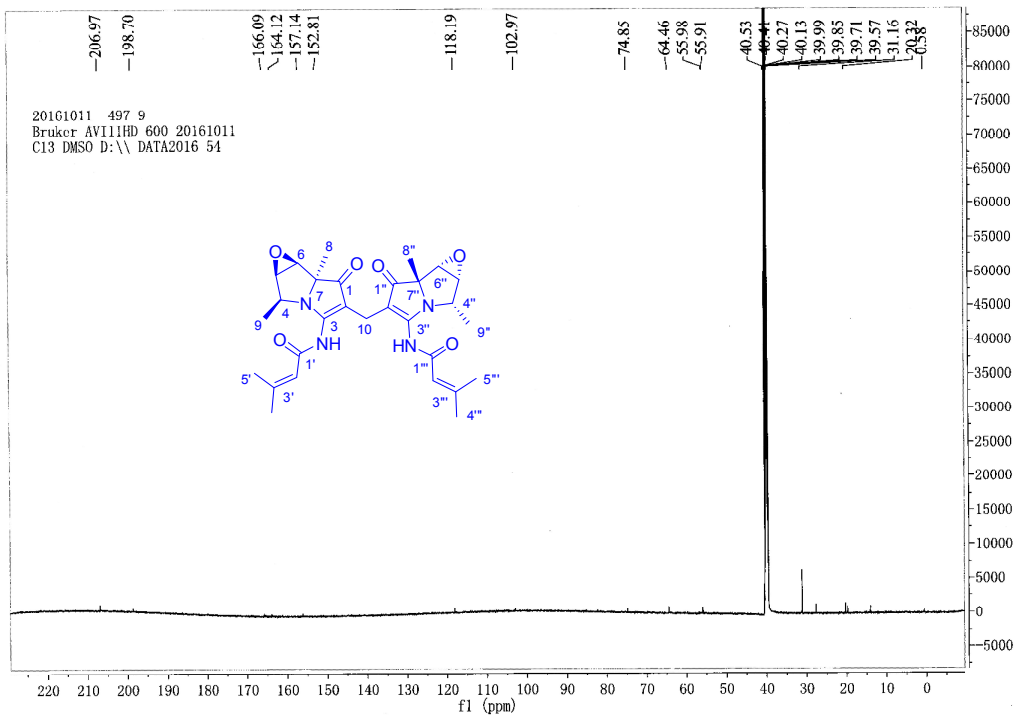


Figure S35 ^{13}C-NMR spectrum of dibohemamine A (**4**) in DMSO-d_6.

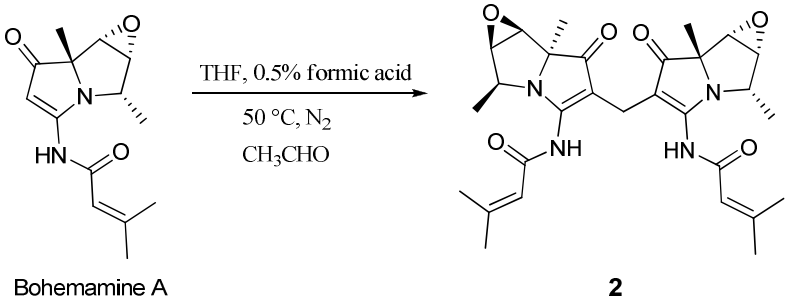


Figure S36. Synthesis of dibohemamine E (**2**) from bohemamine A.

Bohemamine A (1.1 mg), acetaldehyde (60 *u*L) and formic acid (3 μL), in dry THF (0.7 mL), were stirred at 50 °C for 45 h. LC-MS analysis detected the presence of **2** (Figure S37). The reaction mixture was purified by reversed-phase HPLC (Diamonsil, C18(2), 250 × 4.6 mm, 5 μm, 1.0 mL/min) using a gradient solvent system from 30% to 60% CH_3CN in H_2O over 40 min and then 90% to 100% CH_3CN over 10 min to yield compound **2** (t_R = 25.0 min) (Figure S38). It was further confirmed by $[\alpha]_D^{20}$ -48.3 (*c* 0.009, MeOH), CD spectrum (Figure S40; 348 ($\Delta\varepsilon$ +39.9), 287 ($\Delta\varepsilon$ -123.1), 247 ($\Delta\varepsilon$ +40.7; in MeOH) and HRESIMS (Figure S39; *m/z* 551.2875 $[M + H]^+$, calcd for $C_{30}H_{39}N_4O_6$, 551.2870, ppm = 1.97).

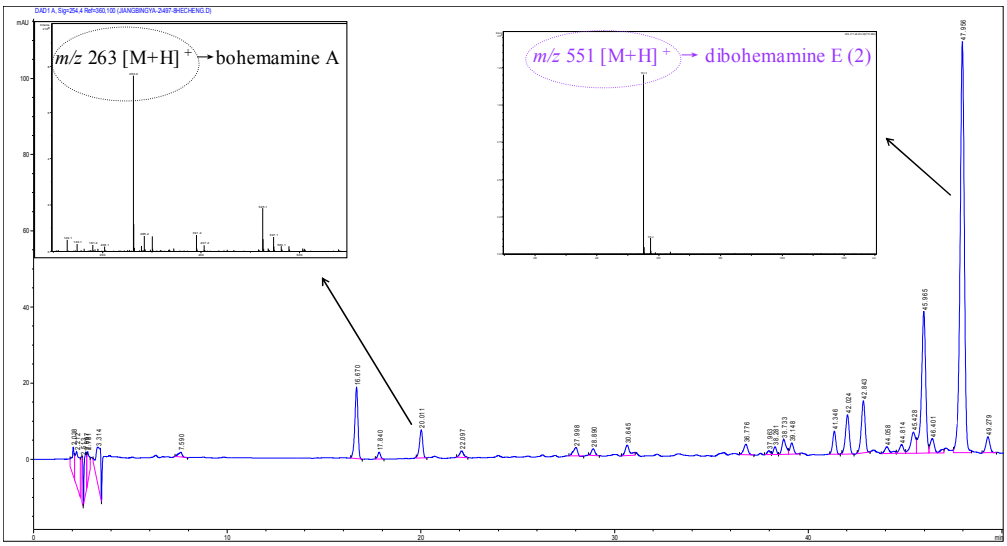


Figure S37. (+) LC-MS analysis for the formation of **2** from bohemanine A. HPLC parameters: Diamonsil C18(2) (4.6 × 150 mm, 5 μm); mobile phase MeCN-H_2O, 1.0 ml/min, 5-40% in 40 min; wavelength 254 nm; 25 °C.

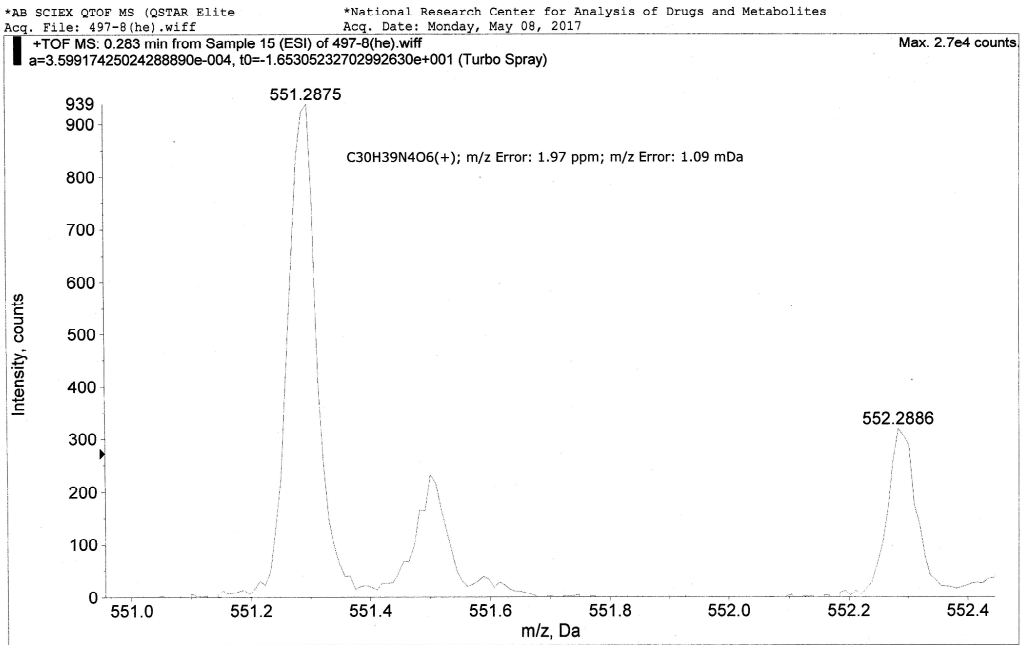


Figure S38. (+)HRMS of dibohemamine E (**2**, synthesized)

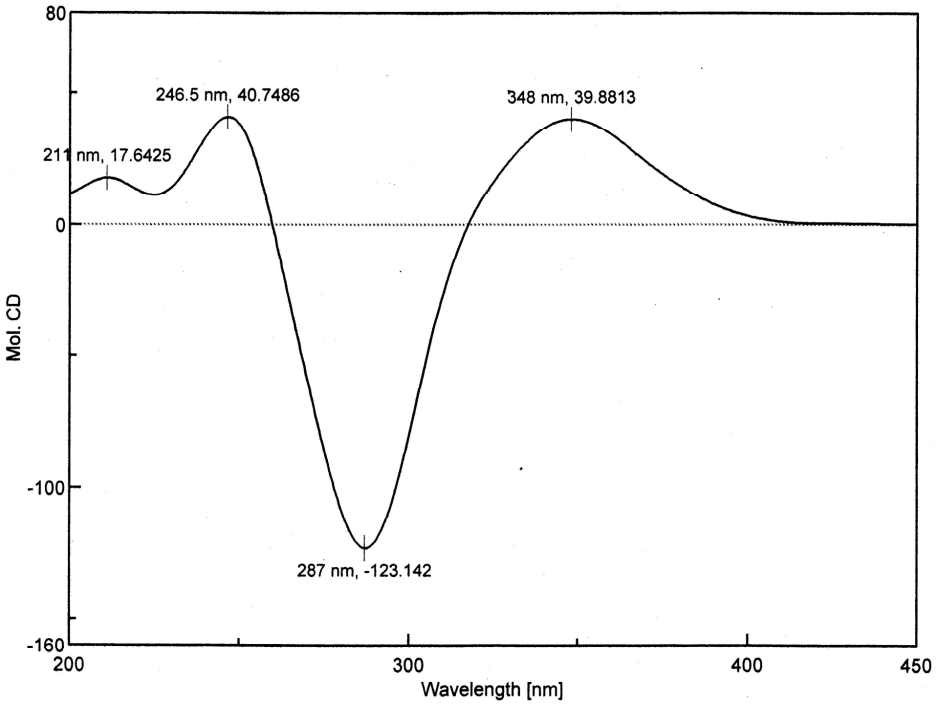


Figure S39 The CD spectrum of dibohemamine E (**2,** synthesized) in MeOH.

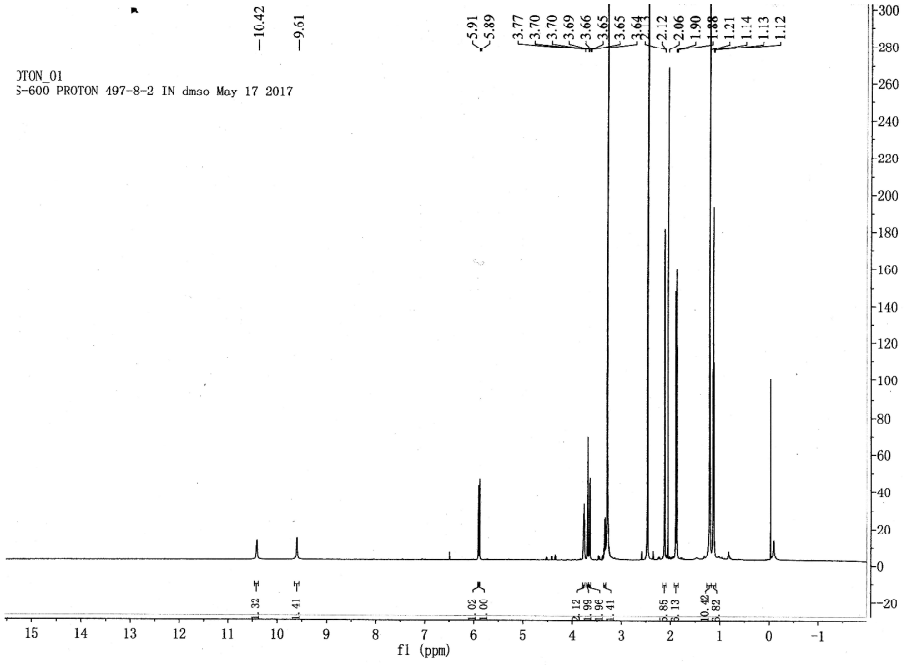
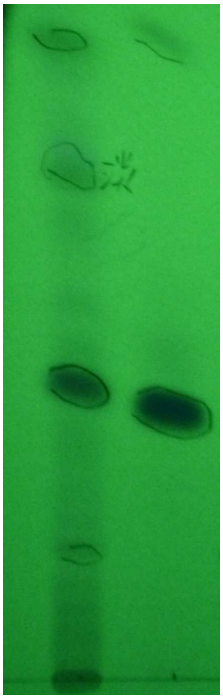


Figure S40 The ^{1}H-NMR spectrum of dibohemamine E (**2,** synthesized) in DMSO-d_6.



fraction F2 bohemamine A

Figure S41 Silica gel TLC of an ODS column fraction F2 from EtOAc extract of *Streptomyces* sp. CPCC 200497.