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# Supporting Information

## Malonylginsenosides with Potential Antidiabetic Activities from the Flower Buds of *Panax ginseng*

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## AUTHOR INFORMATION

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Figure S1. Purity determination of 15 new malonyl-ginsenosides isolated in this study by UHPLC/QTOF MS.

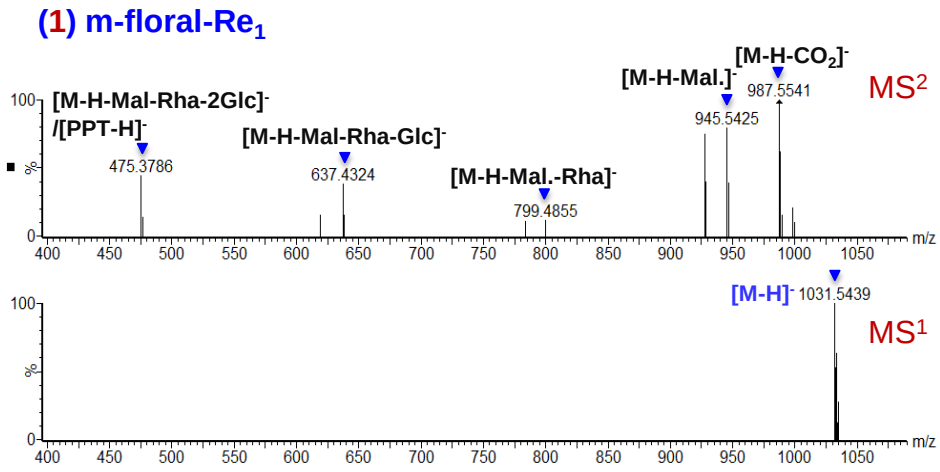


Figure S2. HRESIMS spectrum of compound **1.**

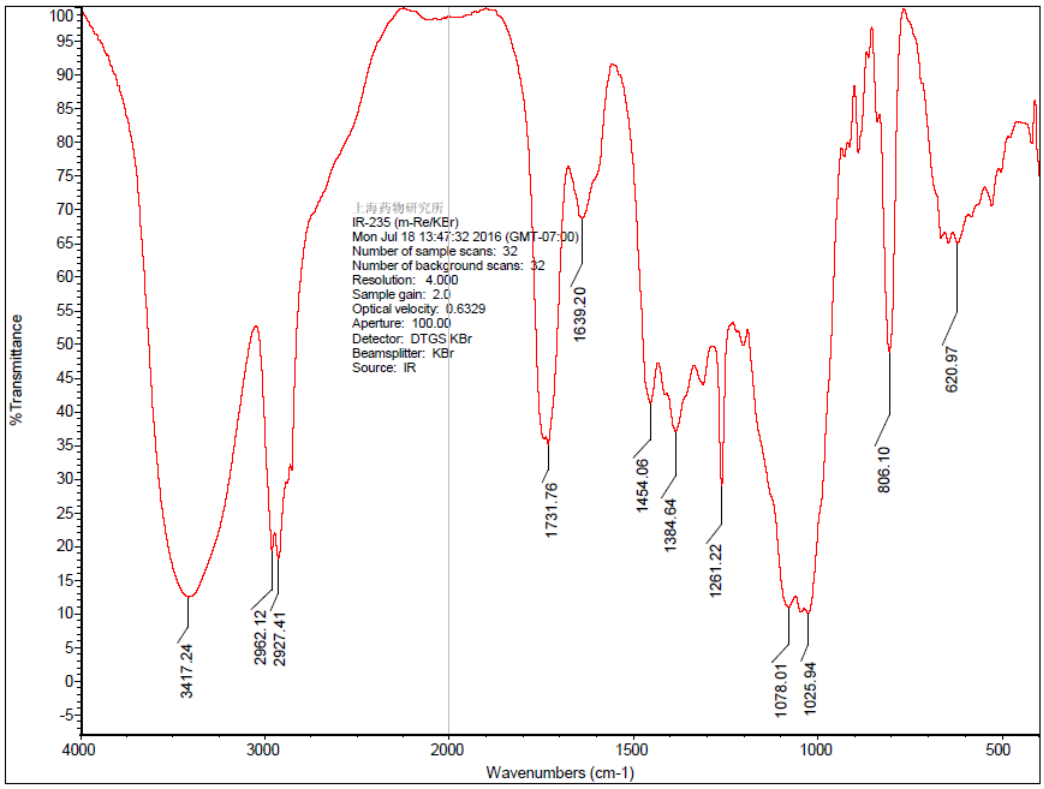


Figure S3. IR spectrum of compound **1.**

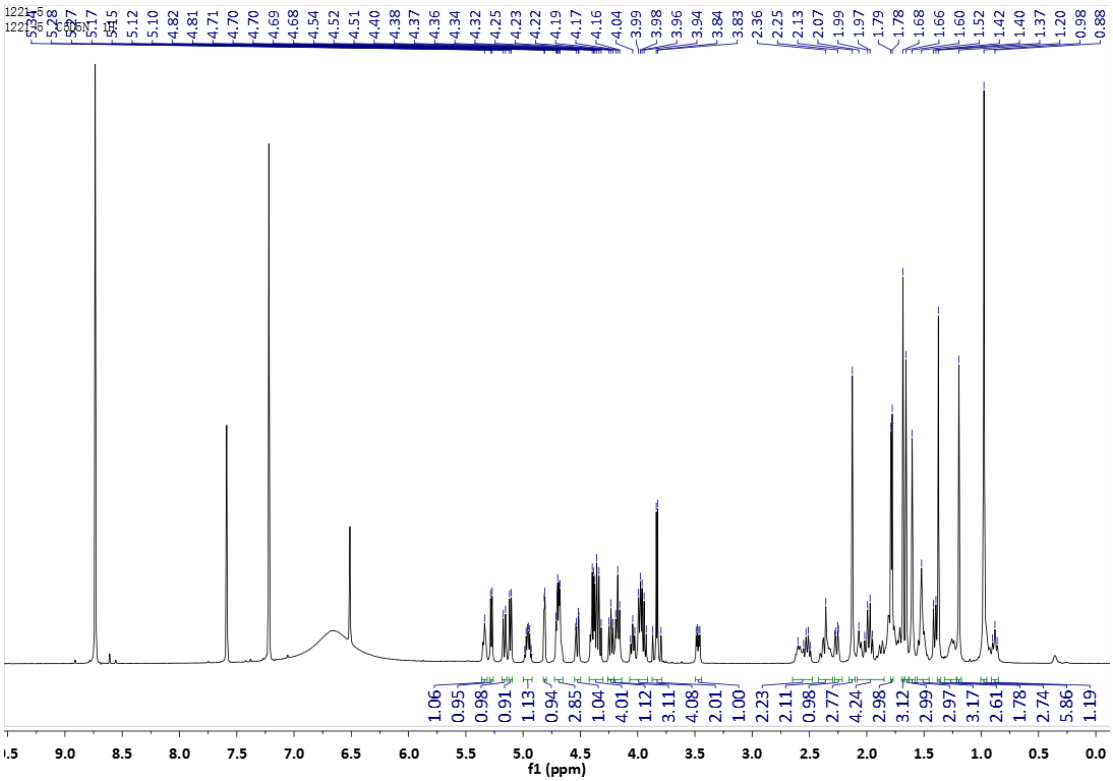

Figure S4. $^{1}$H NMR spectrum of compound **1.**

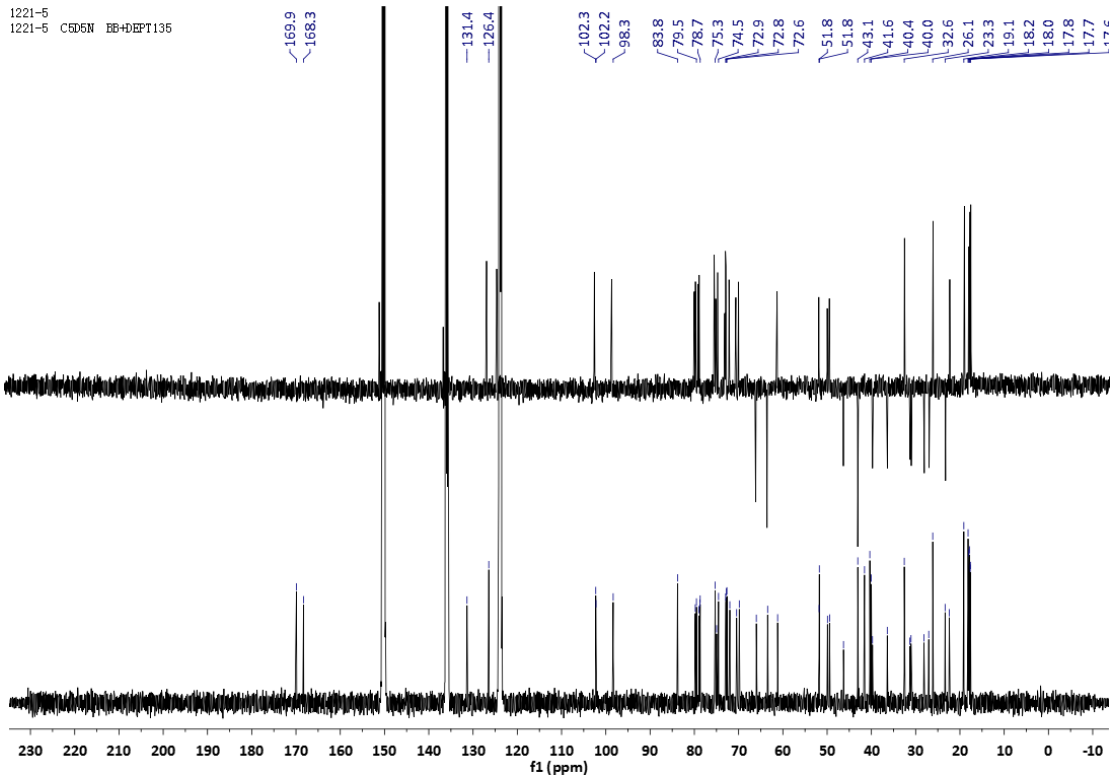

Figure S5. $^{13}$C NMR and DEPT-135 spectra of compound **1.**

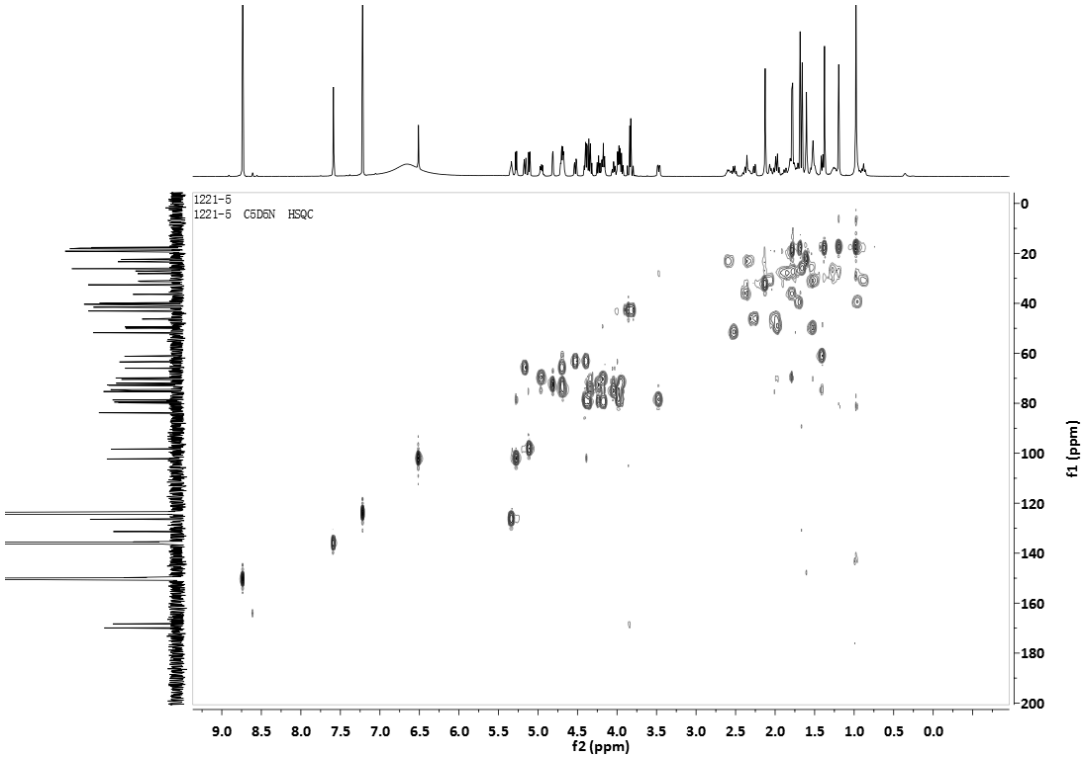


Figure S6. HSQC spectrum of compound **1.**

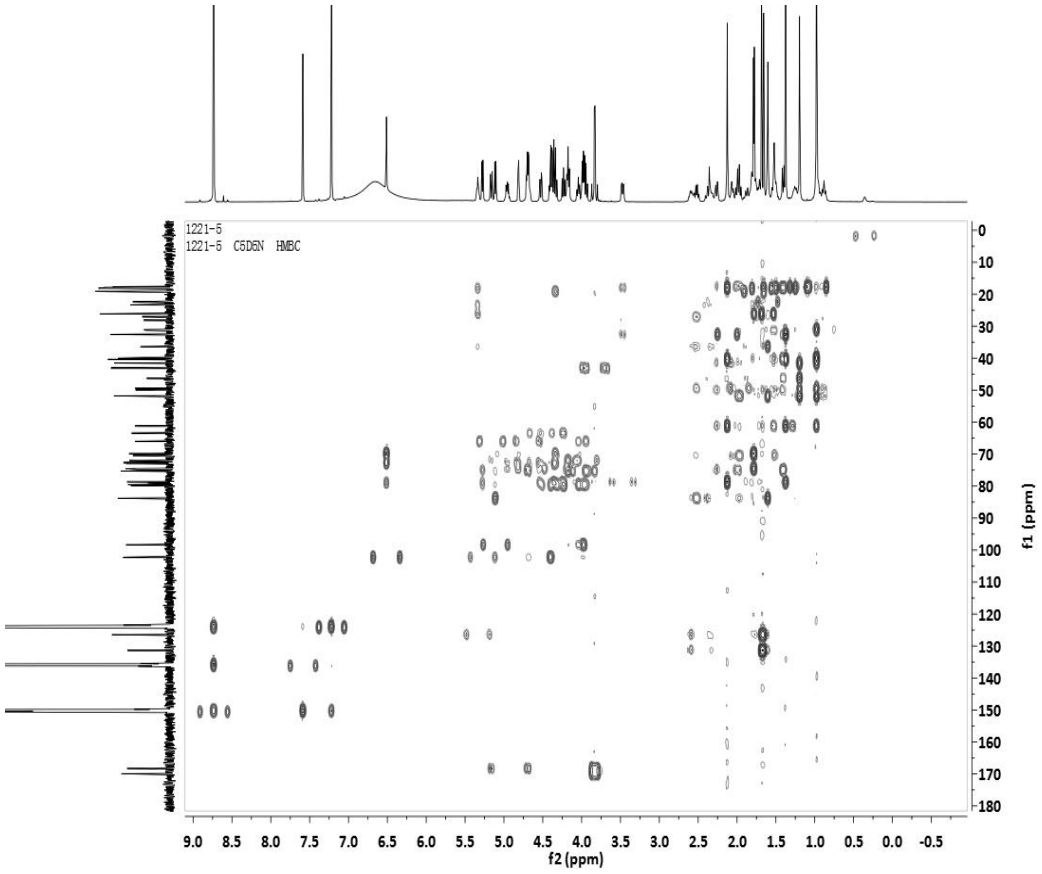


Figure S7. HMBC spectrum of compound **1.**

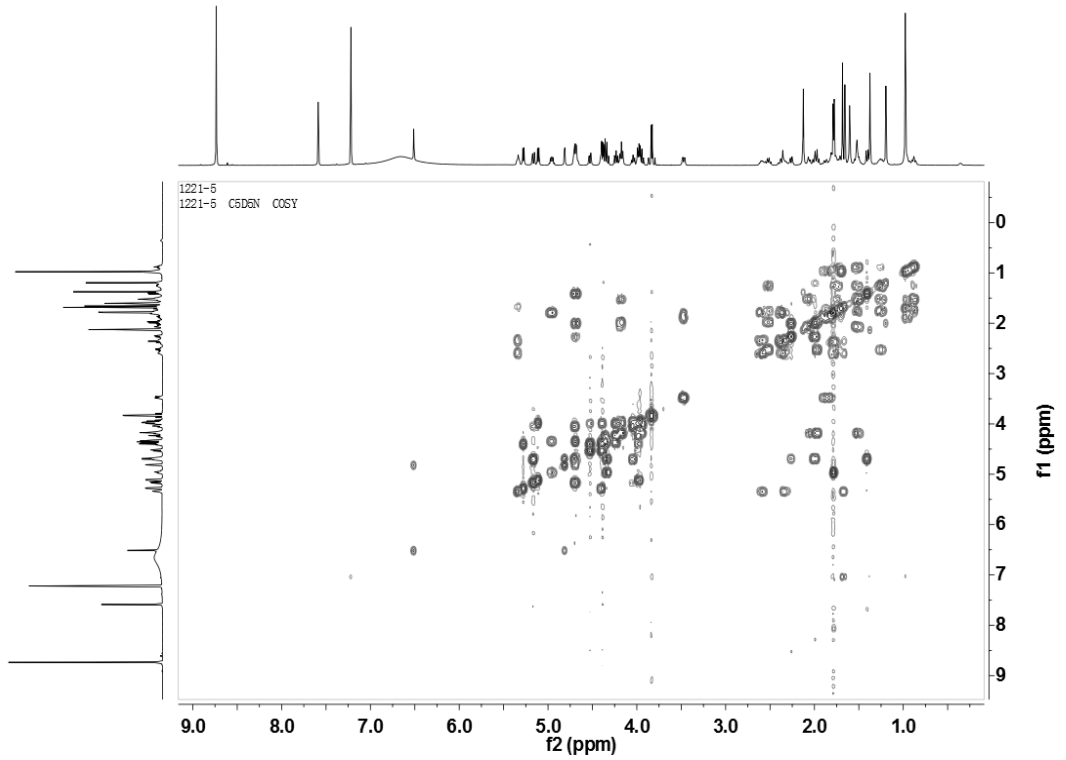


Figure S8. $^{1}$H-$^{1}$H COSY spectrum of compound **1.**

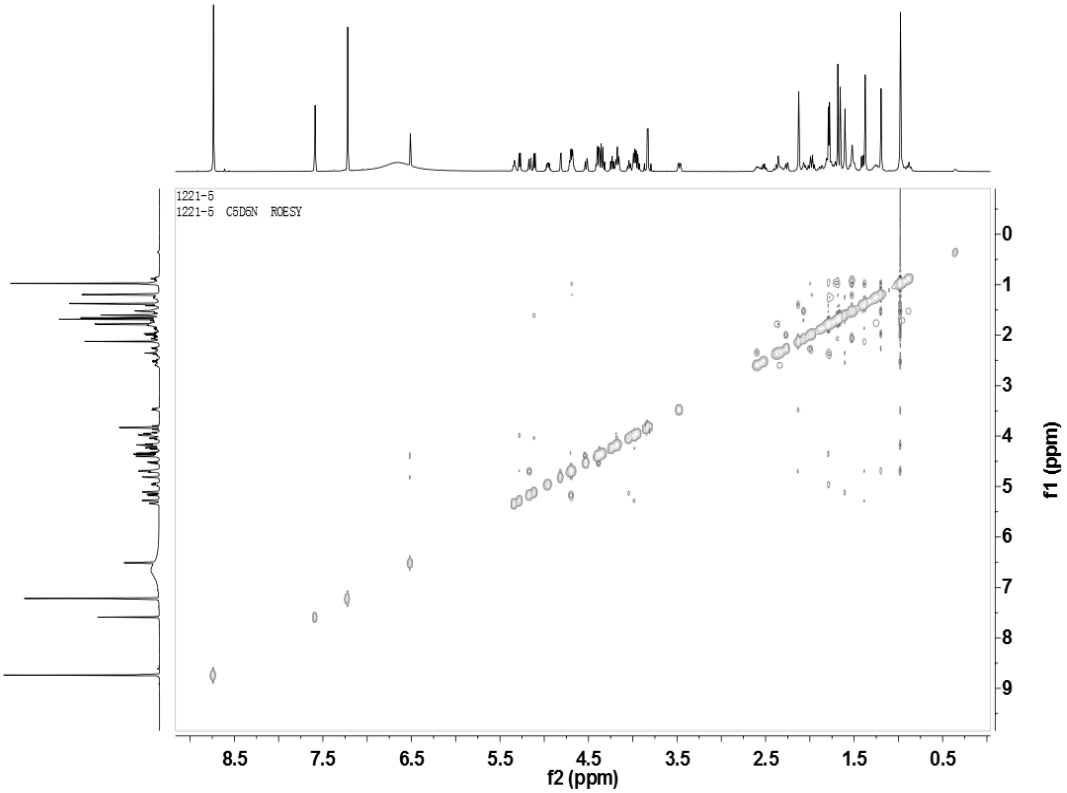


Figure S9. ROESY spectrum of compound **1.**

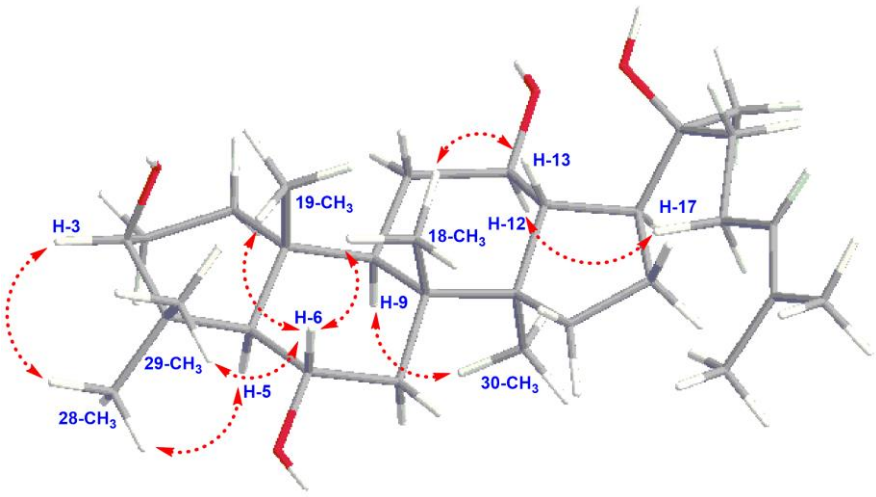


Figure S10. Key ROESY correlations of the sapogenin moiety of compound **1**.

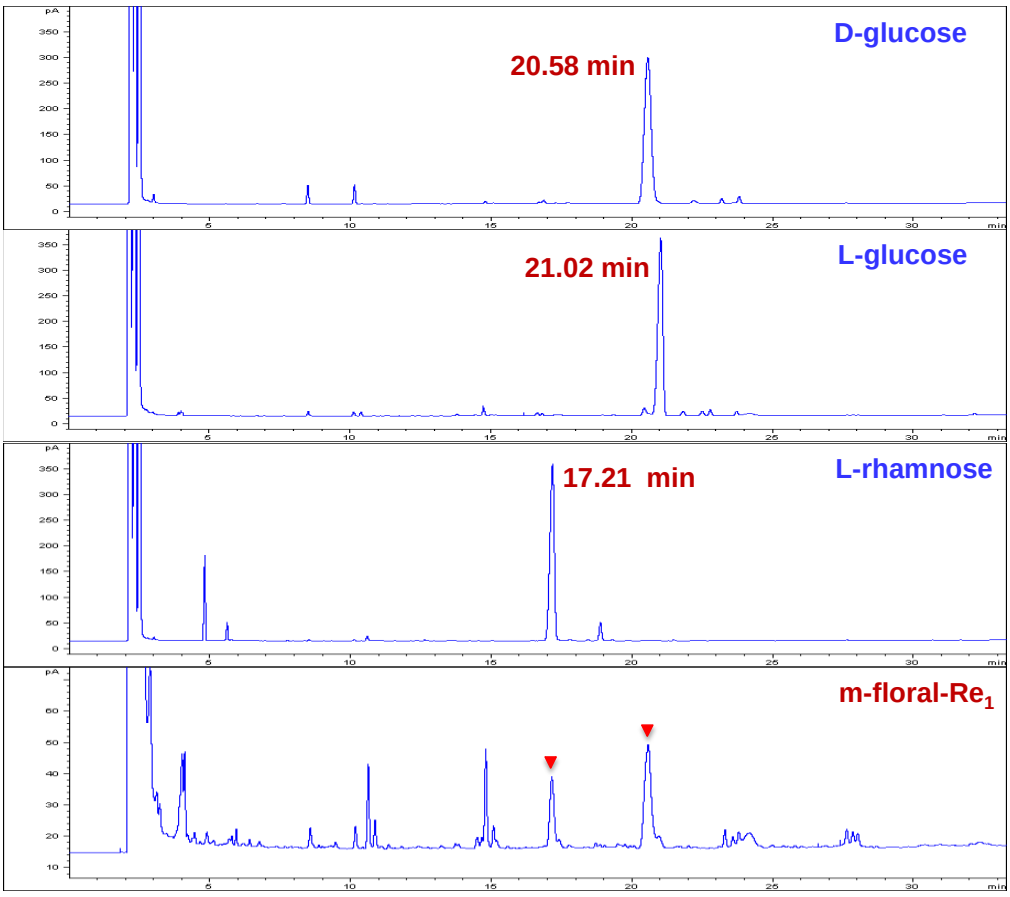


Figure S11. The GC chromatograms of compound **1** after acidic hydrolysis.

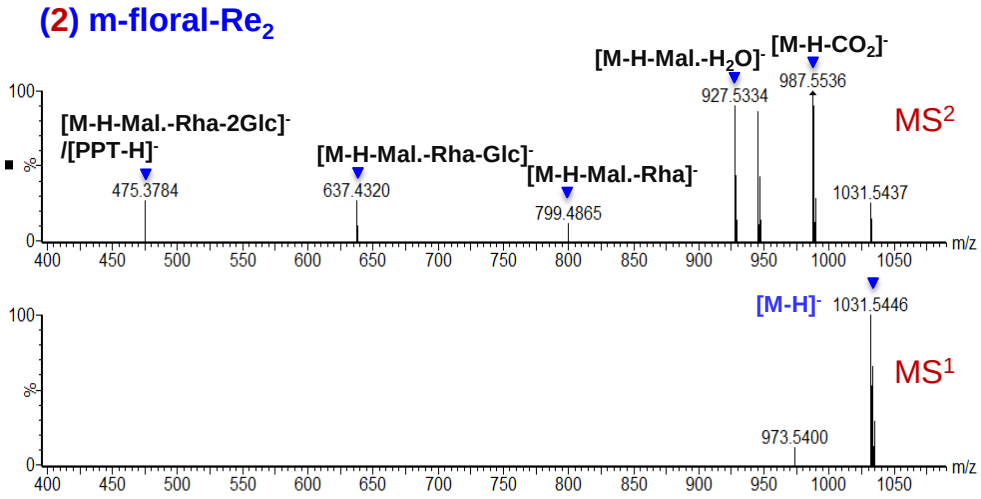


Figure S12. HRESIMS spectrum of compound **2.**

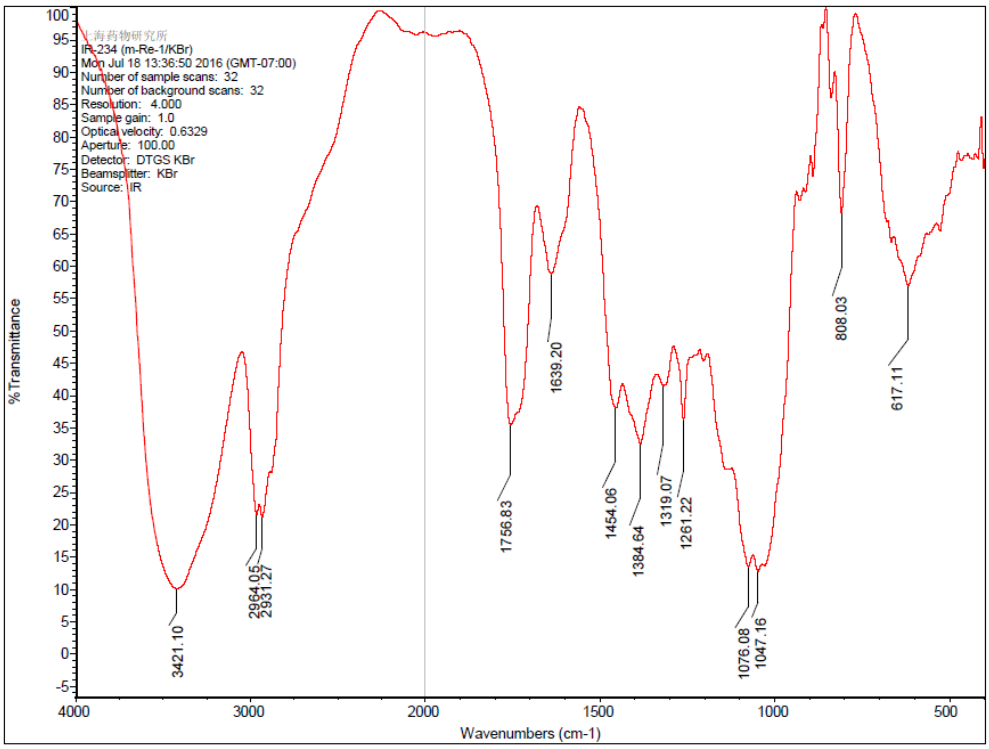


Figure S13. IR spectrum of compound **2**.

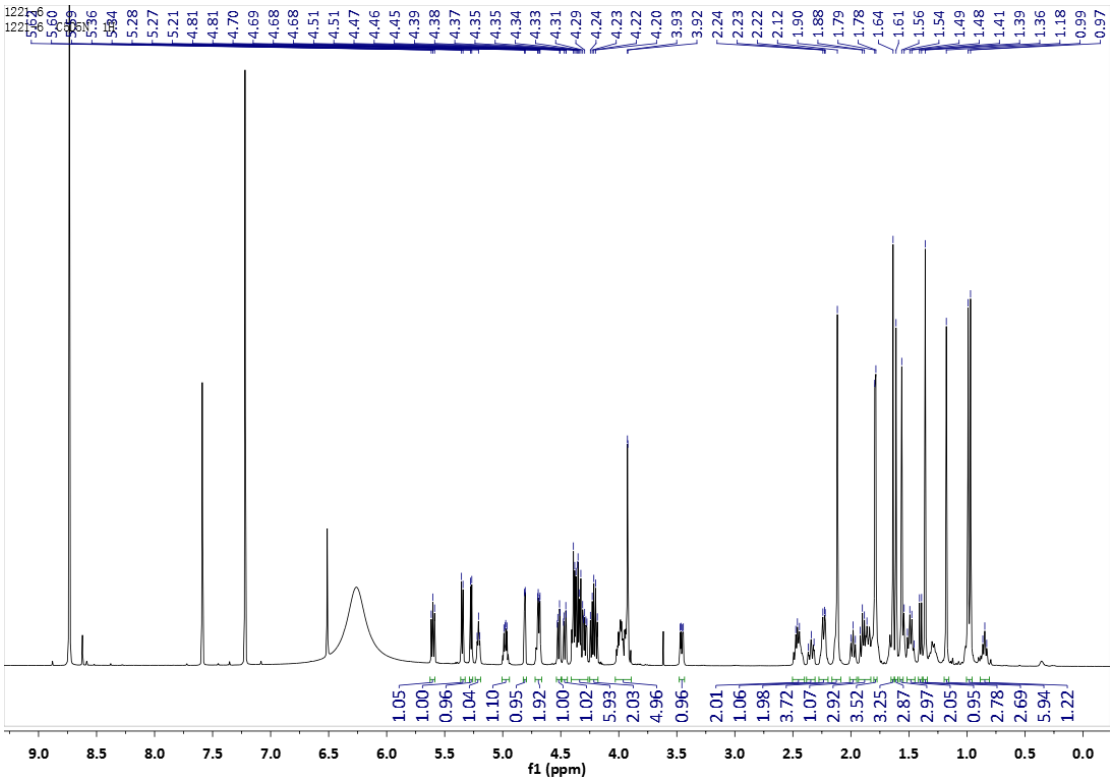


Figure S14. $^{1}$H NMR spectrum of compound **2.**

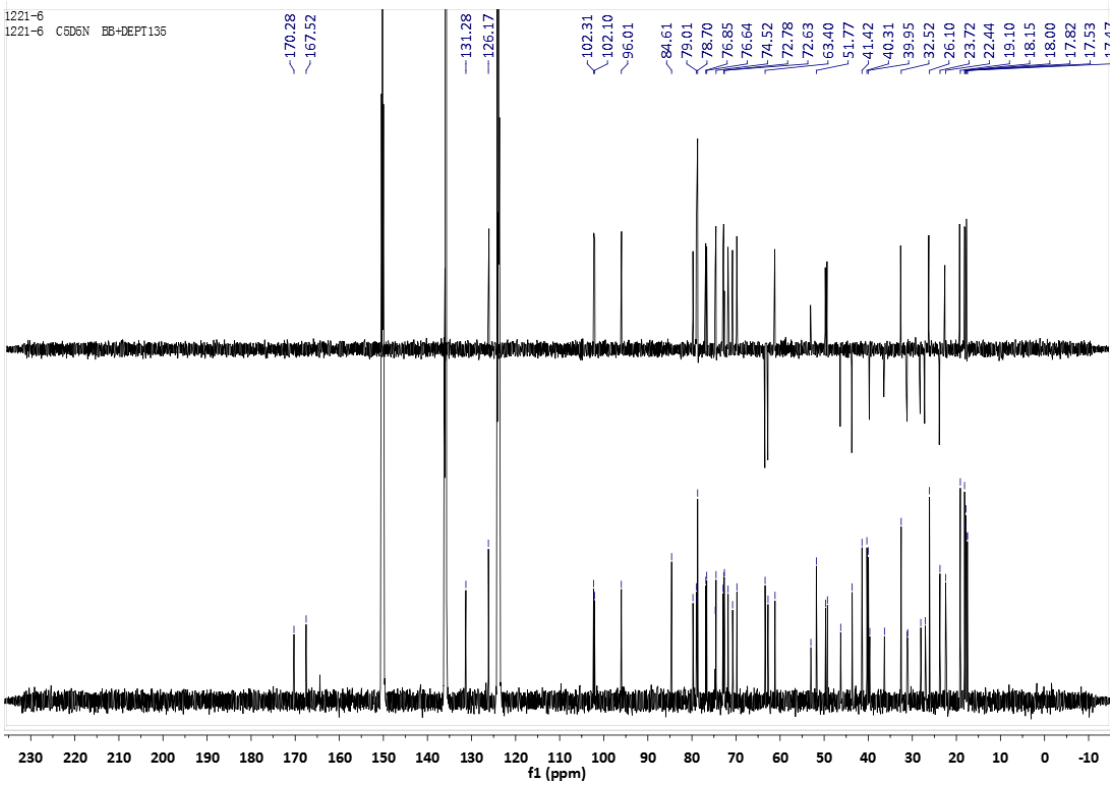


Figure S15. $^{13}$C NMR and DEPT-135 spectra of compound **2.**

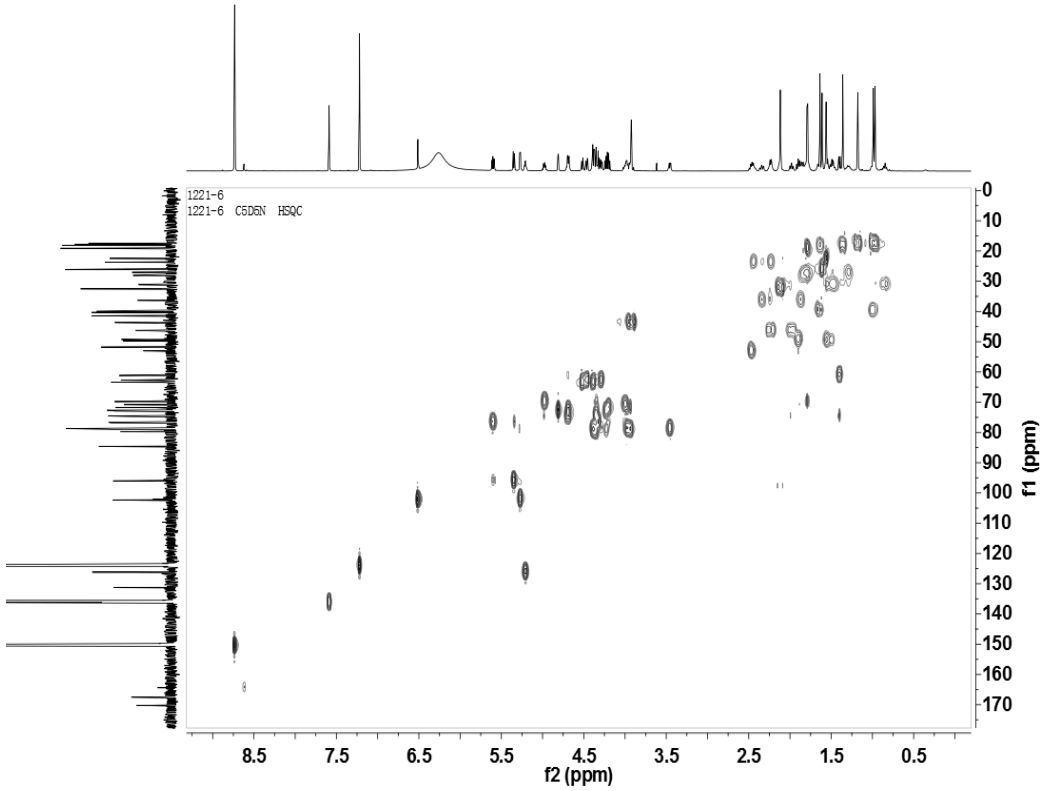


Figure S16. HSQC spectrum of compound **2.**

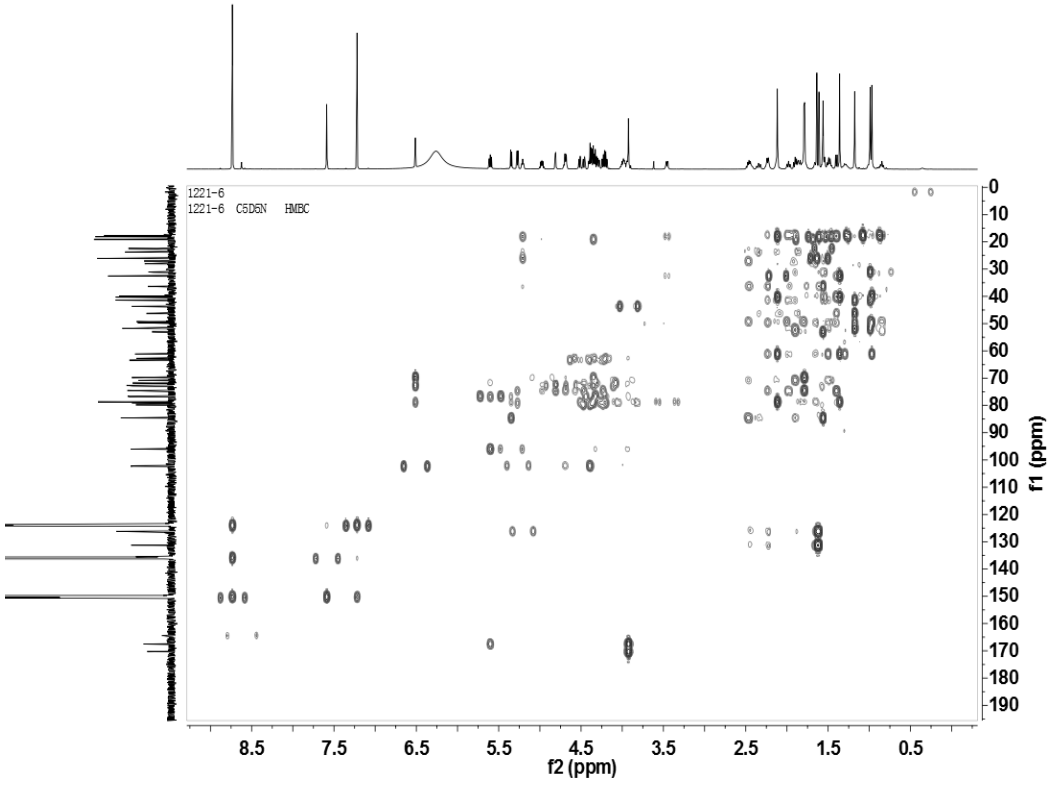


Figure S17. HMBC spectrum of compound **2.**

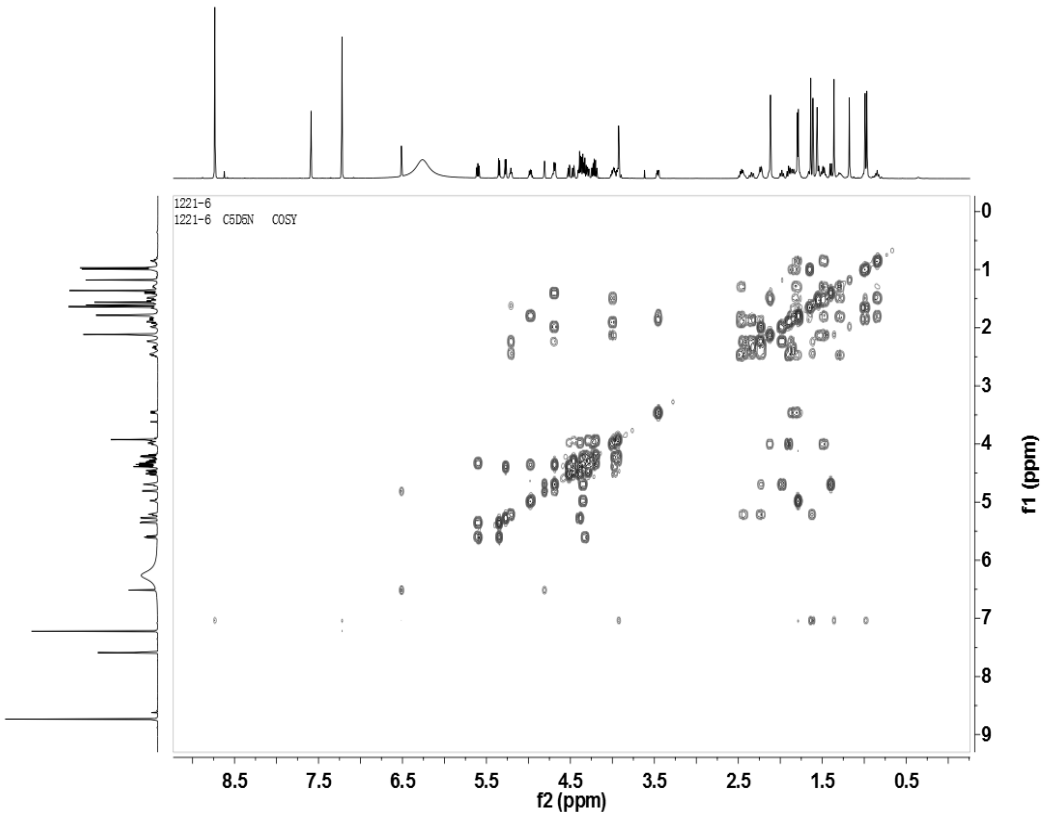


Figure S18. $^{1}$H-$^{1}$H COSY spectrum of compound **2.**

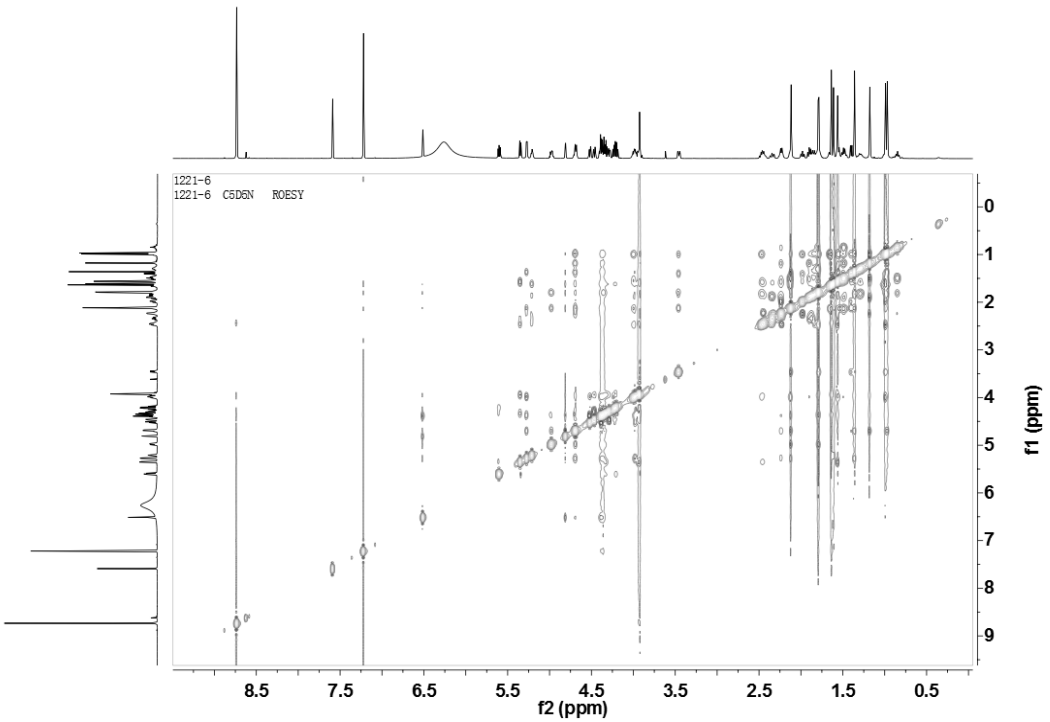


Figure S19. ROESY spectrum of compound **2.**

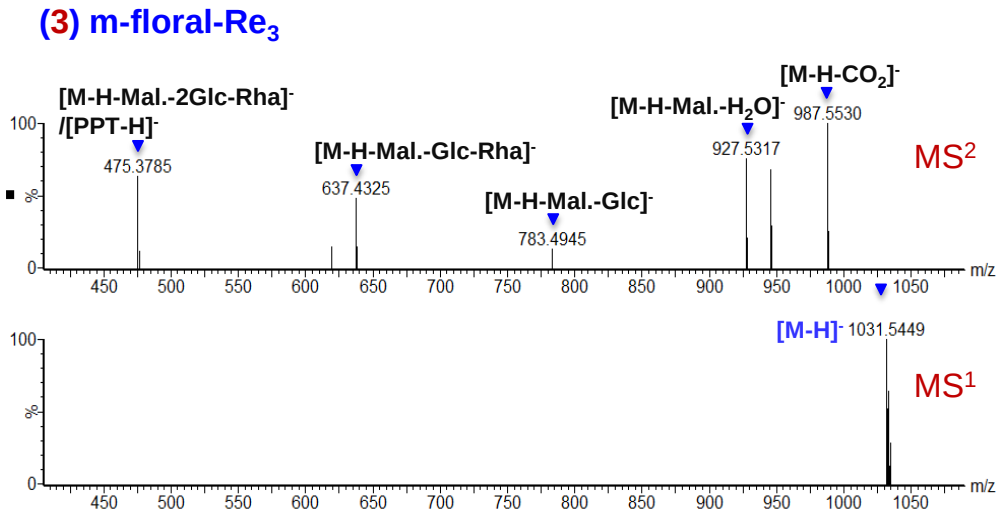


Figure S20. HRESIMS spectrum of compound **3.**

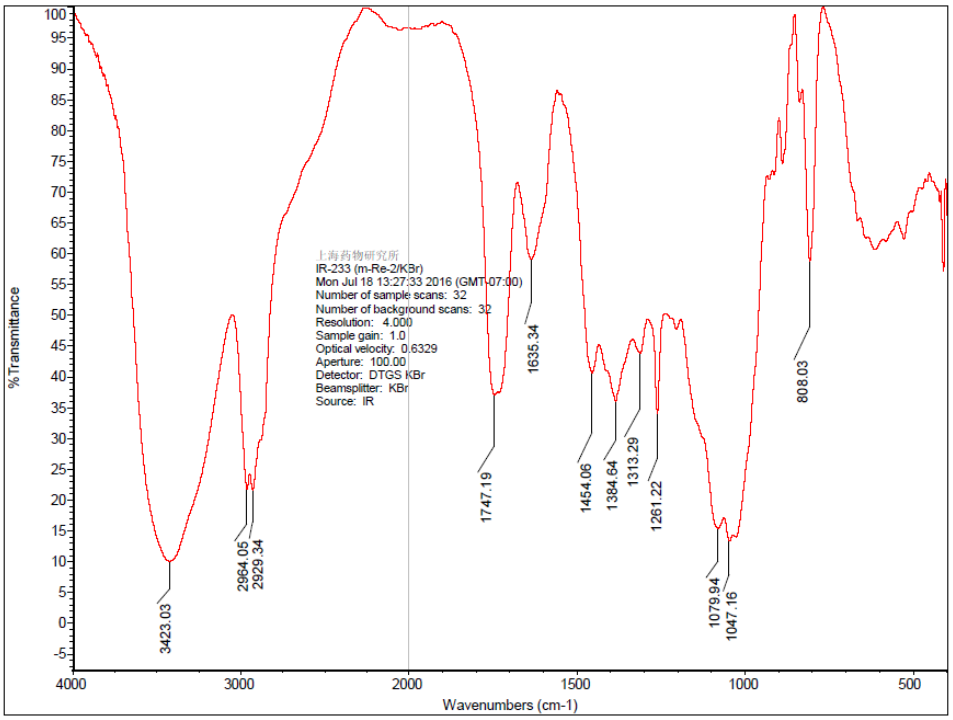


Figure S21. IR spectrum of compound **3**.

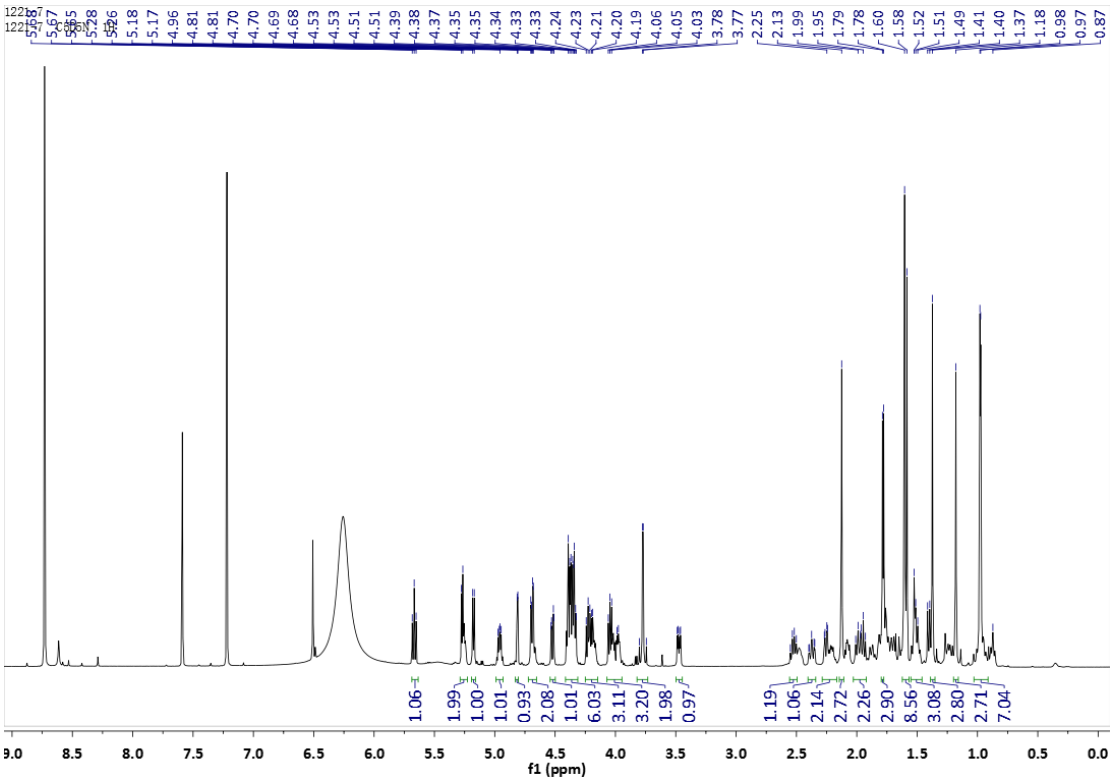


Figure S22. $^{1}$H NMR spectrum of compound **3.**

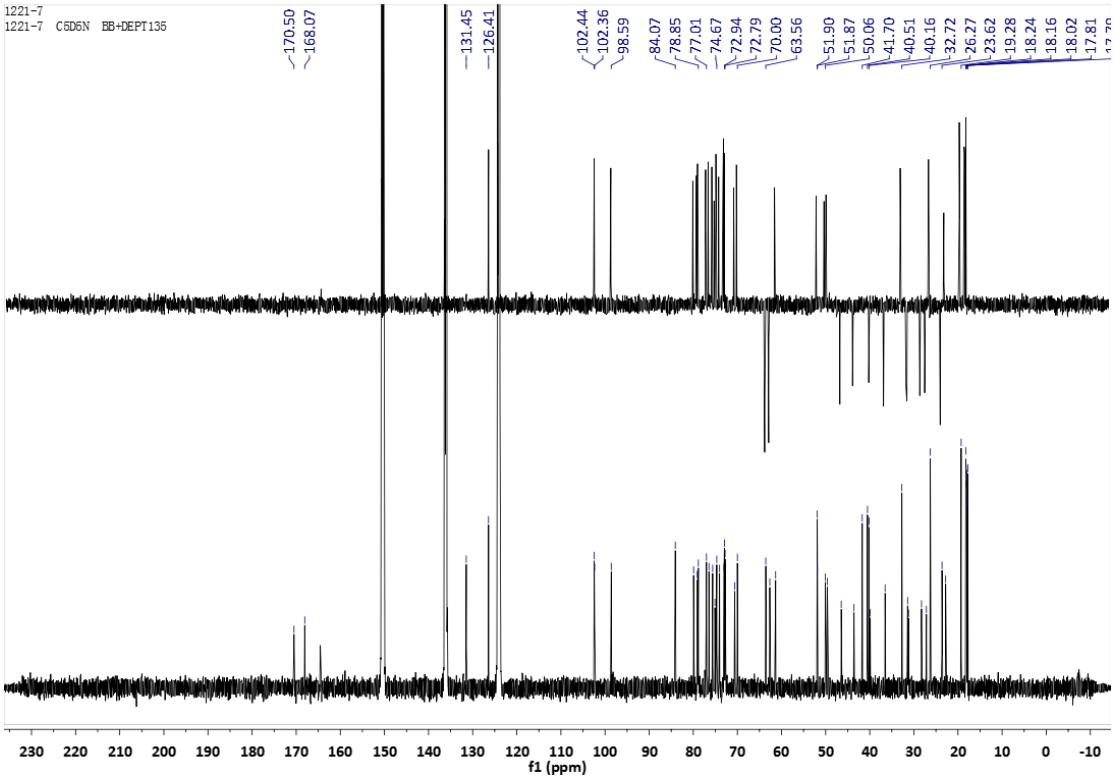


Figure S23. $^{13}$C NMR and DEPT-135 spectra of compound **3.**

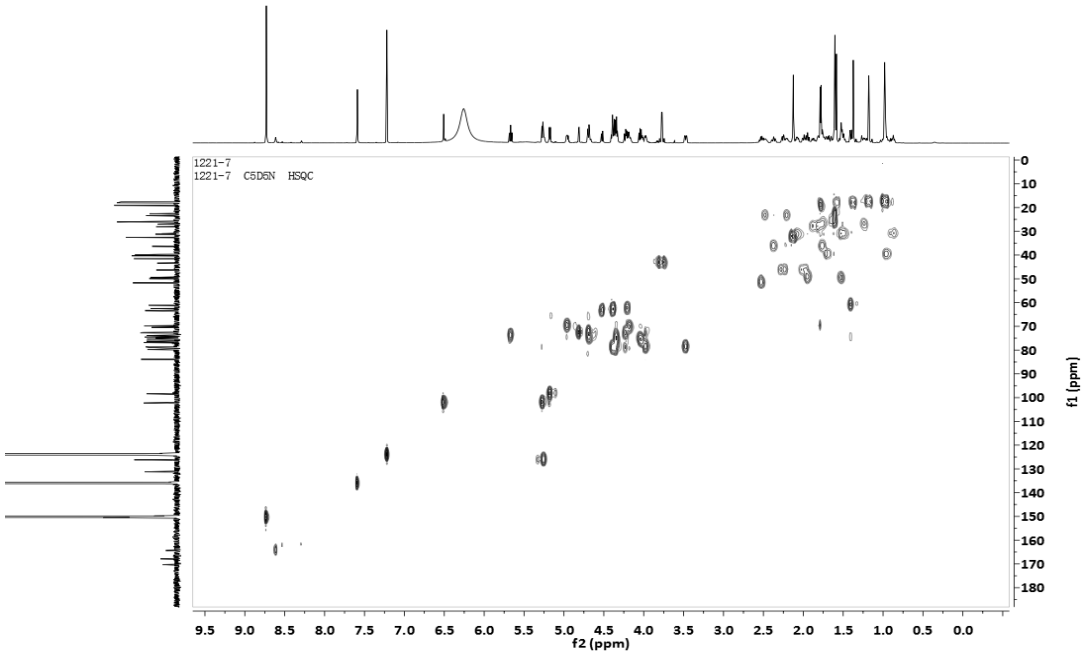


Figure S24. HSQC spectrum of compound **3.**

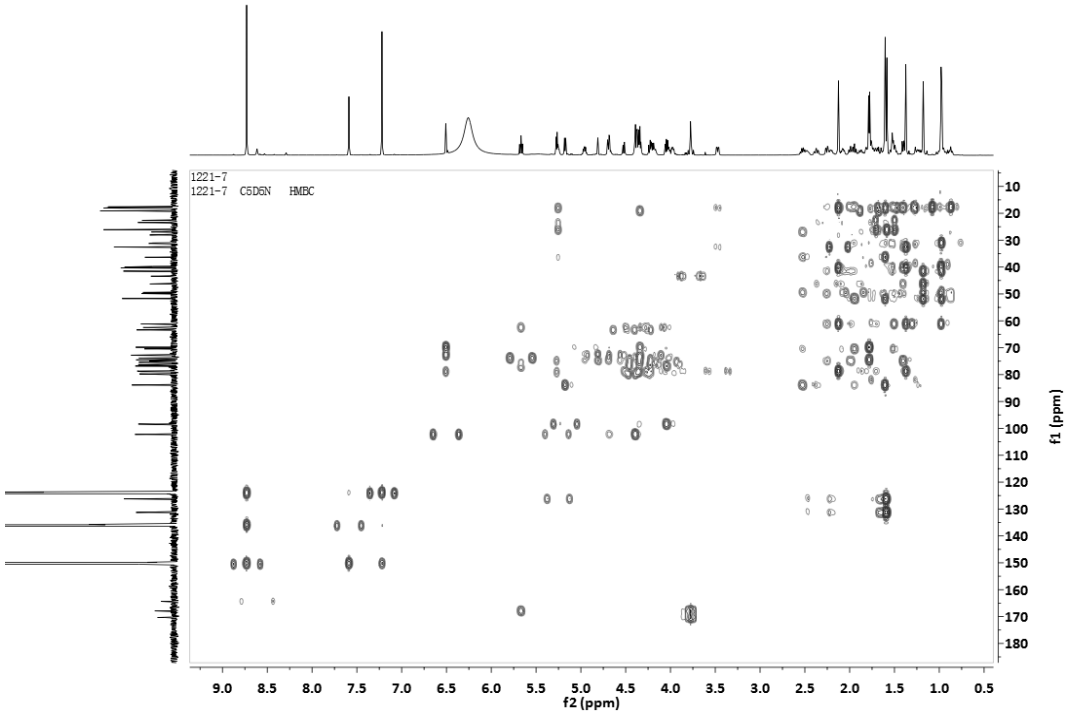


Figure S25. HMBC spectrum of compound **3.**

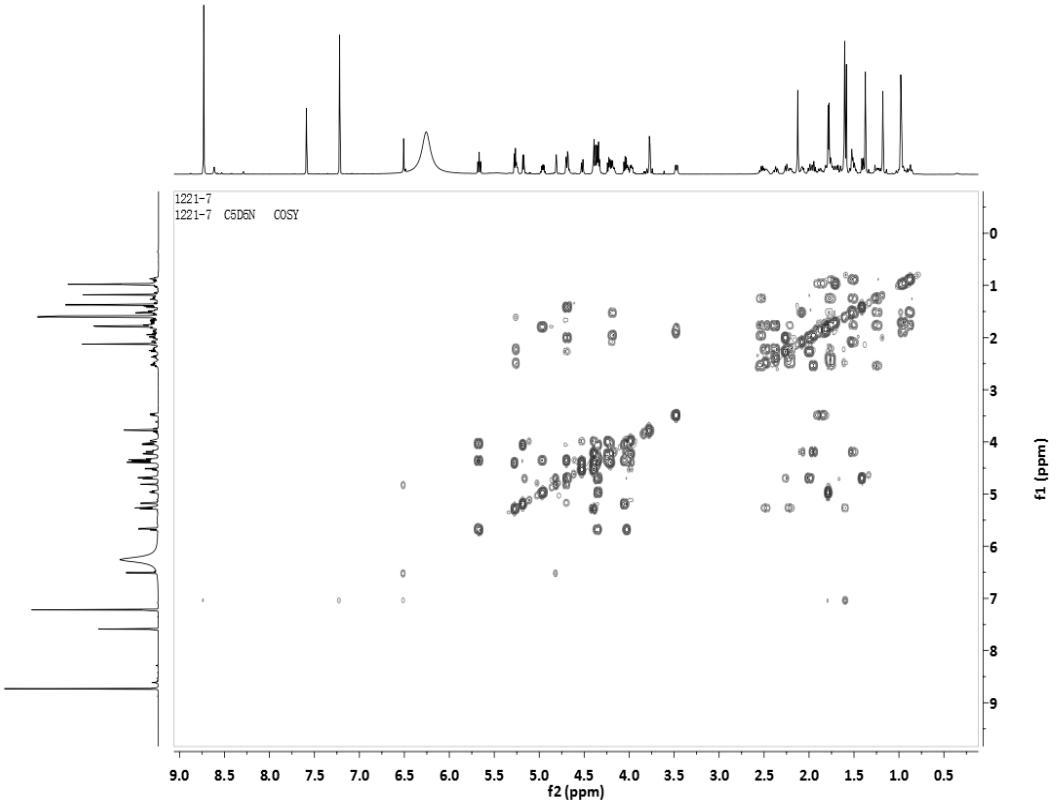


Figure S26. $^{1}$H-$^{1}$H COSY spectrum of compound **3.**

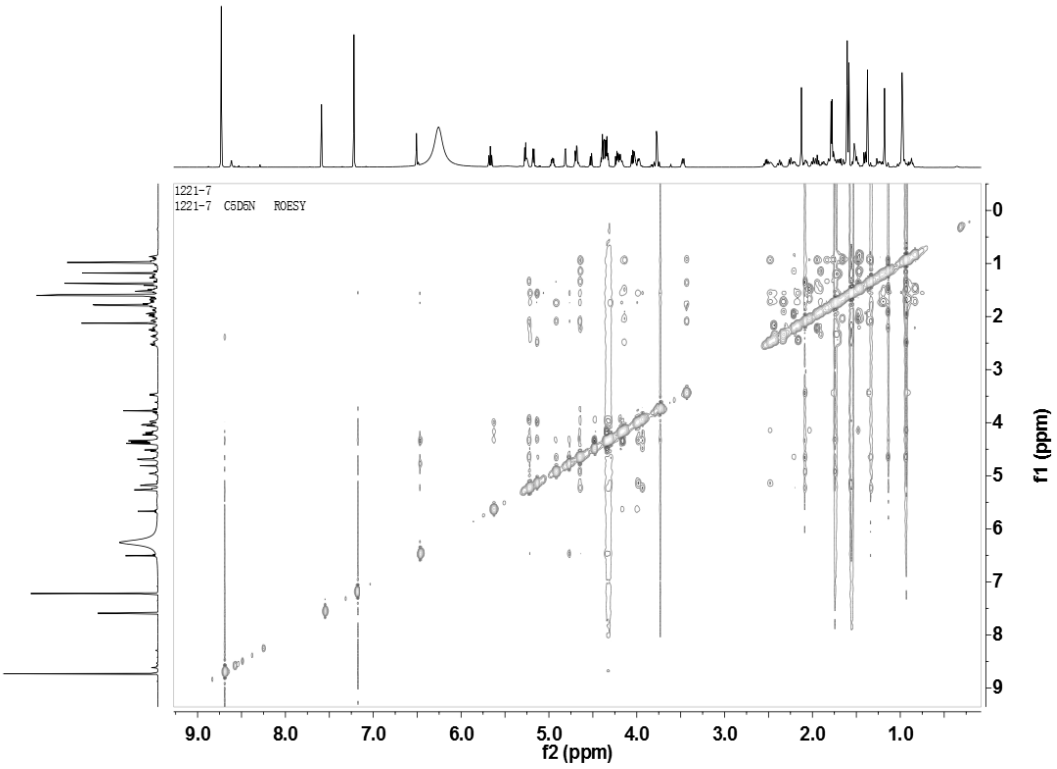


Figure S27. ROESY spectrum of compound **3.**

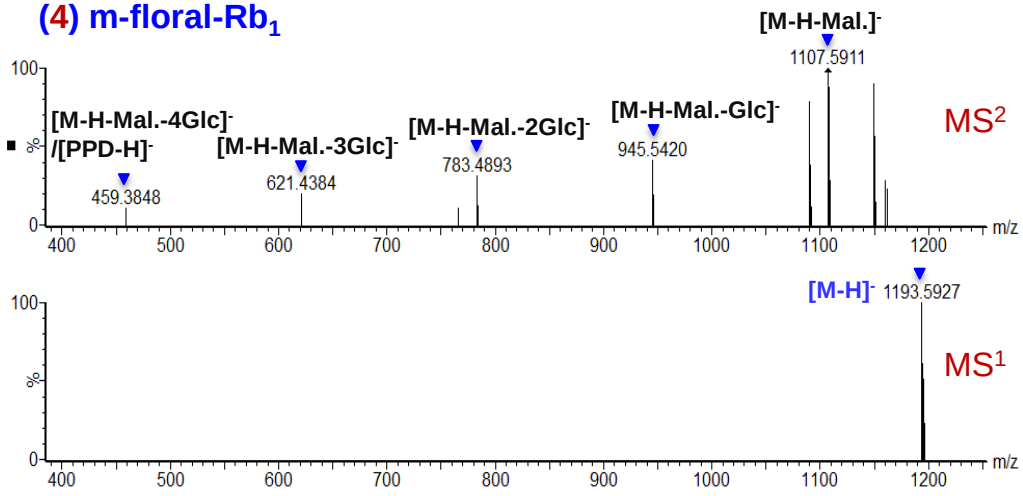


Figure S28. HRESIMS spectrum of compound **4.**

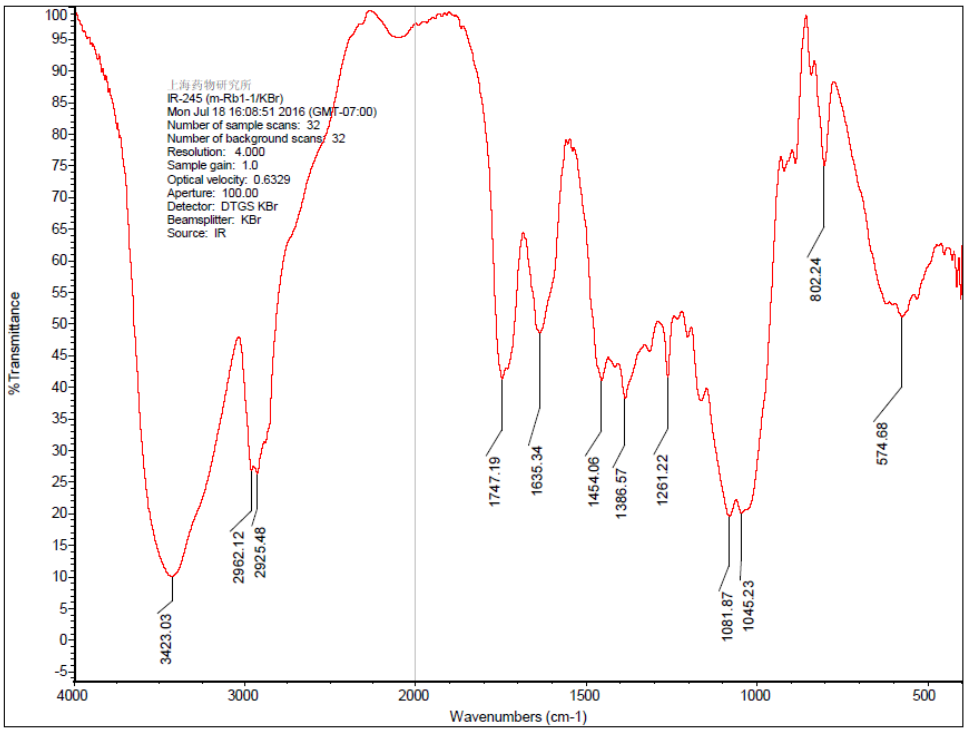


Figure S29. IR spectrum of compound **4**.

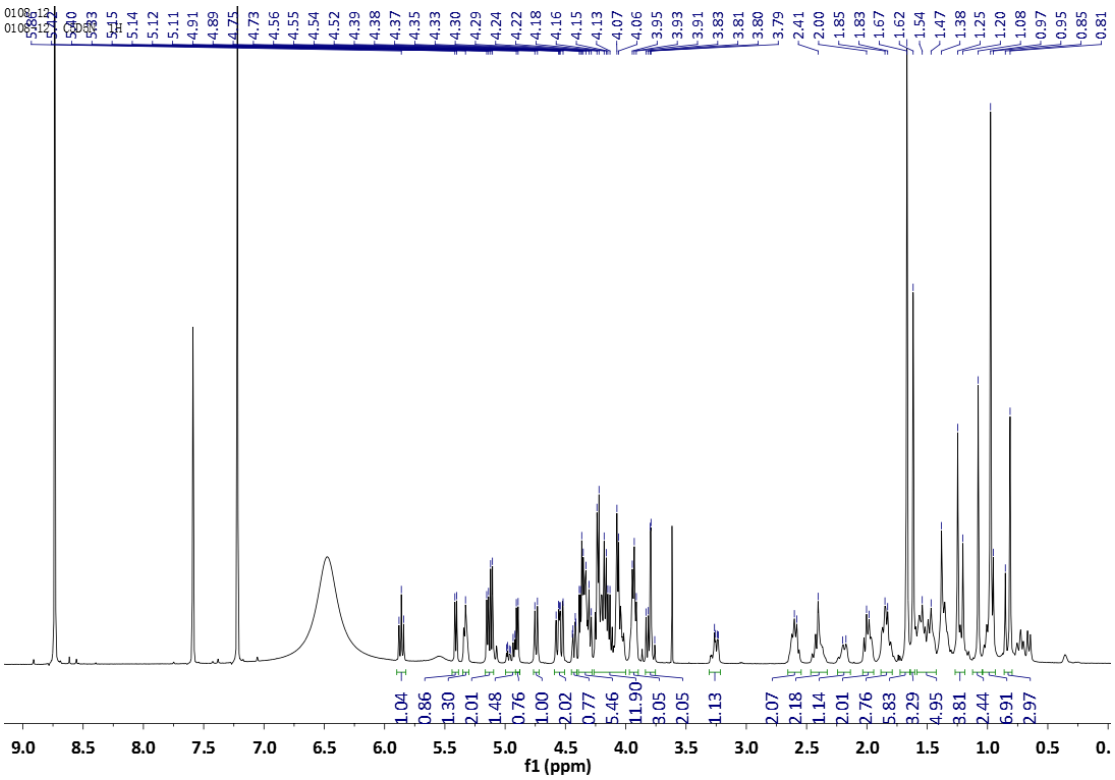


Figure S30. $^{1}$H NMR spectrum of compound **4.**

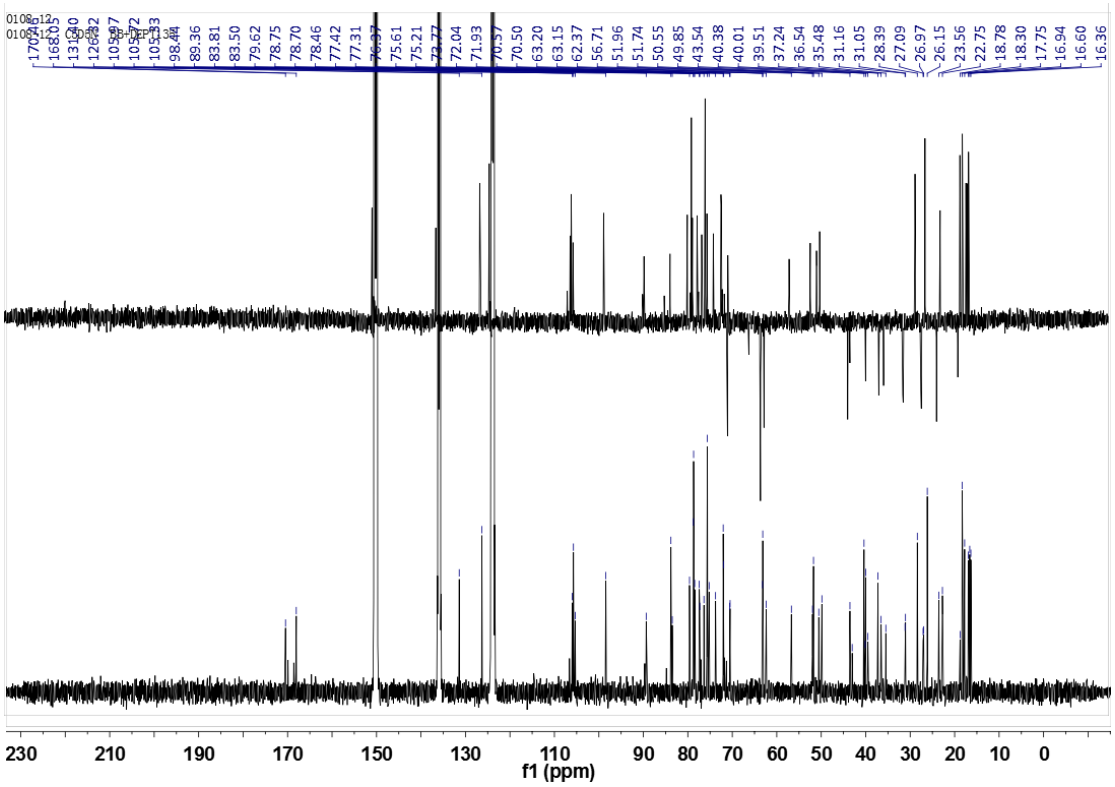


Figure S31. $^{13}$C NMR and DEPT-135 spectrum of compound **4.**

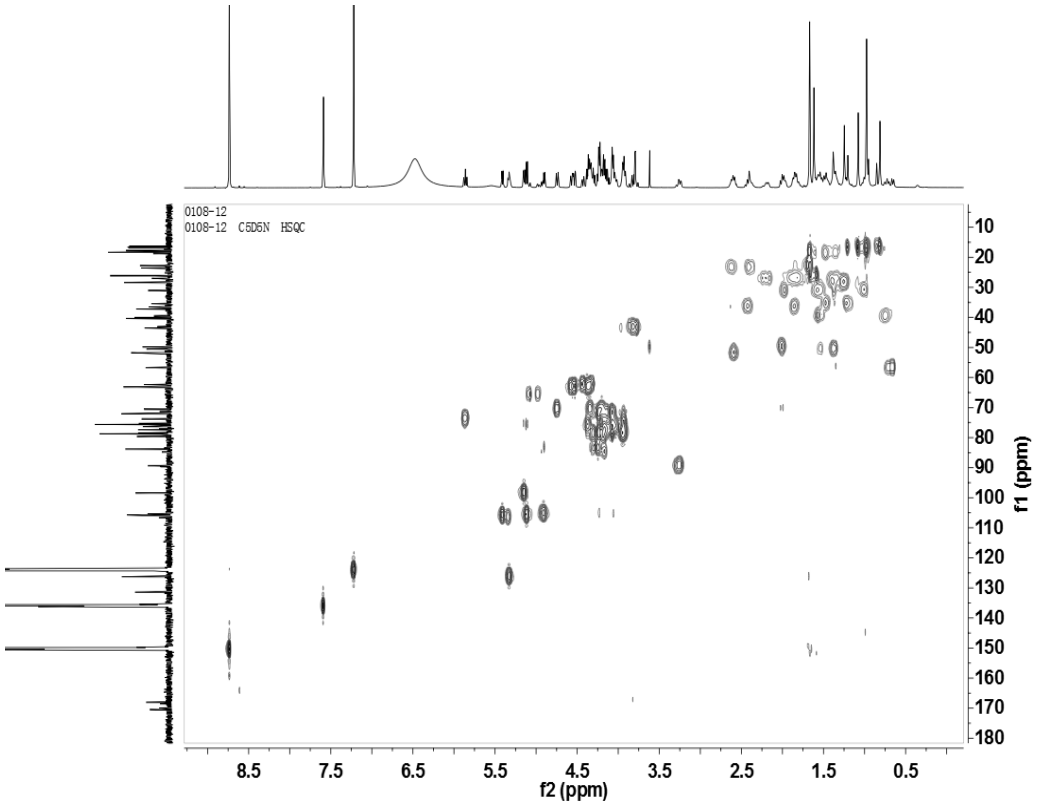


Figure S32. HSQC spectrum of compound **4.**

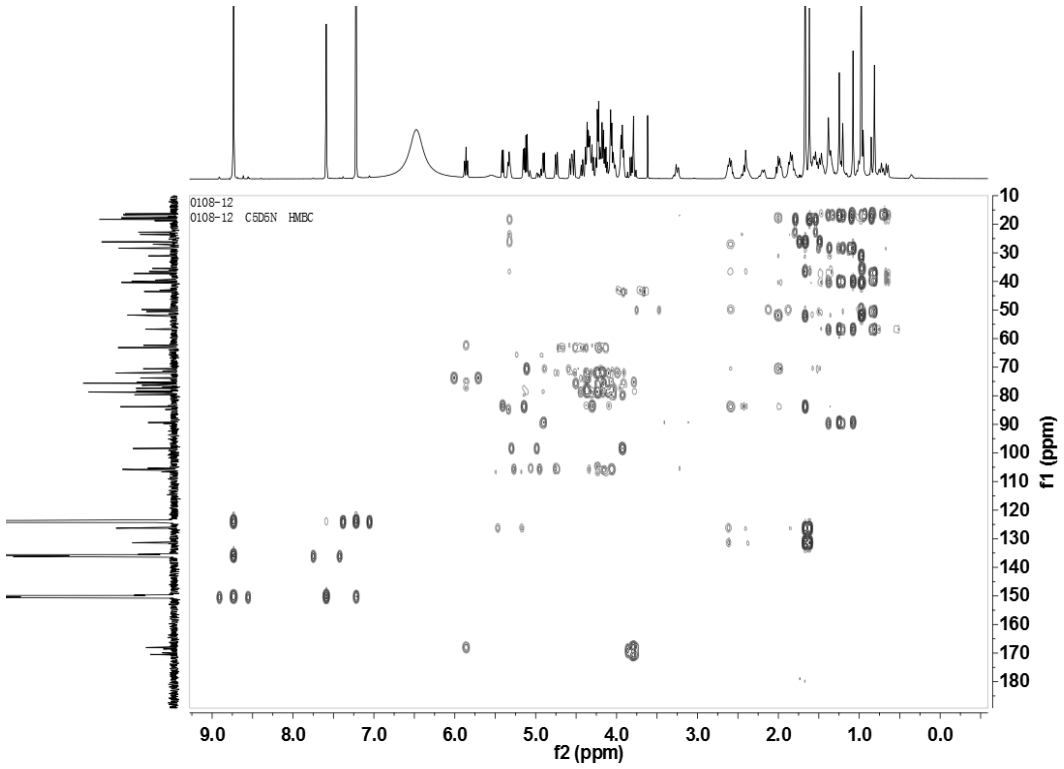


Figure S33. HMBC spectrum of compound **4.**

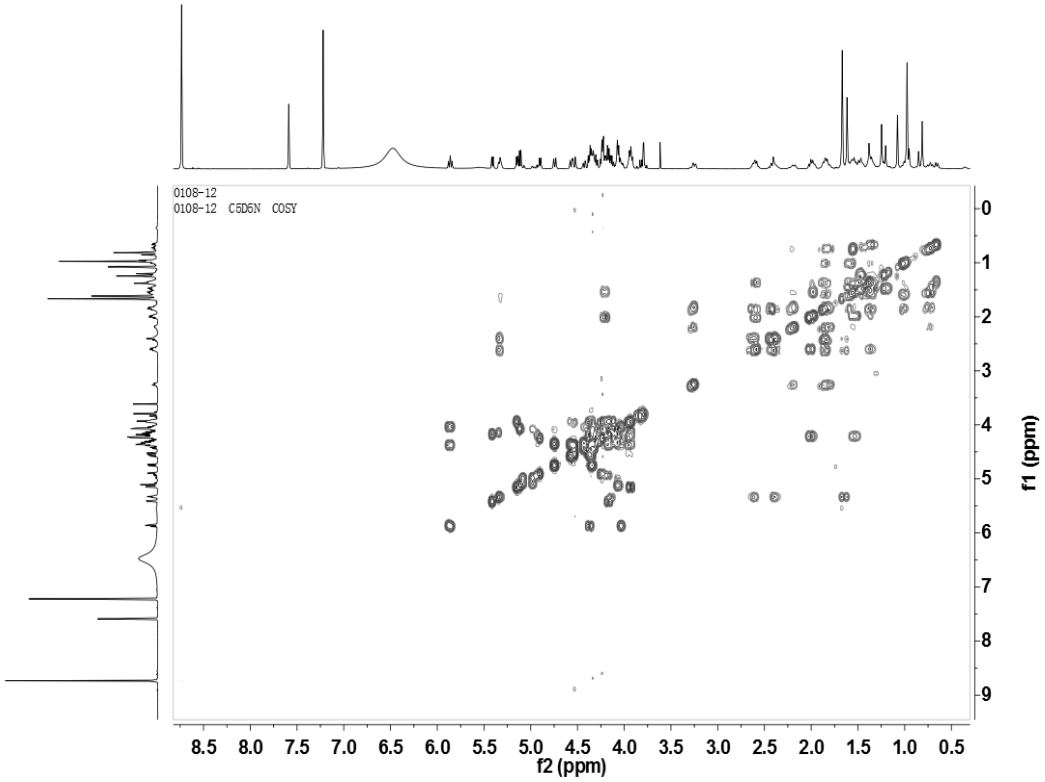


Figure S34. $^{1}$H-$^{1}$H COSY spectrum of compound **4.**

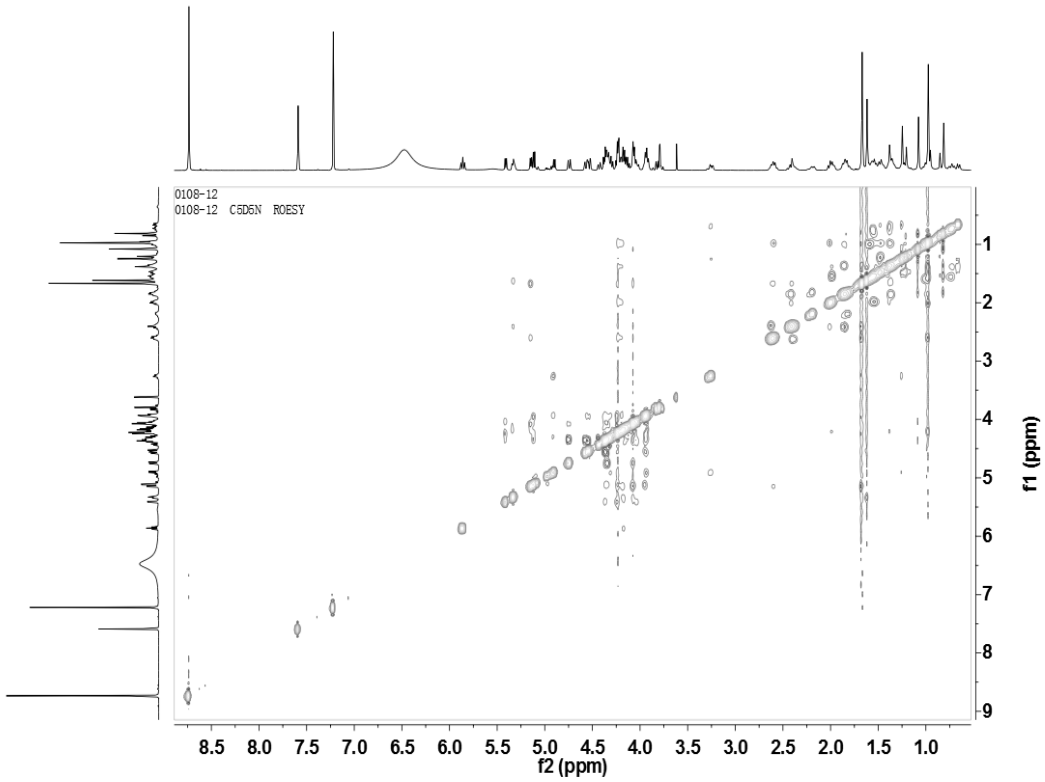


Figure S35. ROESY spectrum of compound **4.**

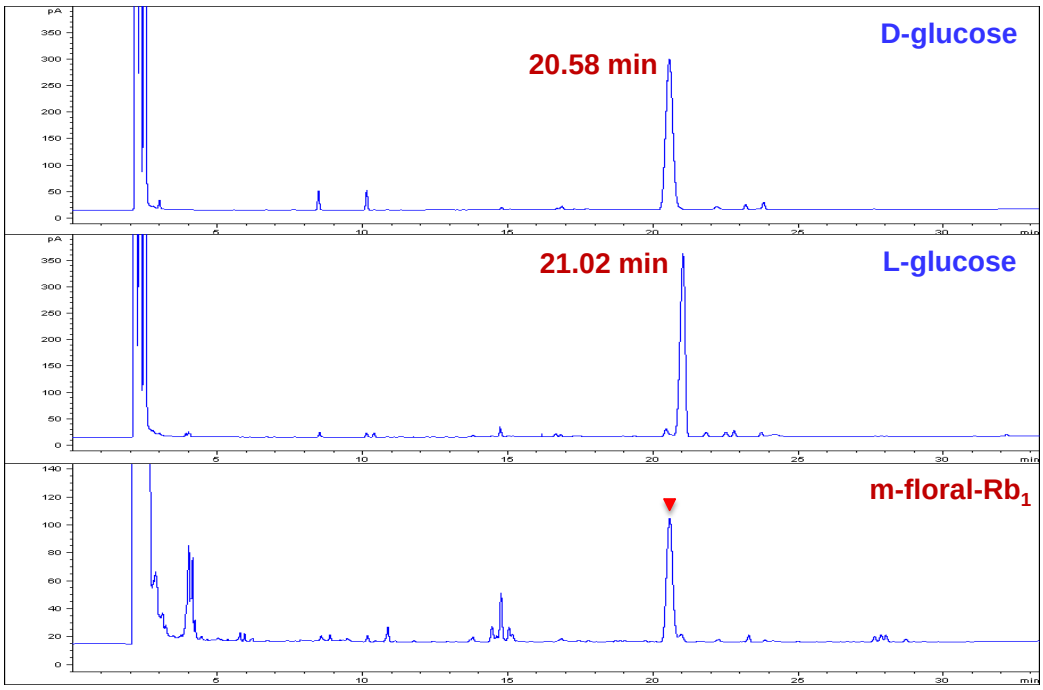


Figure S36. The GC chromatograms of compound **4** after acidic hydrolysis.

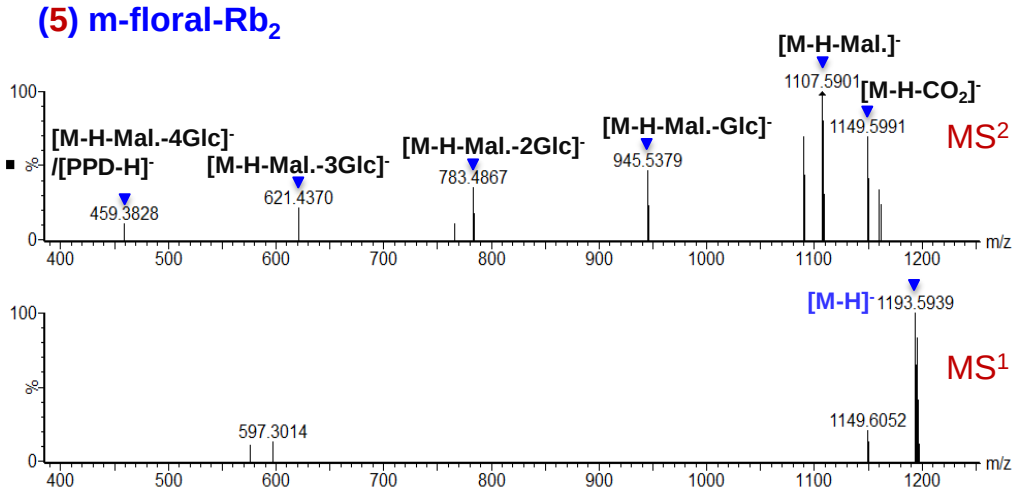


Figure S37. HRESIMS spectrum of compound **5.**

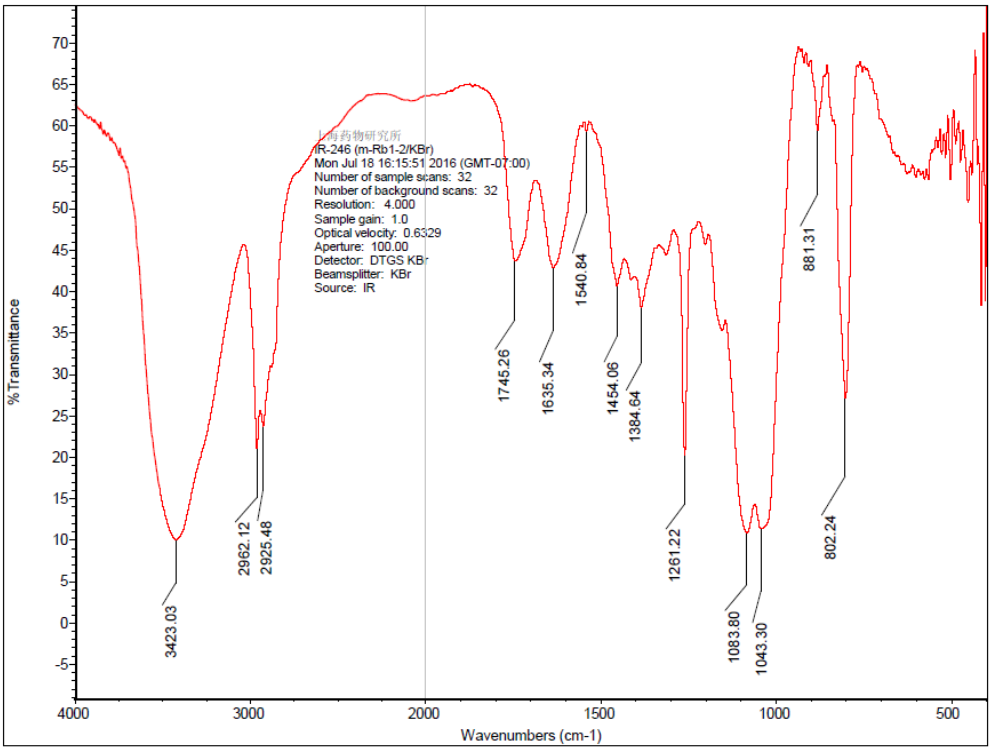


Figure S38. IR spectrum of compound **5**.

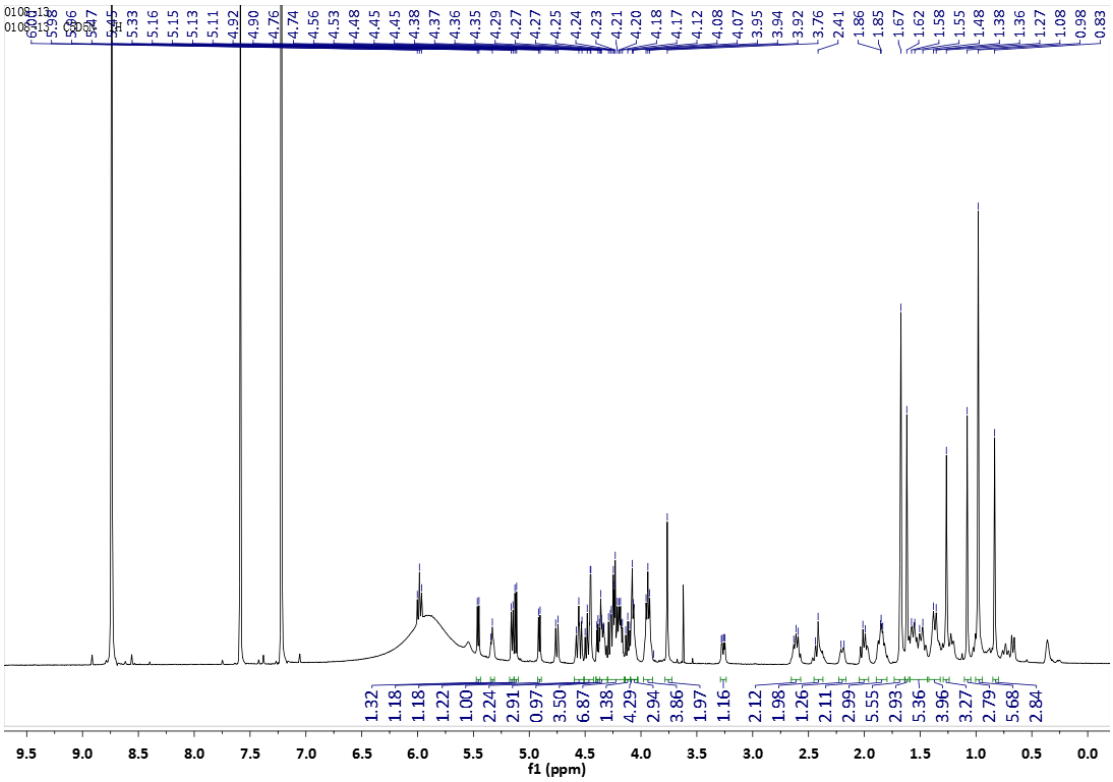


Figure S39. $^{1}$H NMR spectrum of compound **5.**

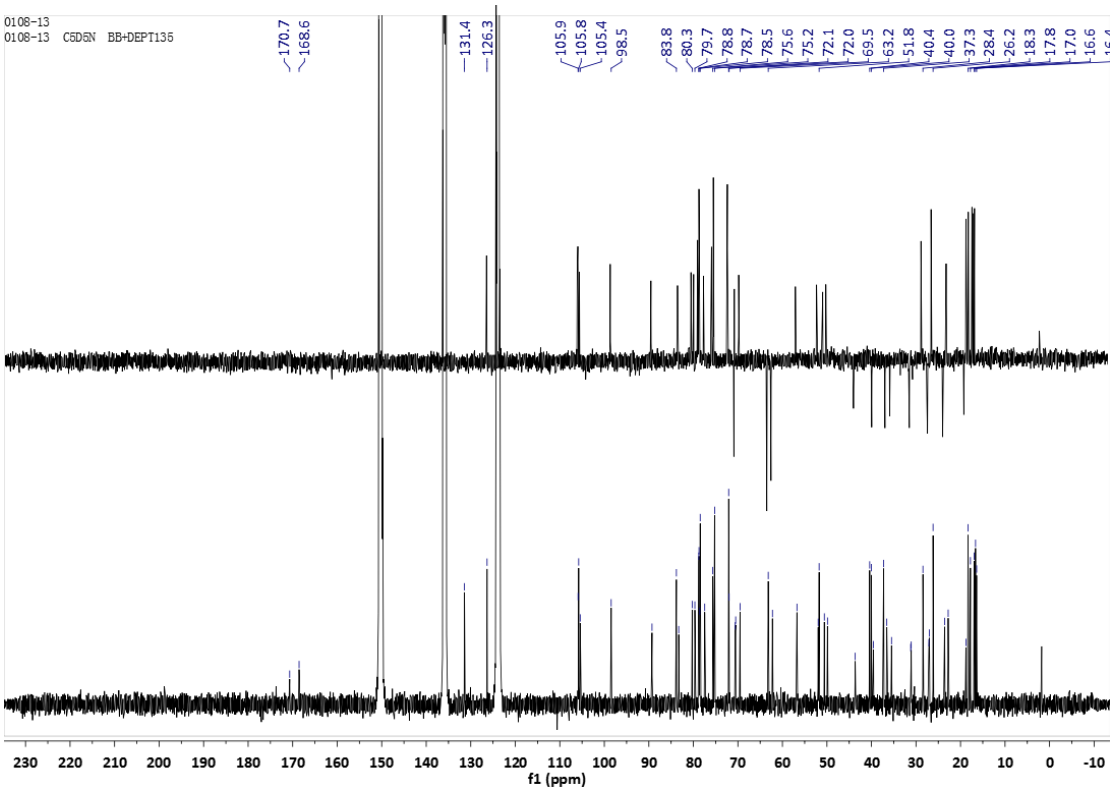


Figure S40. $^{13}$C NMR and DEPT-135 spectra of compound **5.**

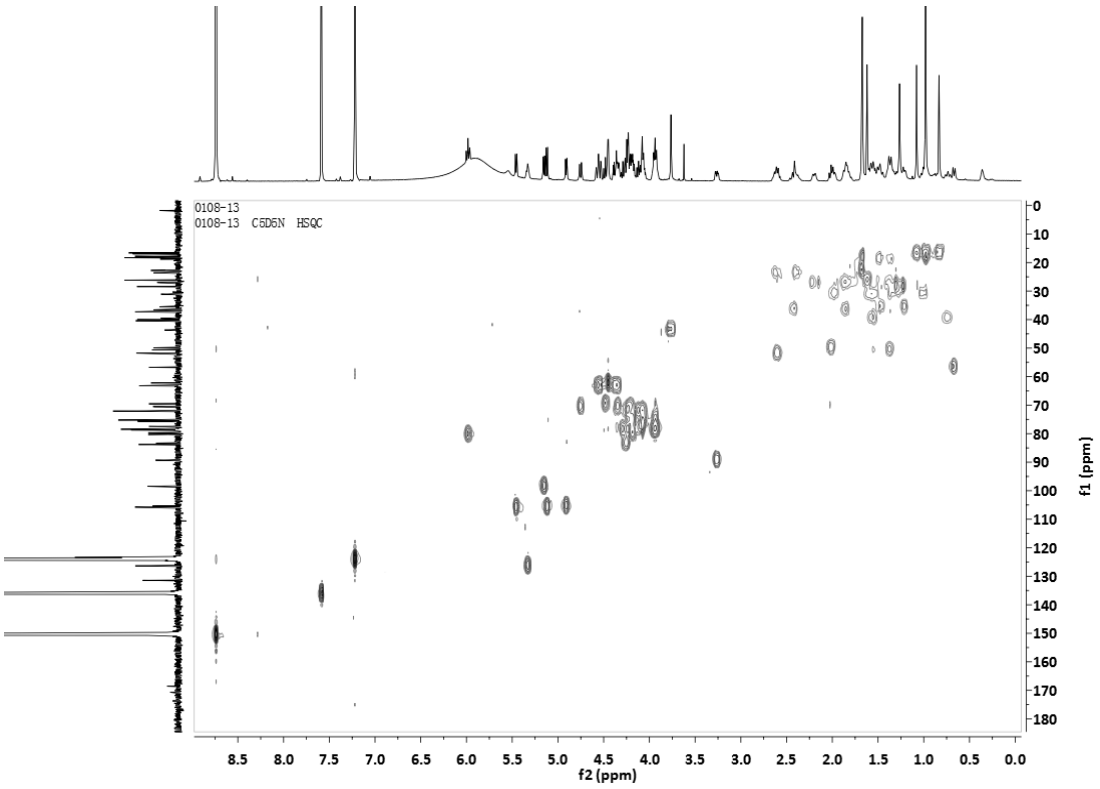


Figure S41. HSQC spectrum of compound **5.**

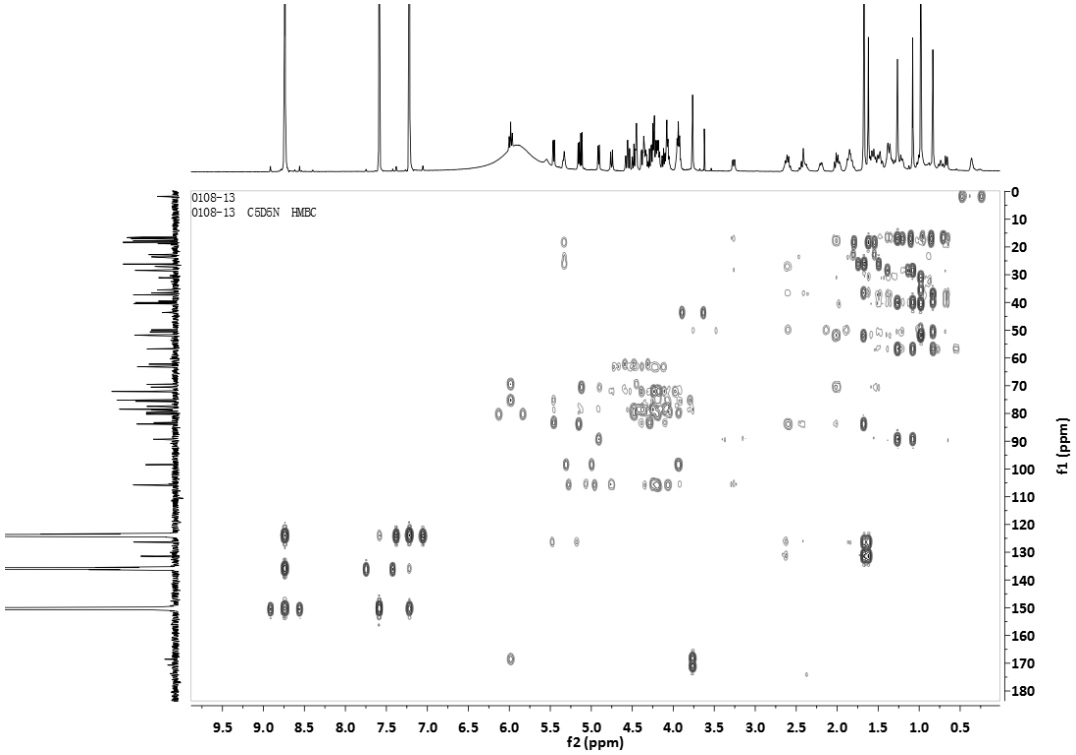


Figure S42. HMBC spectrum of compound **5.**

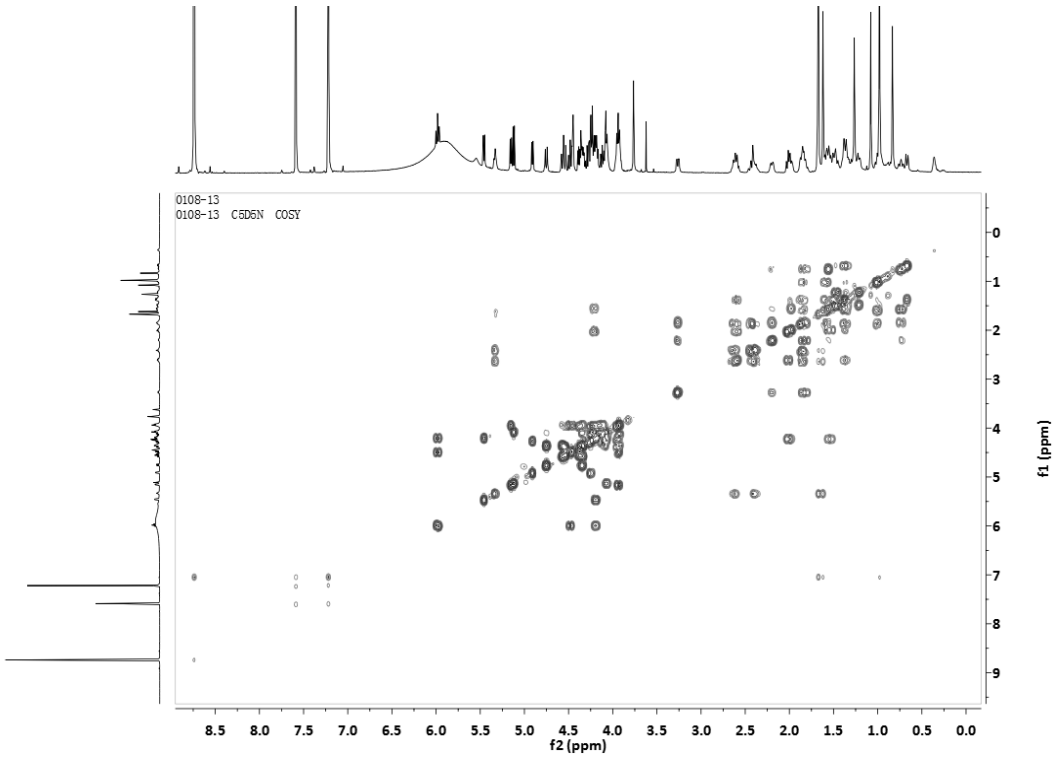


Figure S43. $^{1}$H-$^{1}$H COSY spectrum of compound **5.**

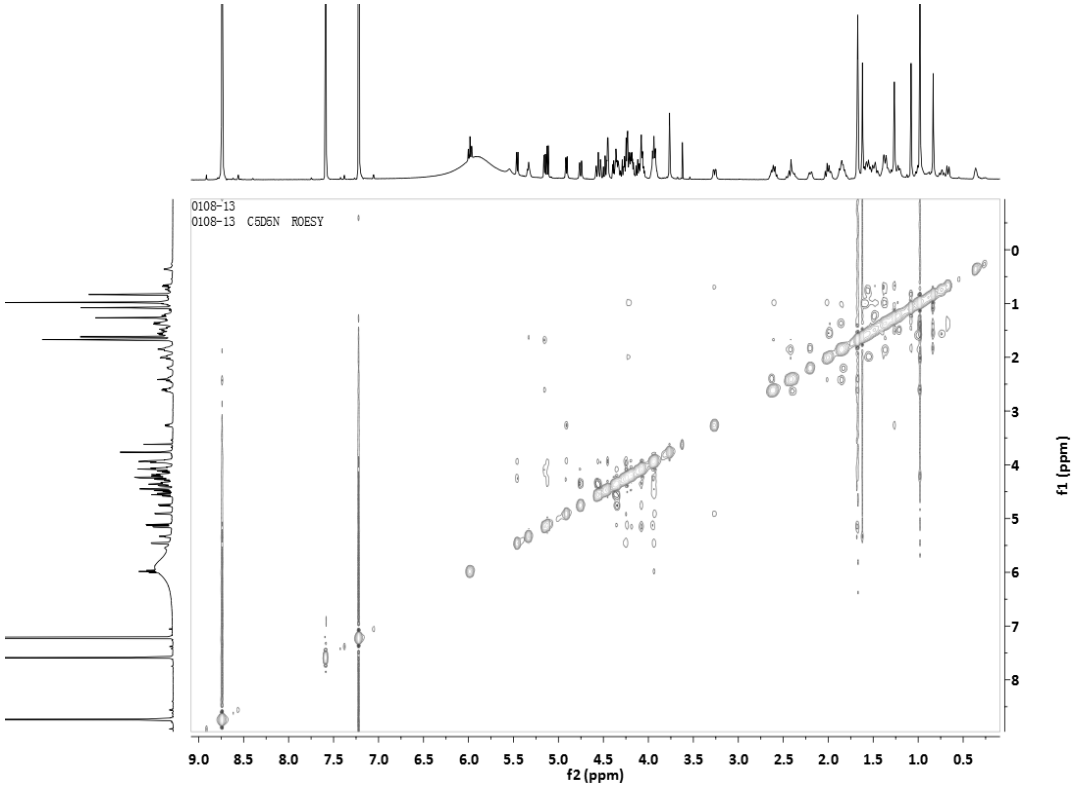


Figure S44. ROESY spectrum of compound **5.**

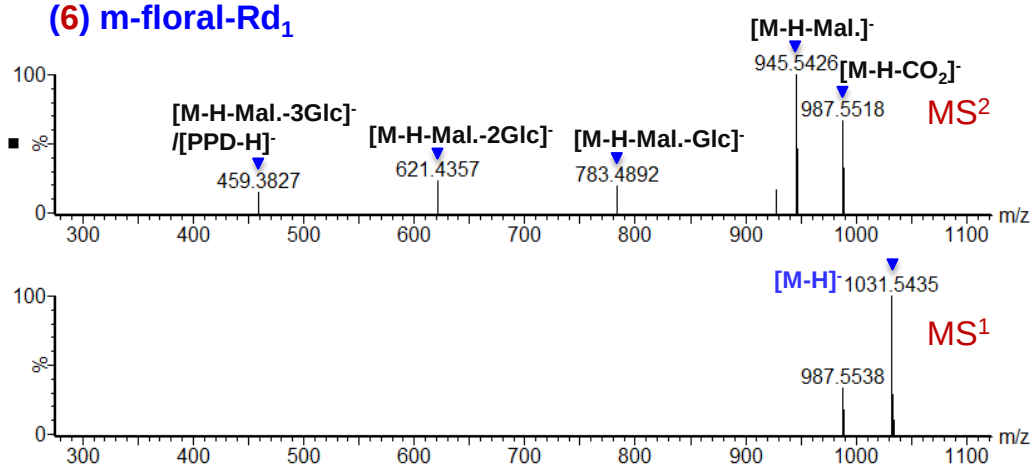


Figure S45. HRESIMS spectrum of compound **6.**

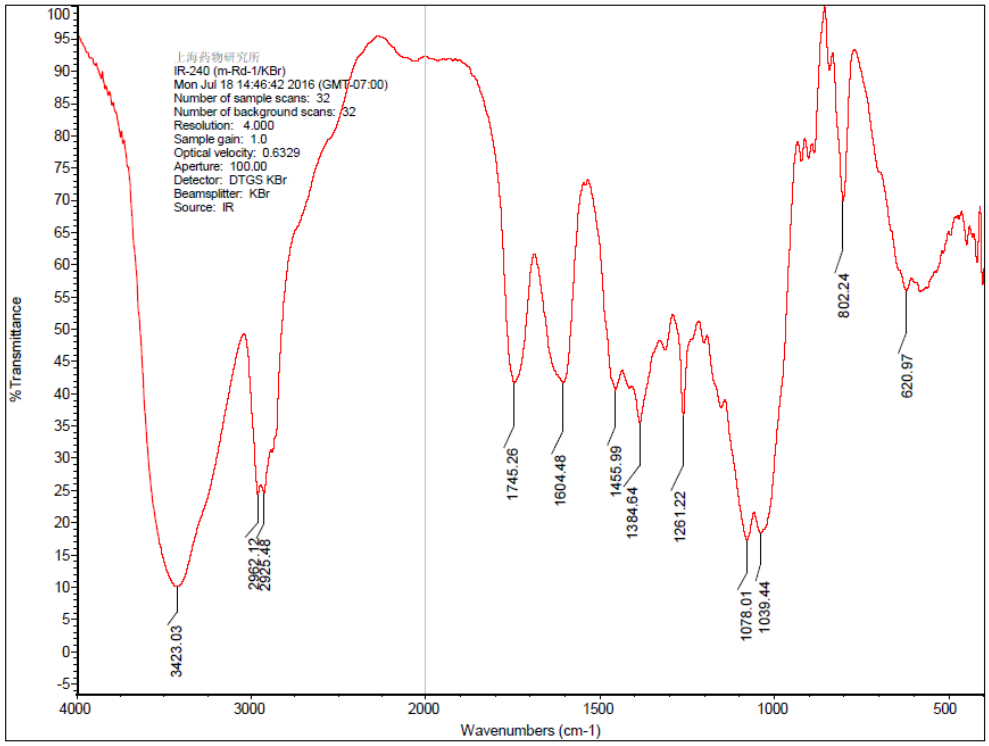


Figure S46. IR spectrum of compound **6**.

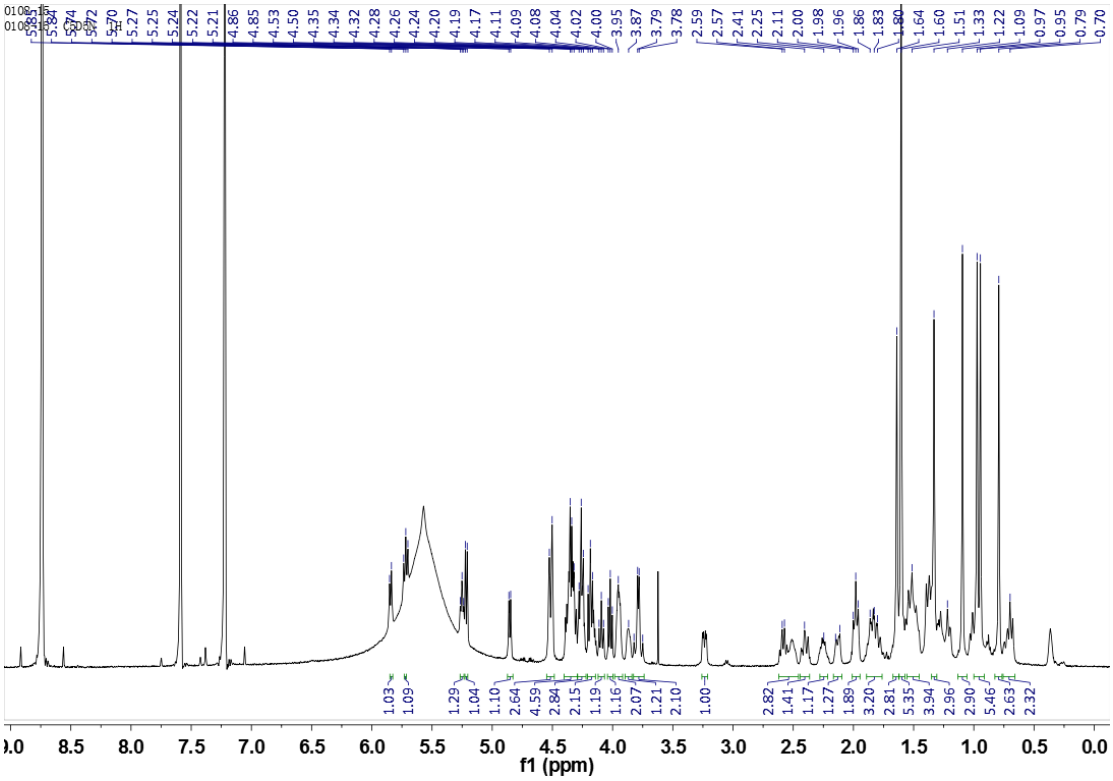


Figure S47. $^{1}$H NMR spectrum of compound **6.**

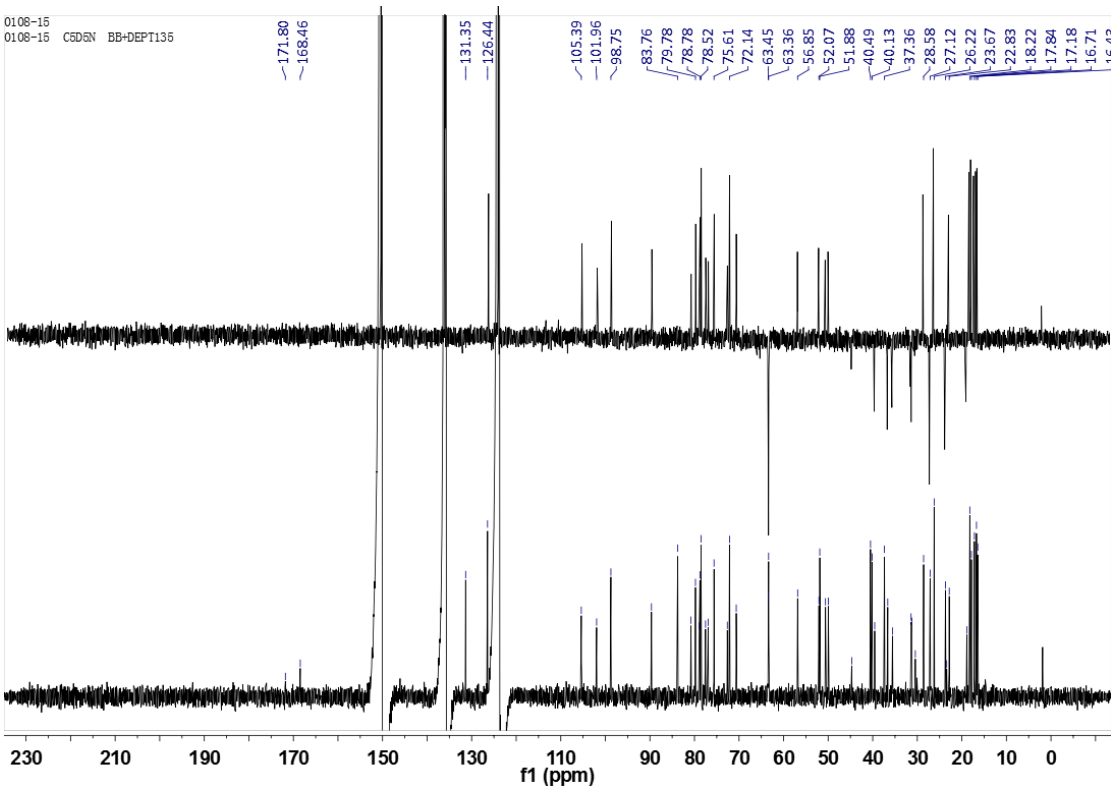


Figure S48. $^{13}C$ NMR spectrum of compound **6.**

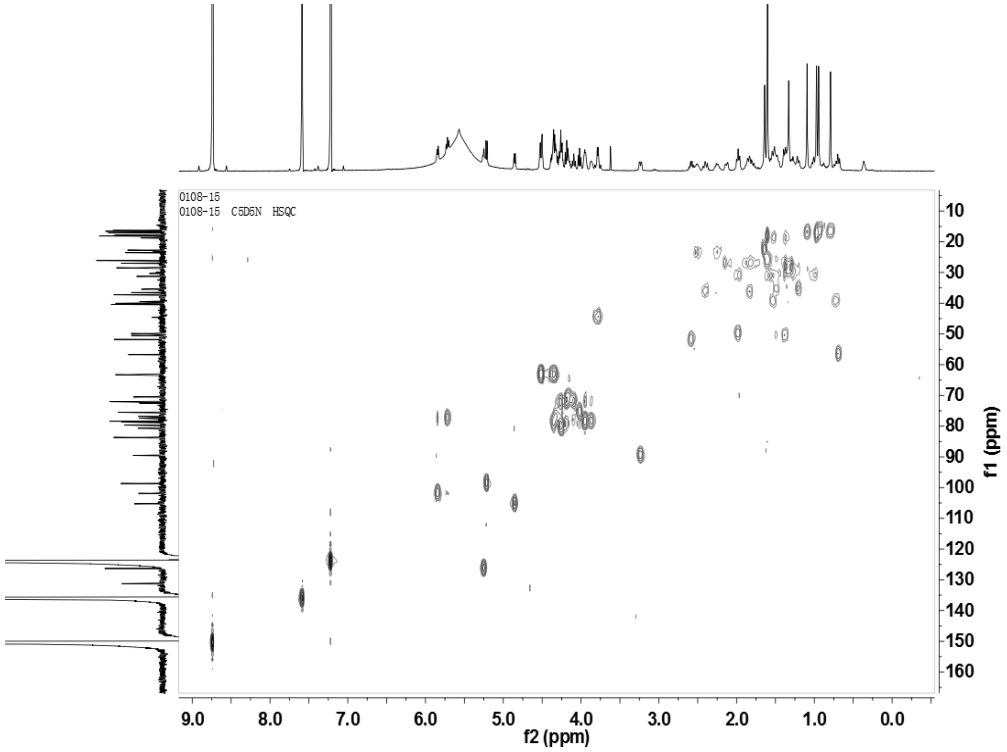


Figure S49. HSQC spectrum of compound **6.**

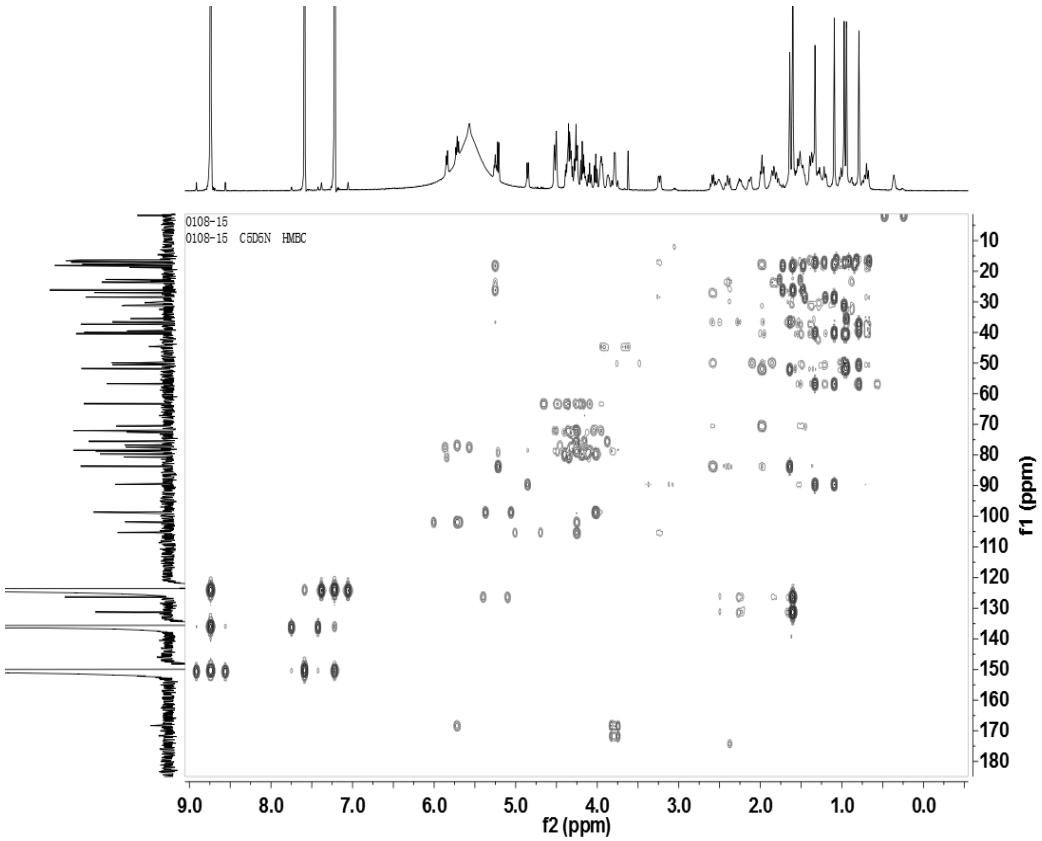


Figure S50. HMBC spectrum of compound **6.**

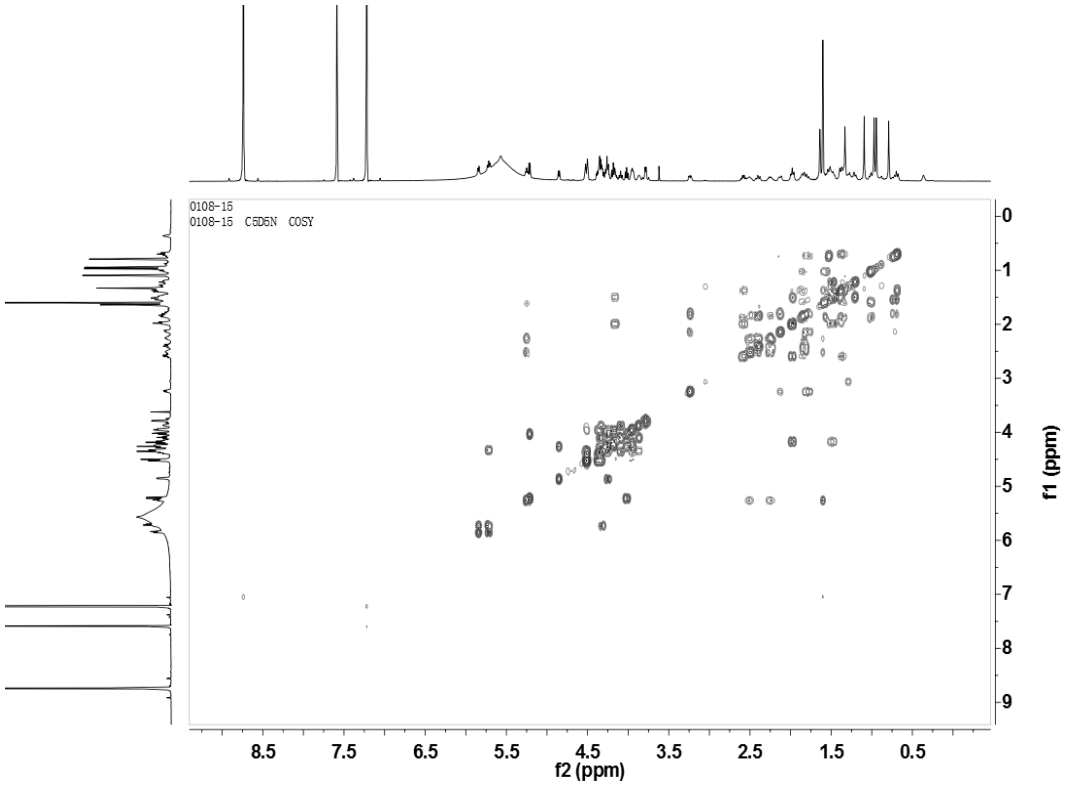


Figure S51. $^{1}$H-$^{1}$H COSY spectrum of compound **6.**

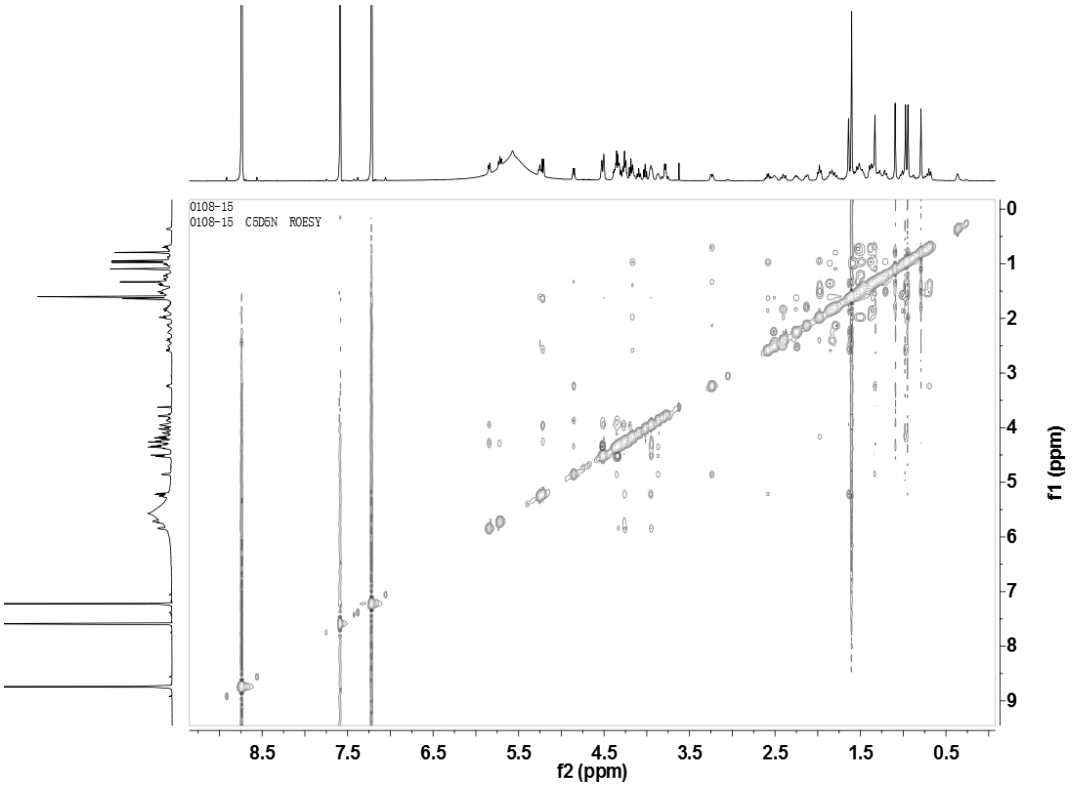


Figure S52. ROESY spectrum of compound **6.**

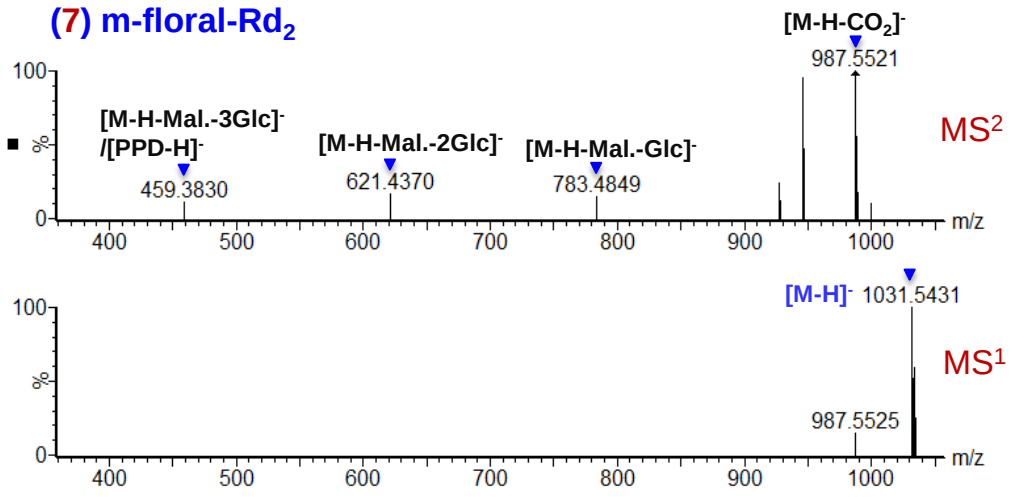


Figure S53. HRESIMS spectrum of compound **7.**

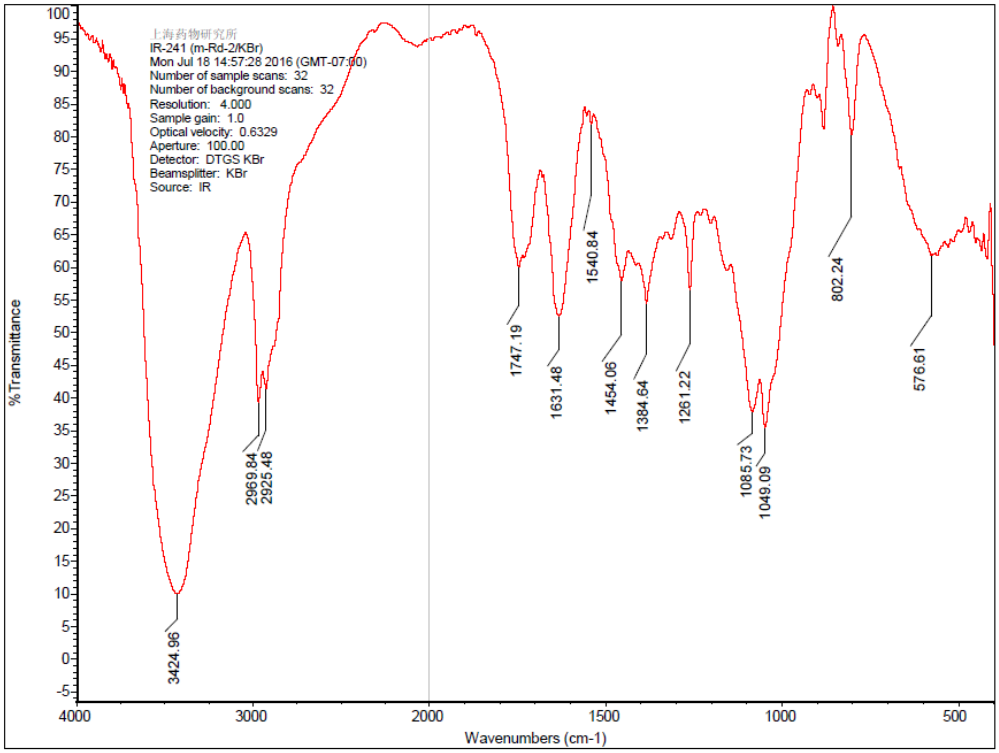


Figure 54. IR spectrum of compound **7**.

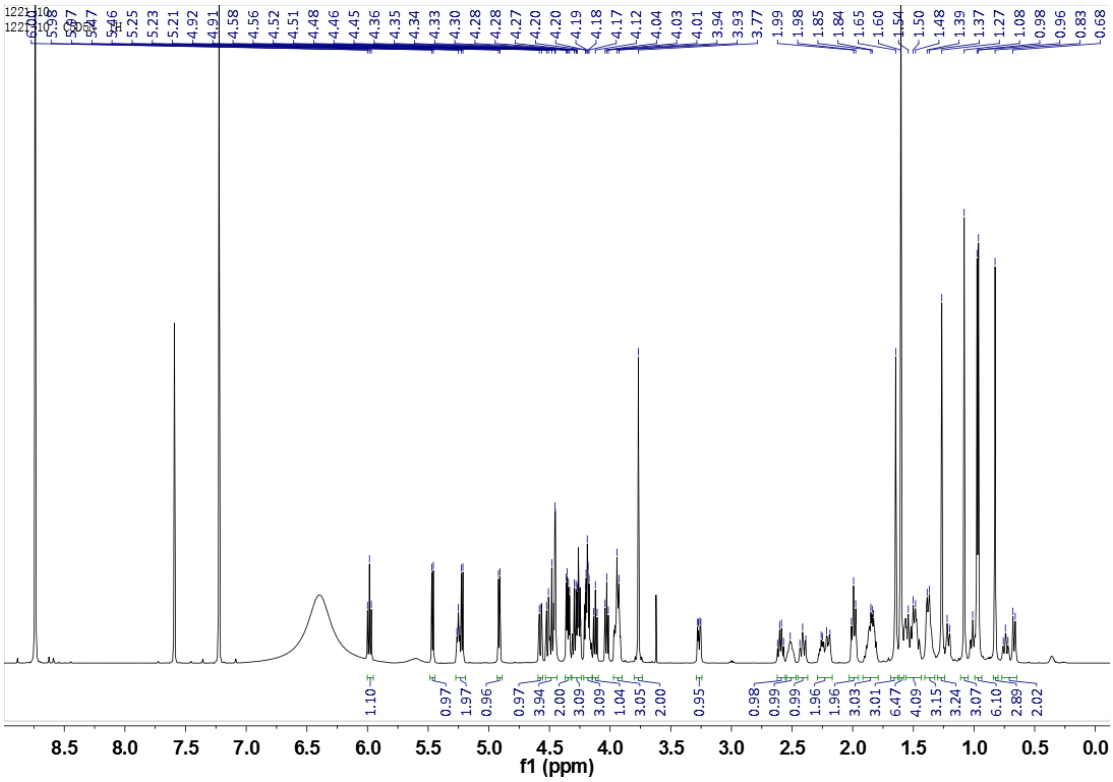


Figure S55. $^{1}$H NMR spectrum of compound **7.**

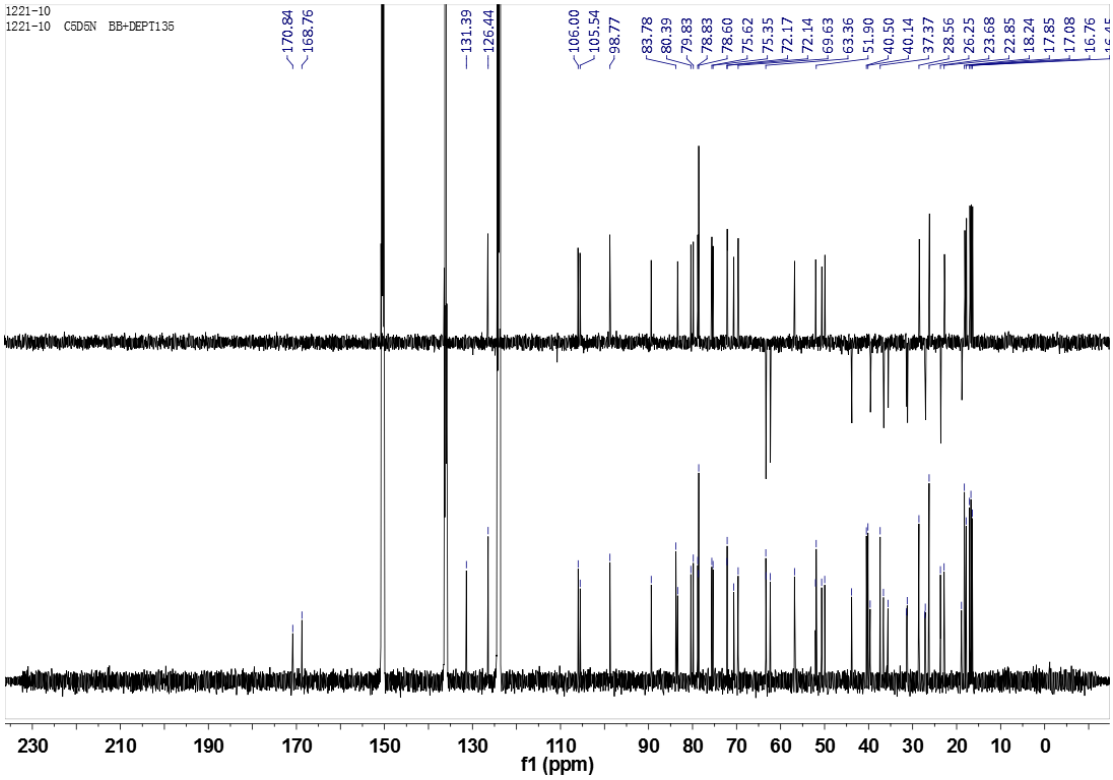


Figure S56. $^{13}$C NMR and DEPT-135 spectra of compound **7.**

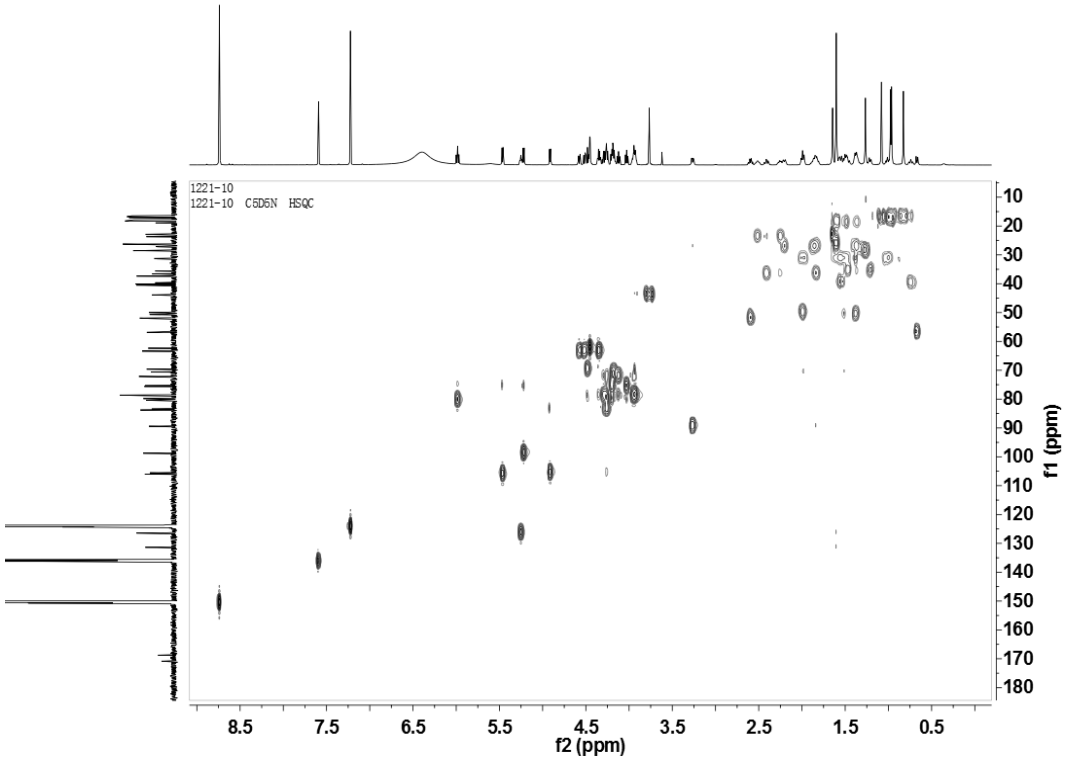


Figure S57. HSQC spectrum of compound **7.**

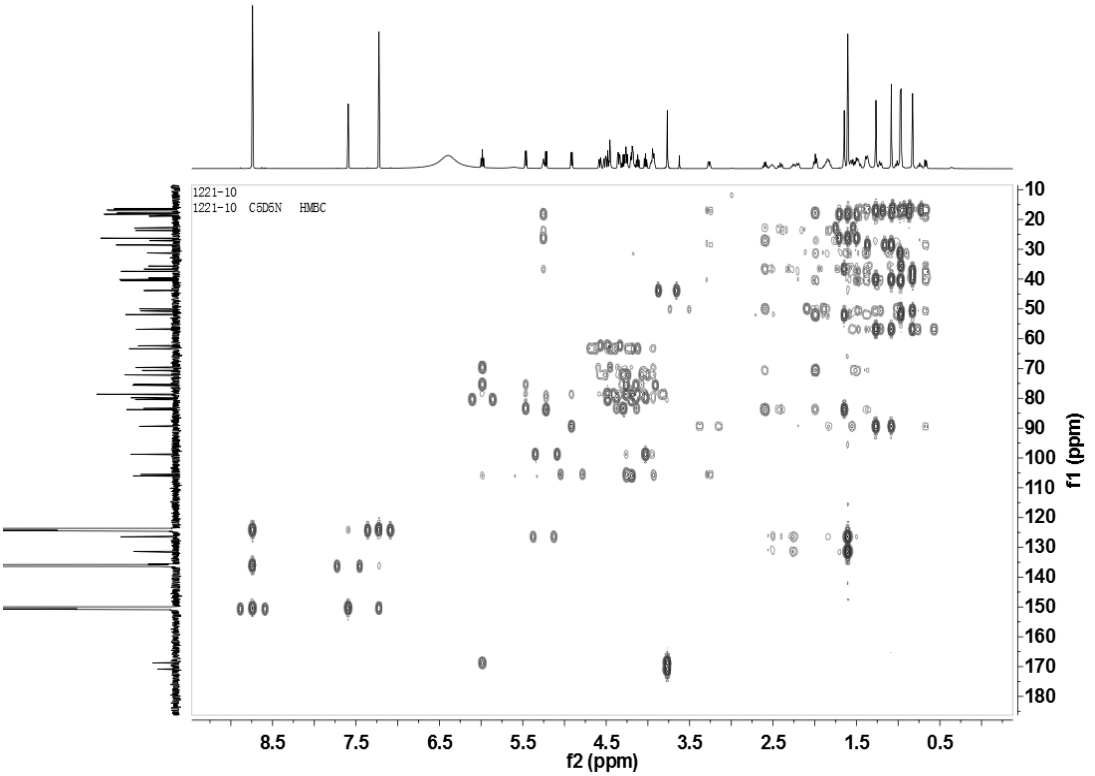


Figure S58. HMBC spectrum of compound **7.**

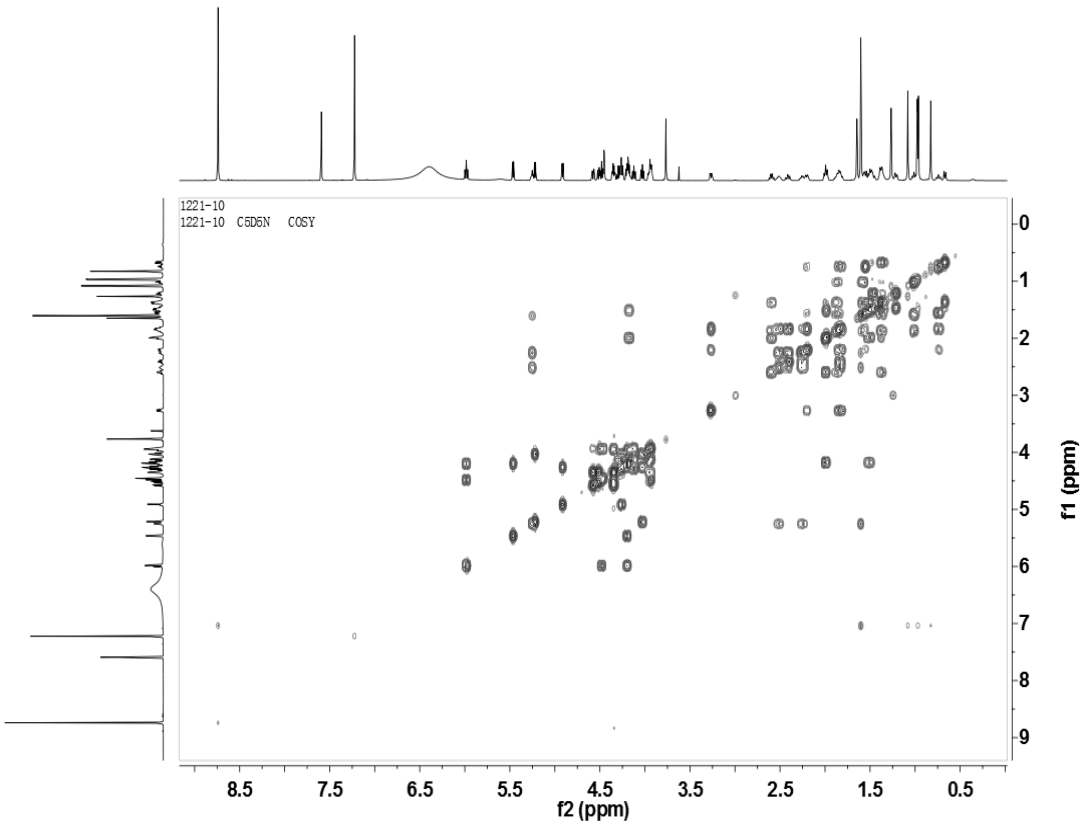


Figure S59. $^{1}$H-$^{1}$H COSY spectrum of compound **7.**

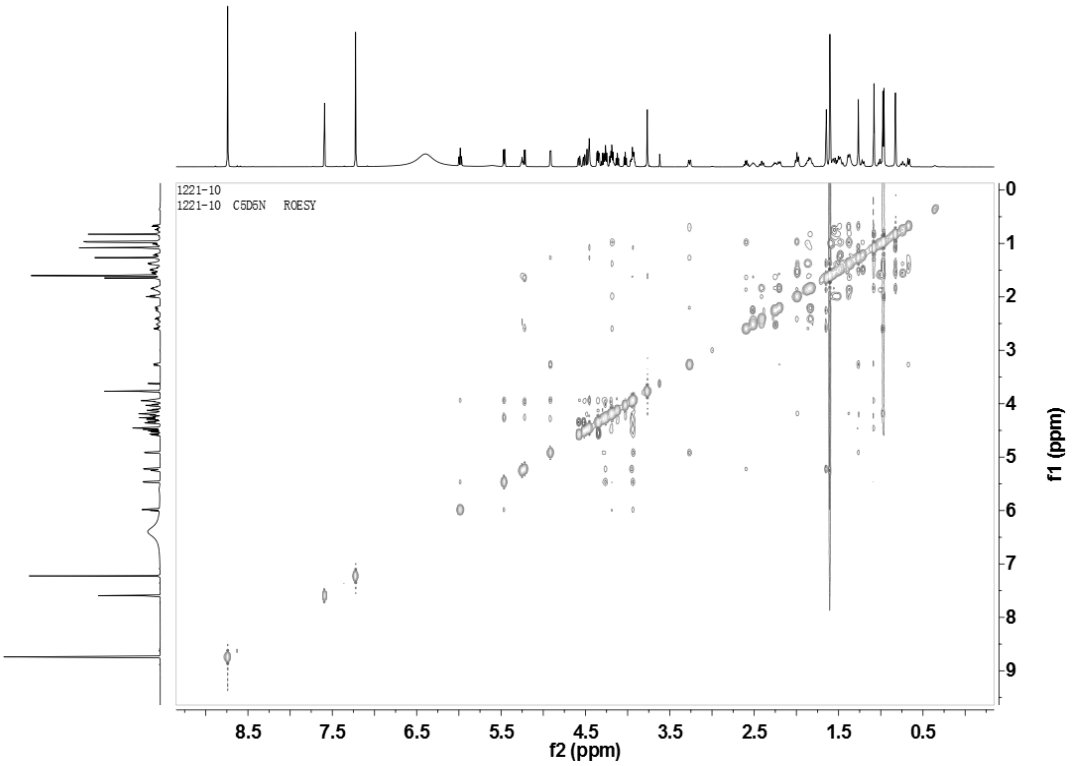


Figure S60. ROESY spectrum of compound **7.**

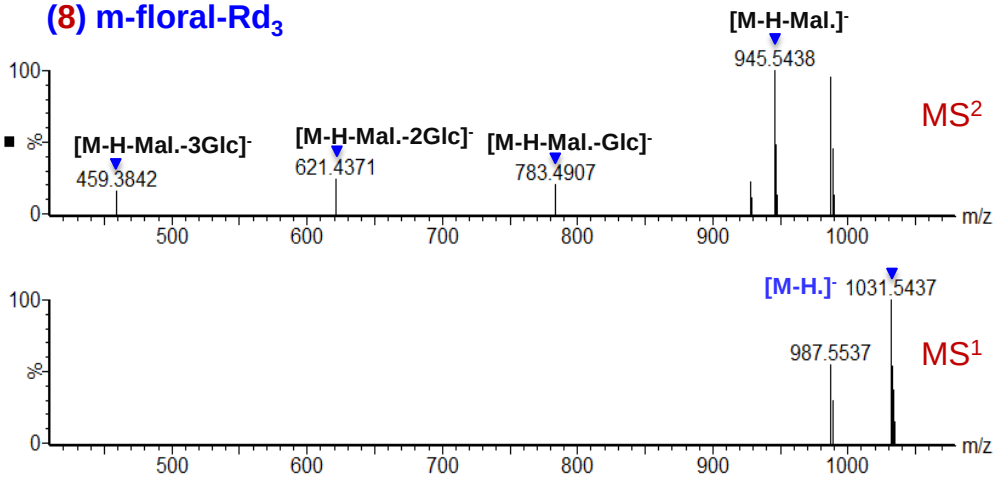


Figure S61. HRESIMS spectrum of compound **8.**

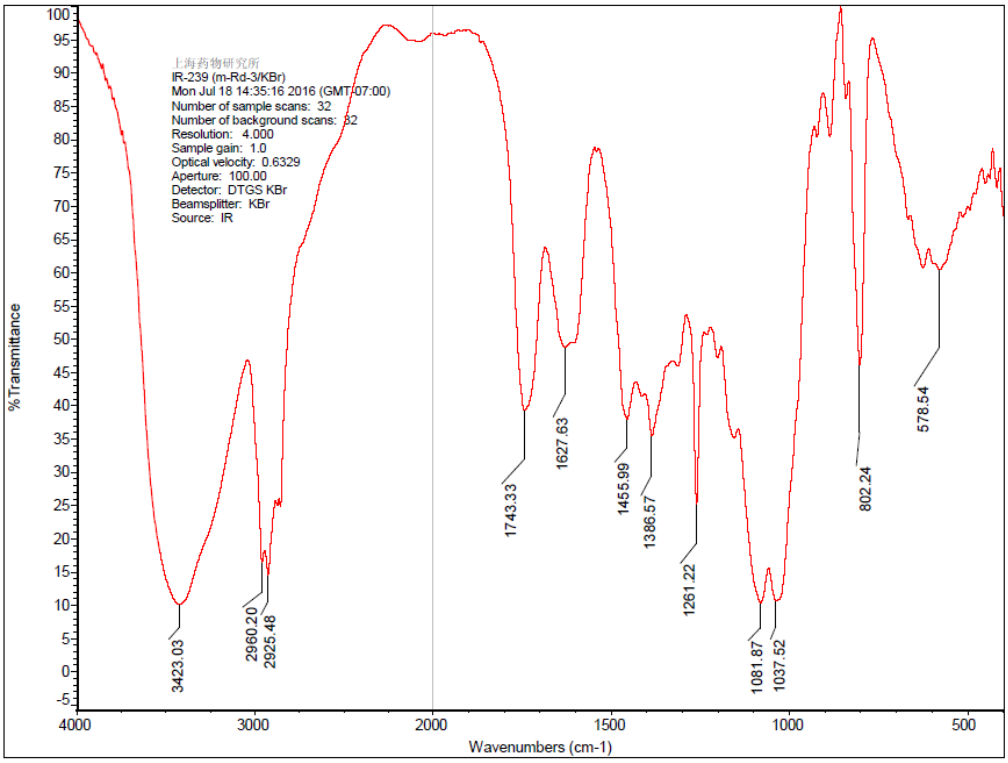


Figure S62. IR spectrum of compound **8.**

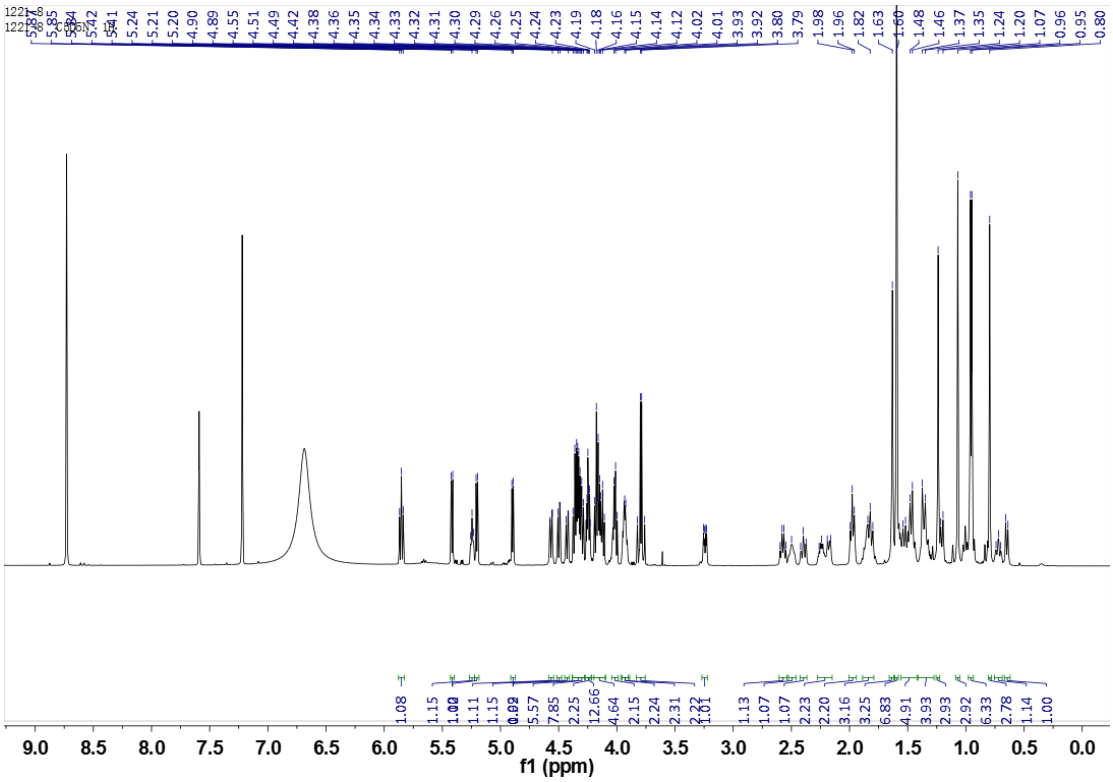


Figure S63. $^{1}$H NMR spectrum of compound **8.**

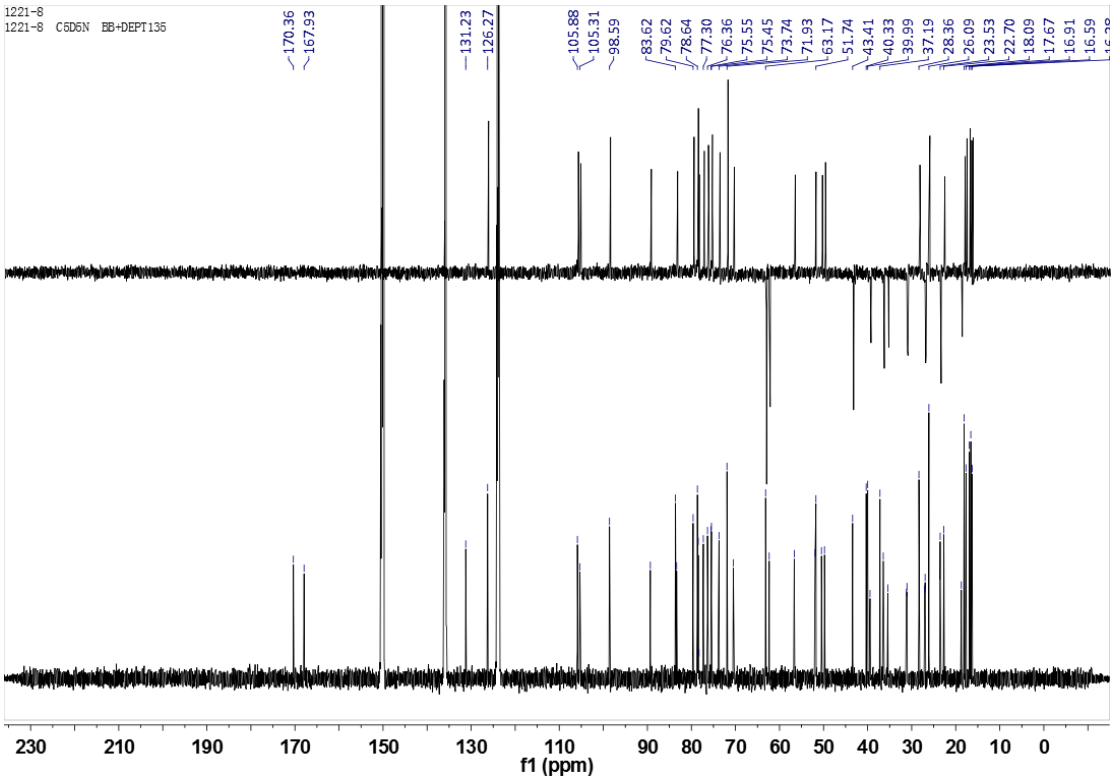


Figure S64. $^{13}C$ NMR and DEPT-135 spectra of compound **8.**

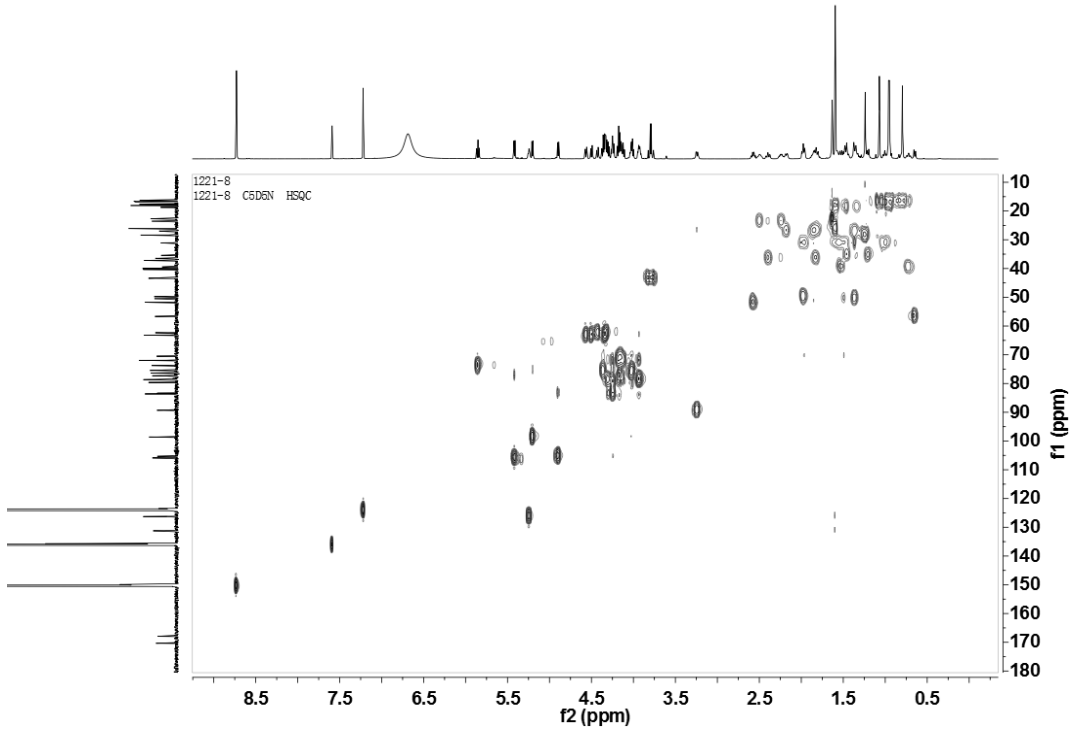


Figure S65. HSQC spectrum of compound **8.**

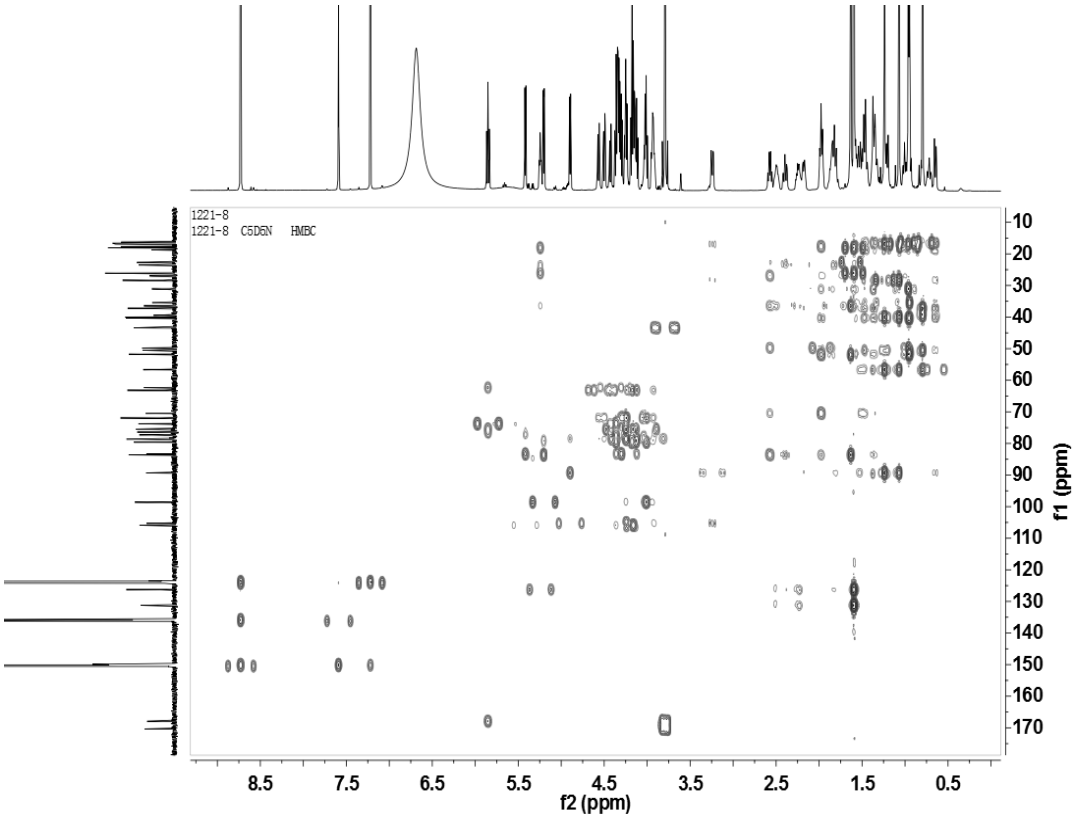


Figure S66. HMBC spectrum of compound **8.**

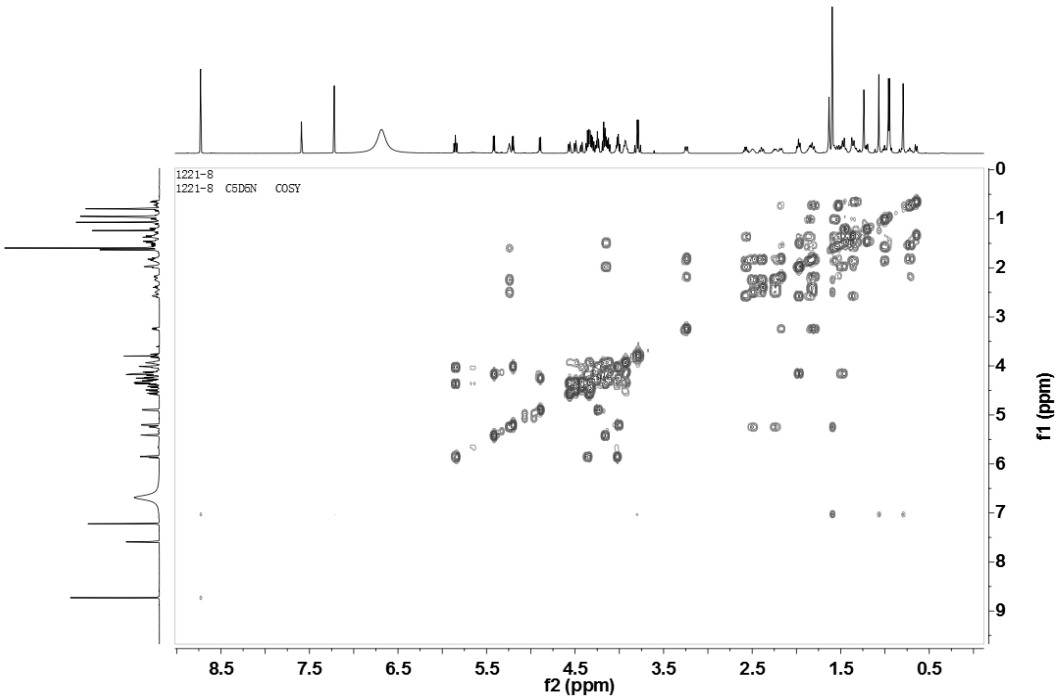


Figure S67. $^{1}$H-$^{1}$H COSY spectrum of compound **8.**

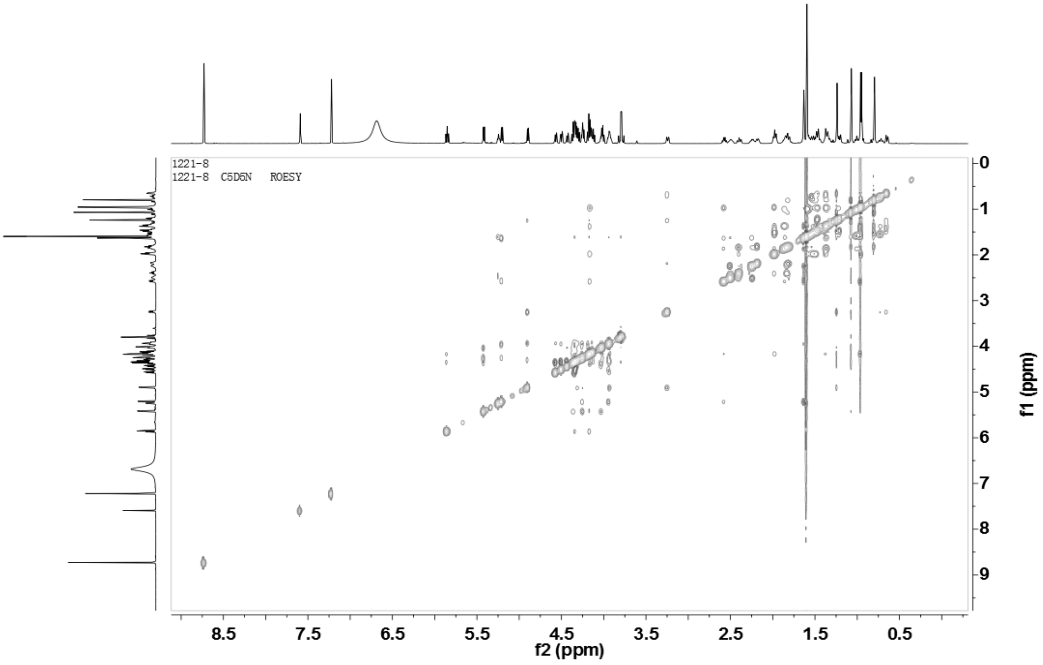


Figure S68. ROESY spectrum of compound **8.**

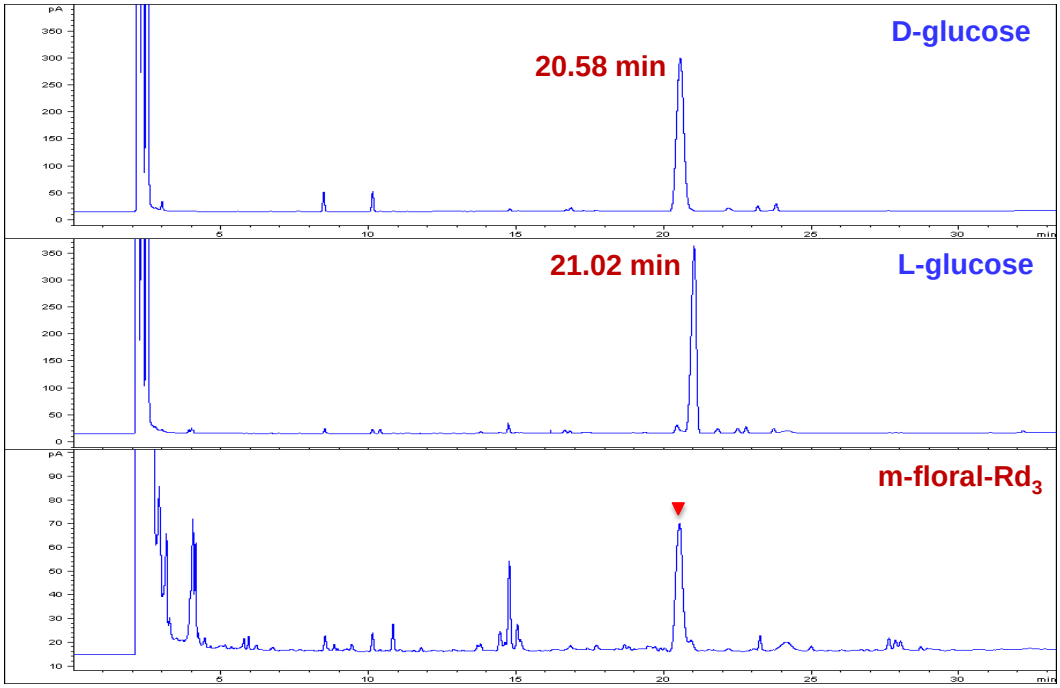


Figure S69. The GC chromatograms of compound **8** after acidic hydrolysis.

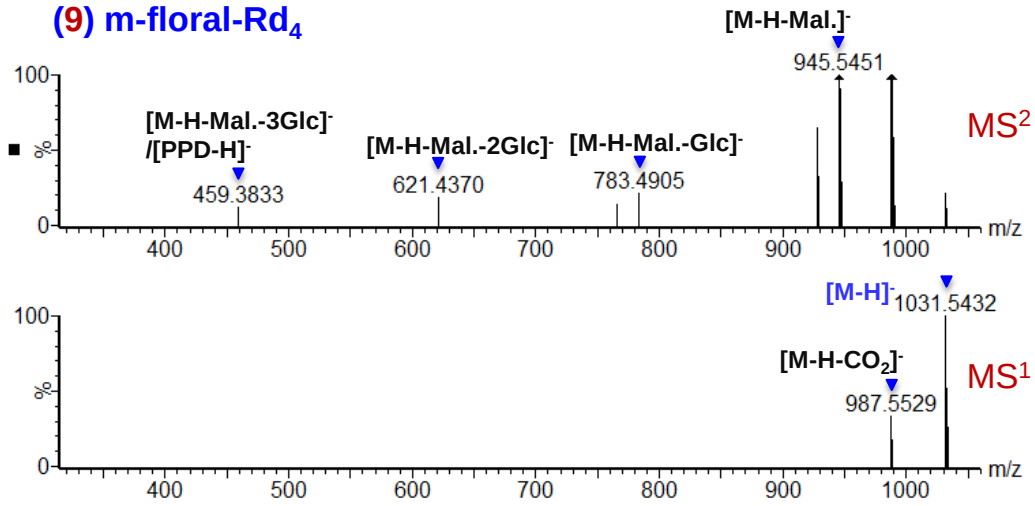


Figure S70. HRESIMS spectrum of compound **9.**

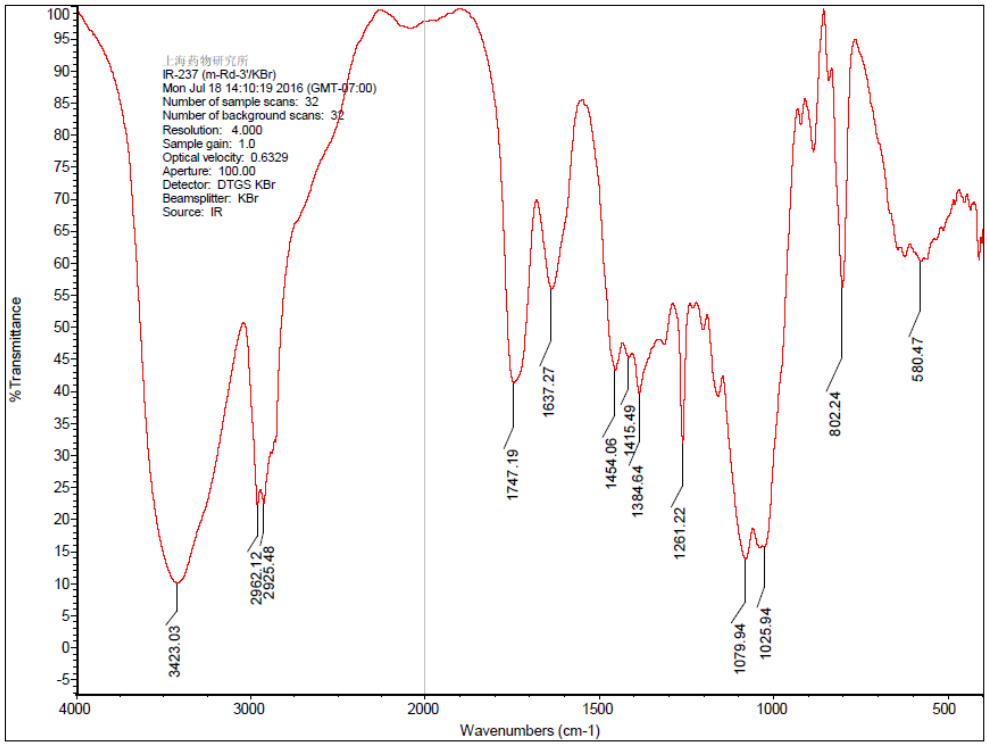


Figure S71. IR spectrum of compound **9.**

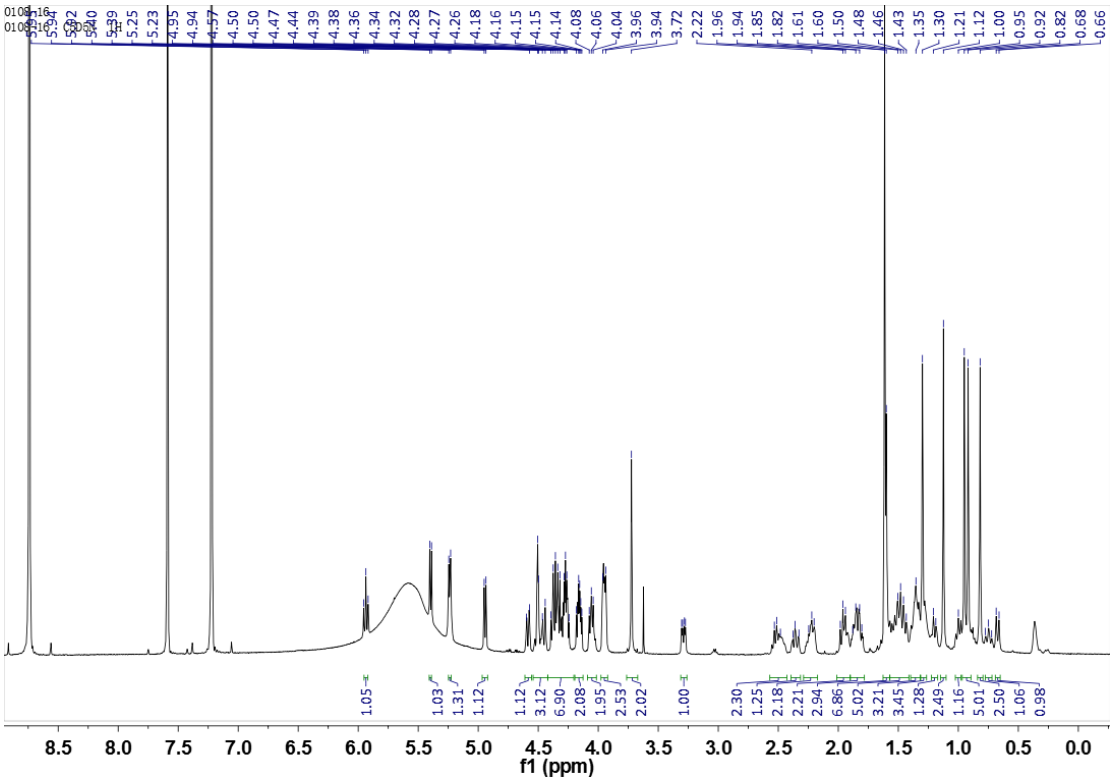

Figure S72. $^{1}$H NMR spectrum of compound **9.**

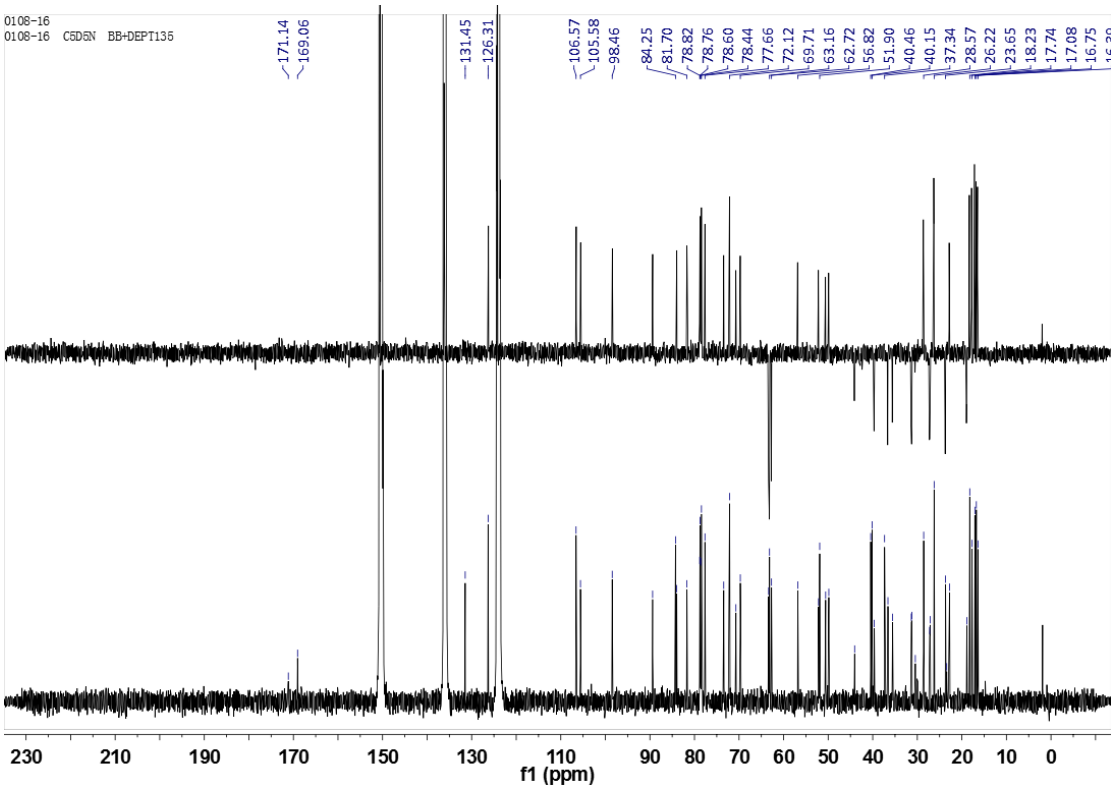

Figure S73. $^{13}$C NMR and DEPT-135 spectra of compound **9.**

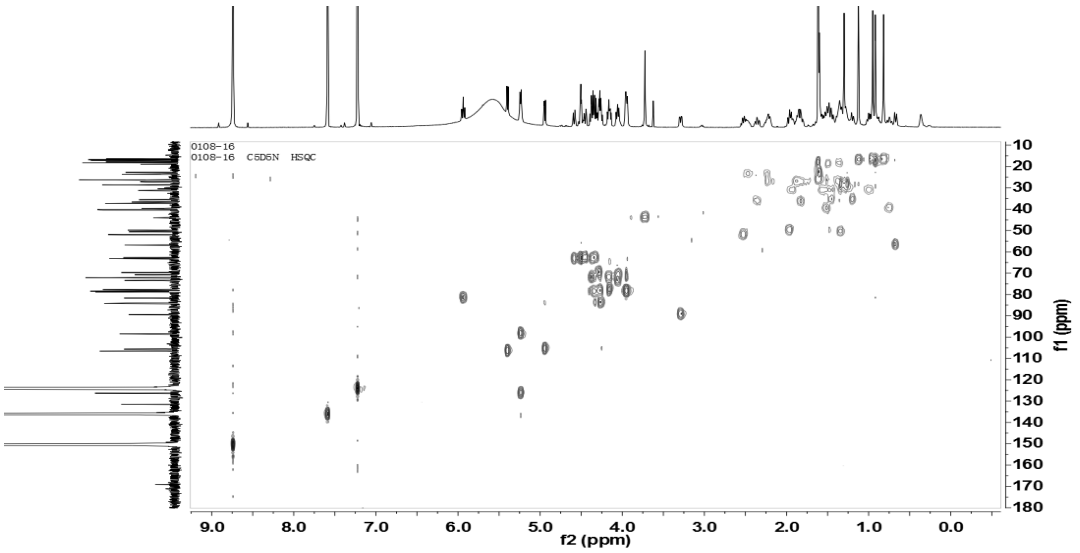


Figure S74. HSQC spectrum of compound **9.**

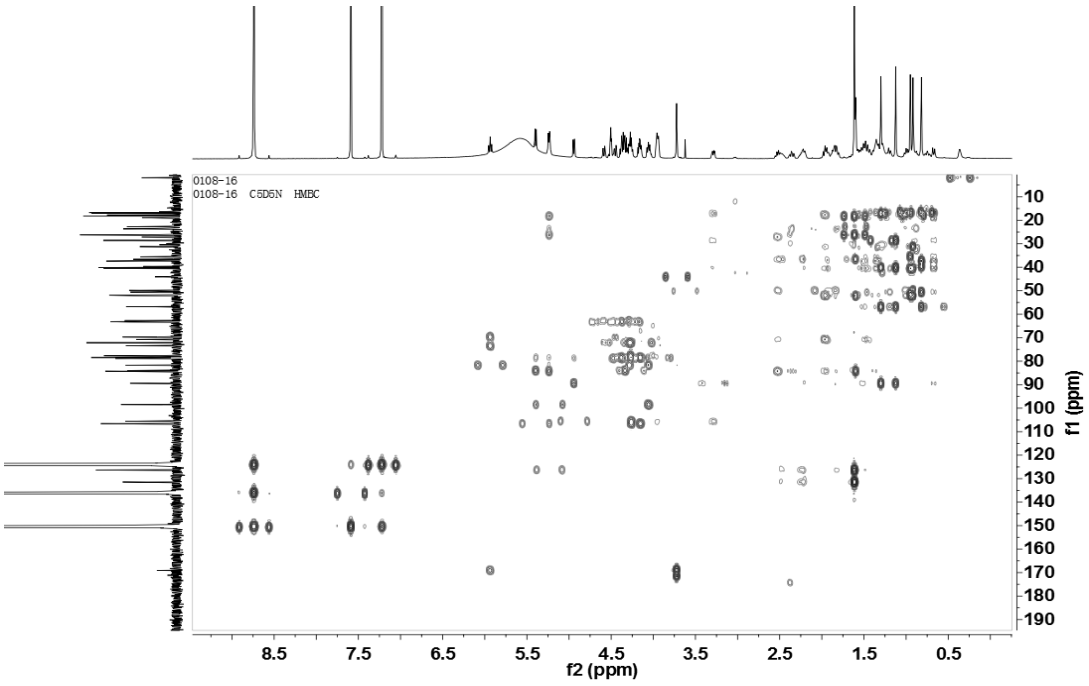


Figure S75. HMBC spectrum of compound **9.**

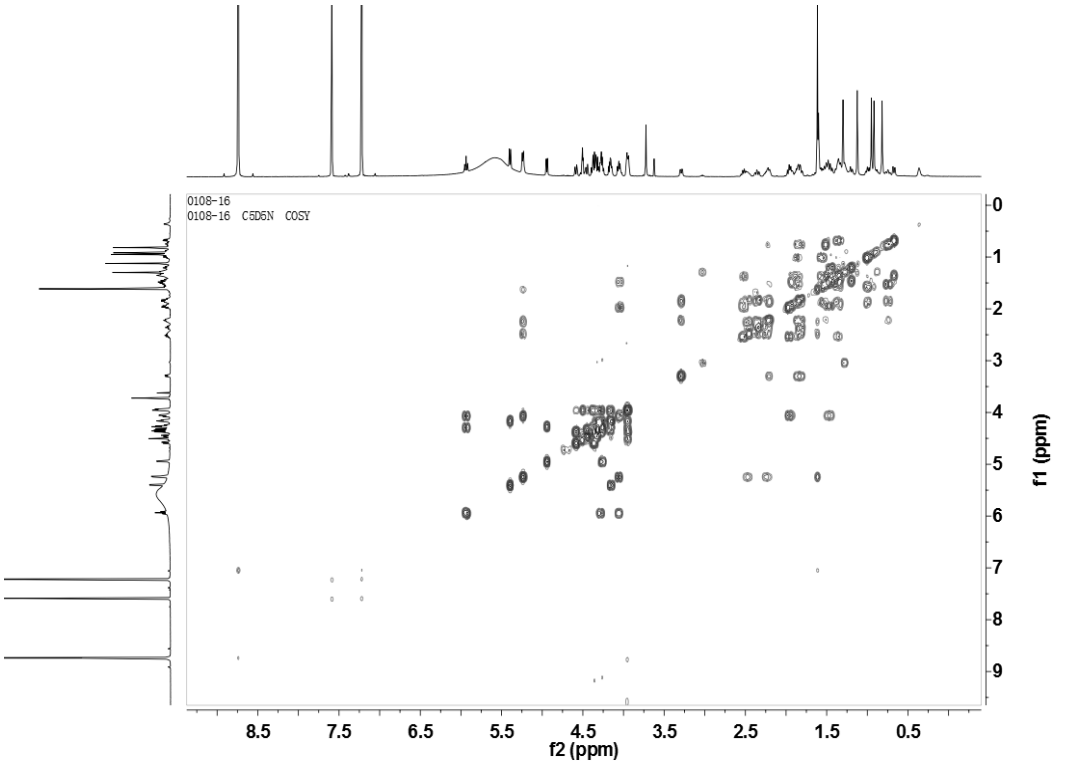


Figure S76. $^{1}$H-$^{1}$H COSY spectrum of compound **9.**

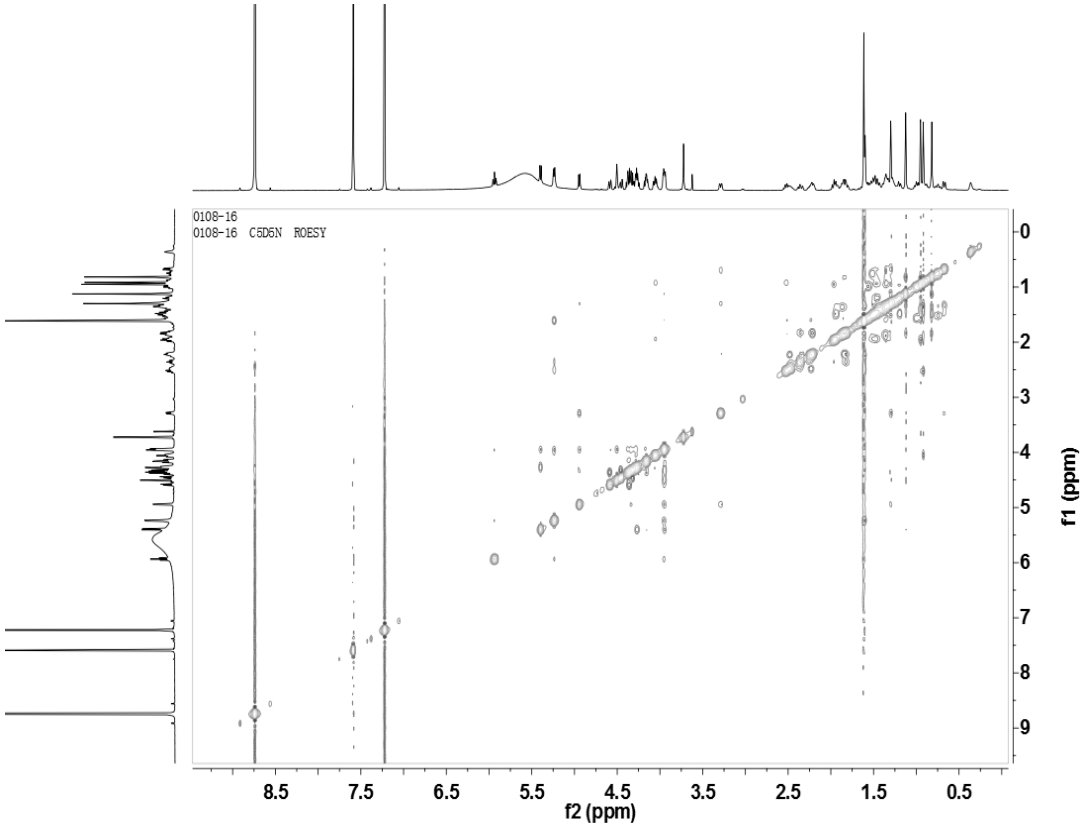


Figure S77. ROESY spectrum of compound **9.**

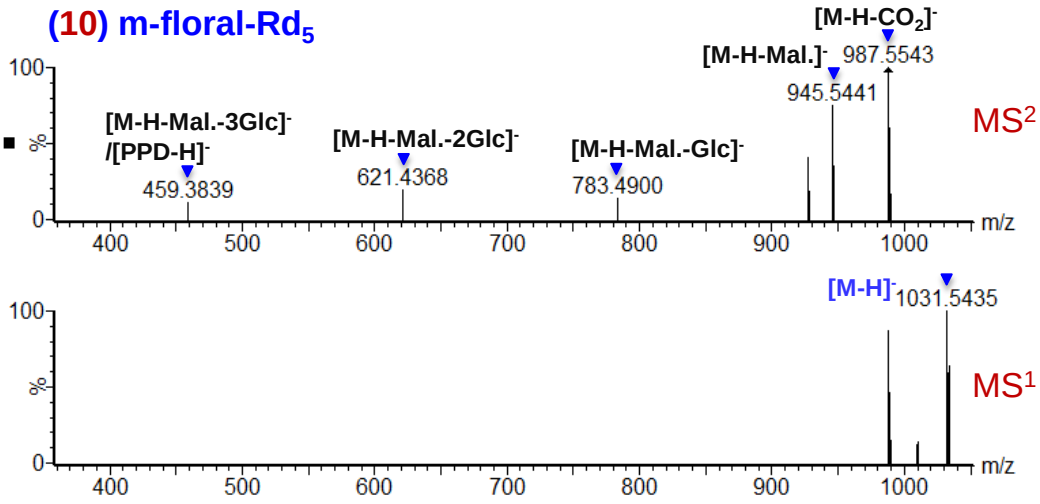


Figure S78. HRESIMS spectrum of compound **10.**

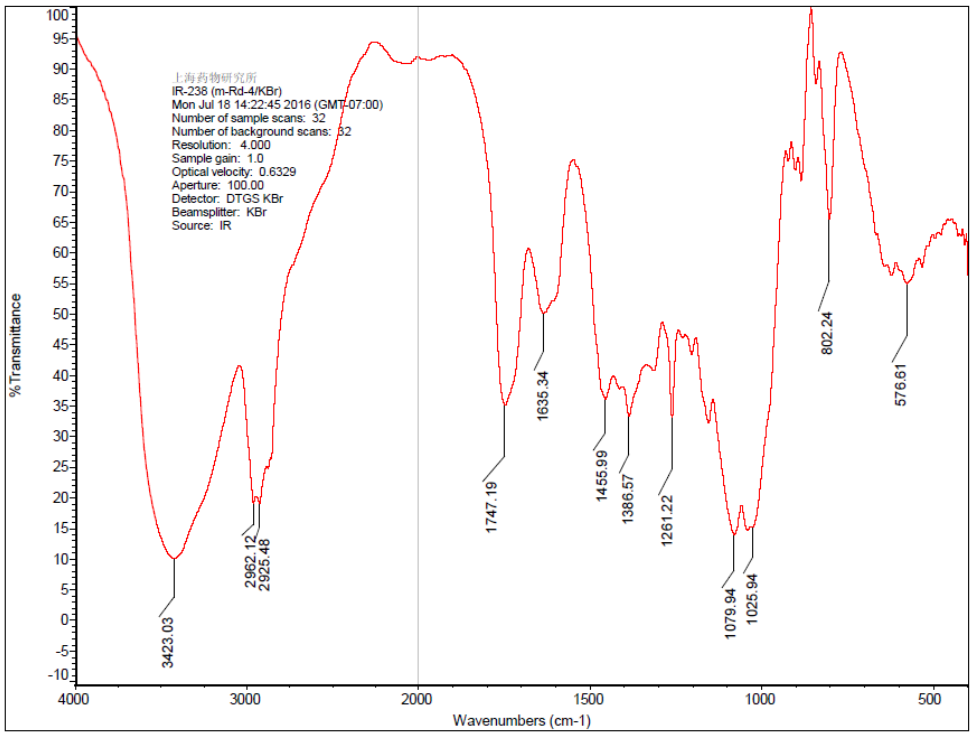


Figure S79. IR spectrum of compound **10.**

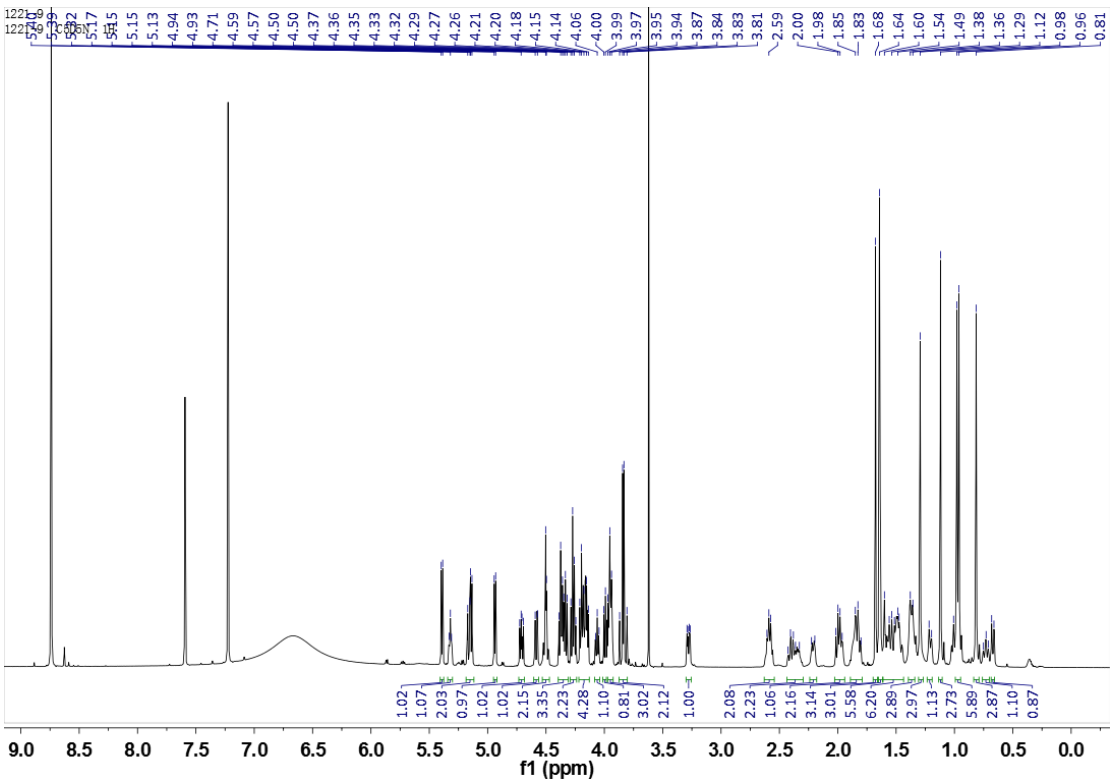


Figure S80. $^{1}$H NMR spectrum of compound **10.**

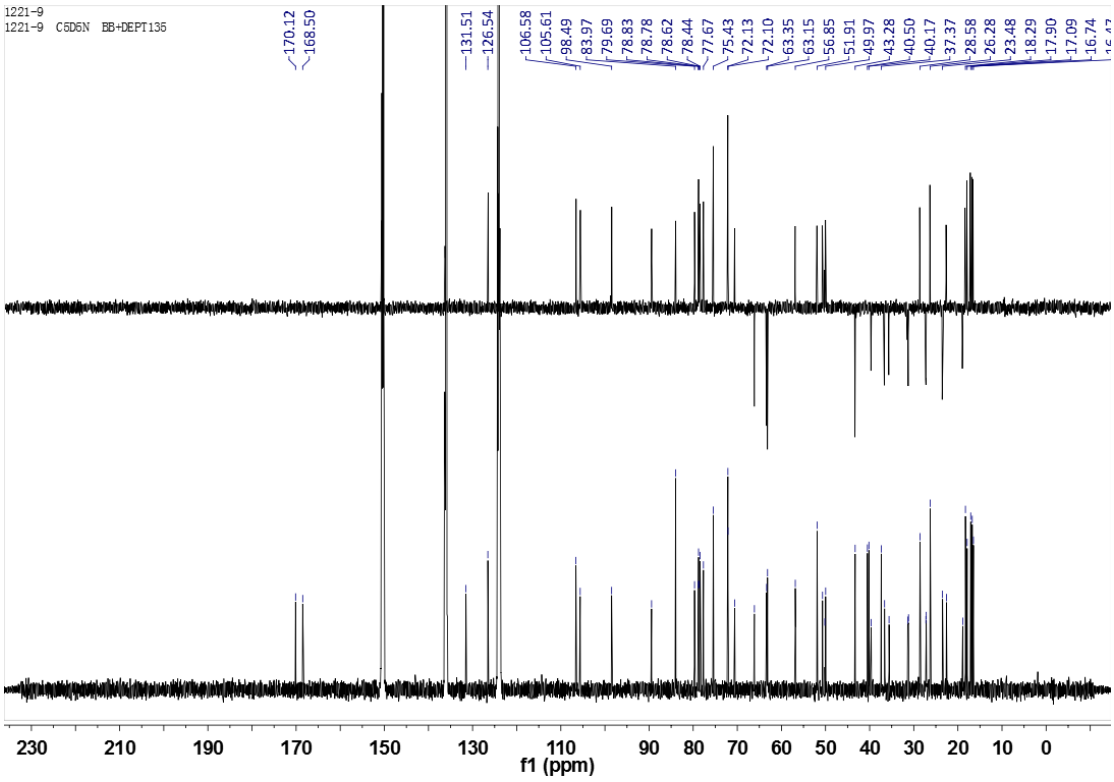


Figure S81. $^{13}$C NMR and DEPT-135 spectra of compound **10.**

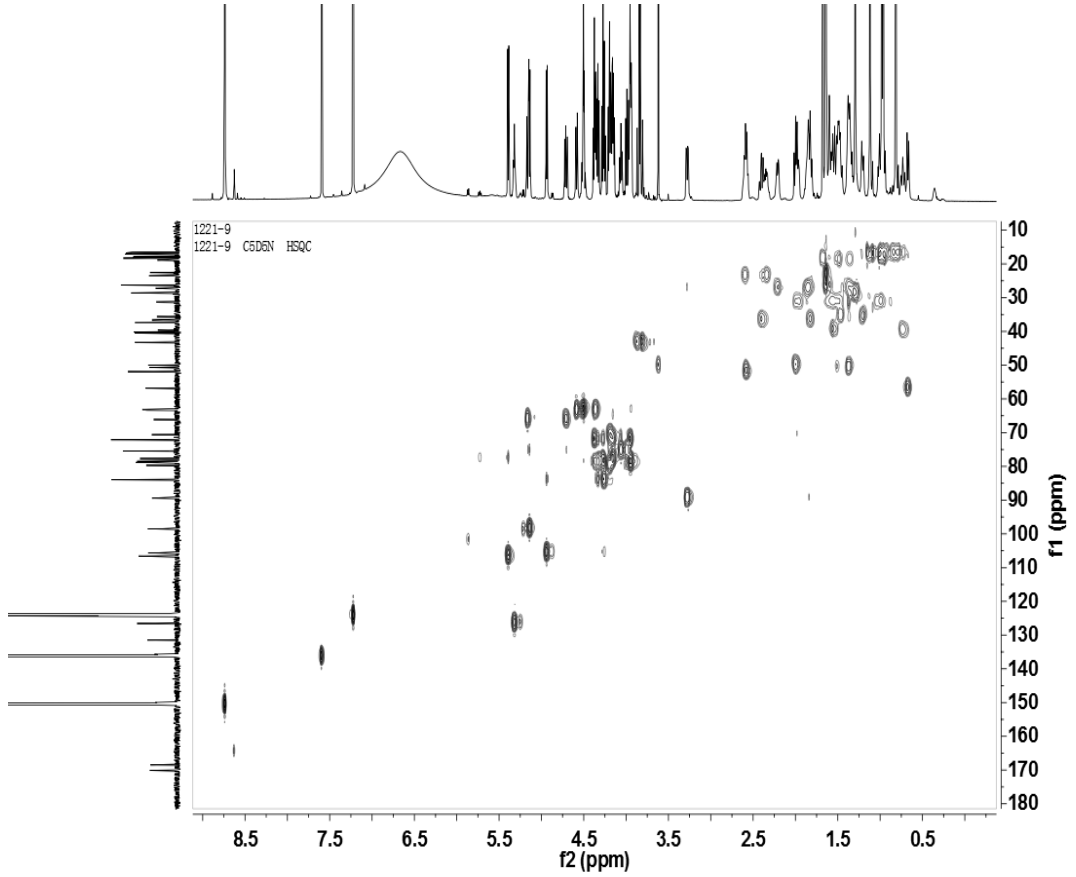


Figure S82. HSQC spectrum of compound **10.**

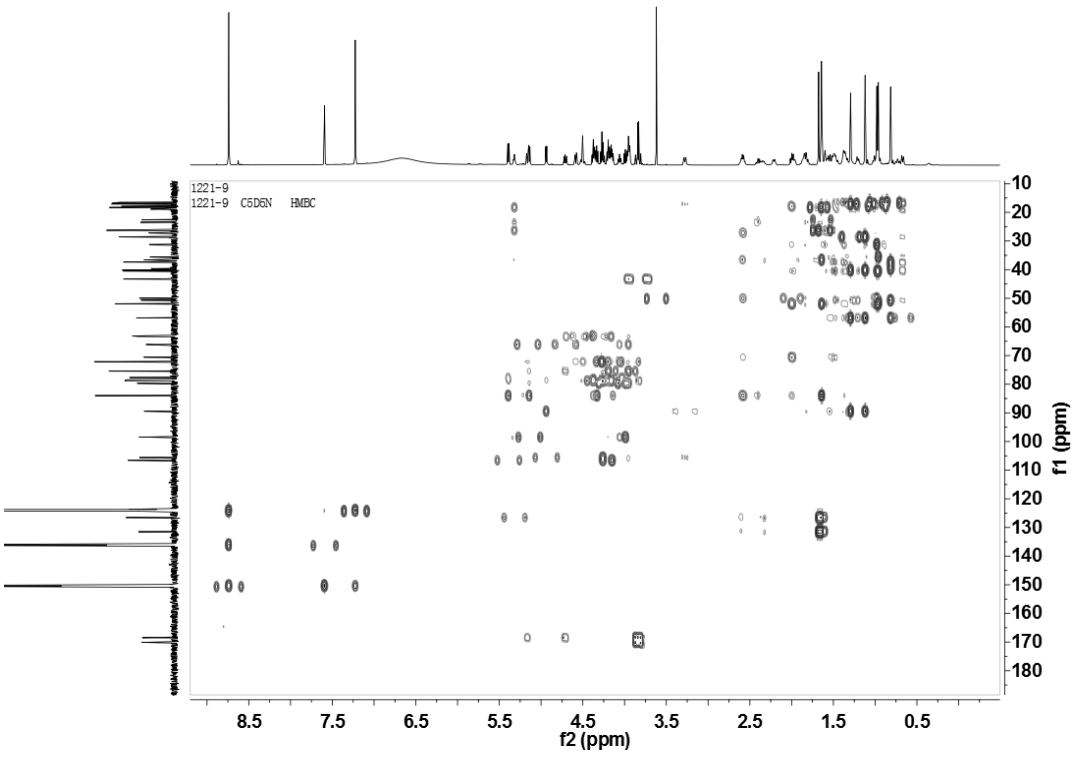


Figure S83. HMBC spectrum of compound **10.**

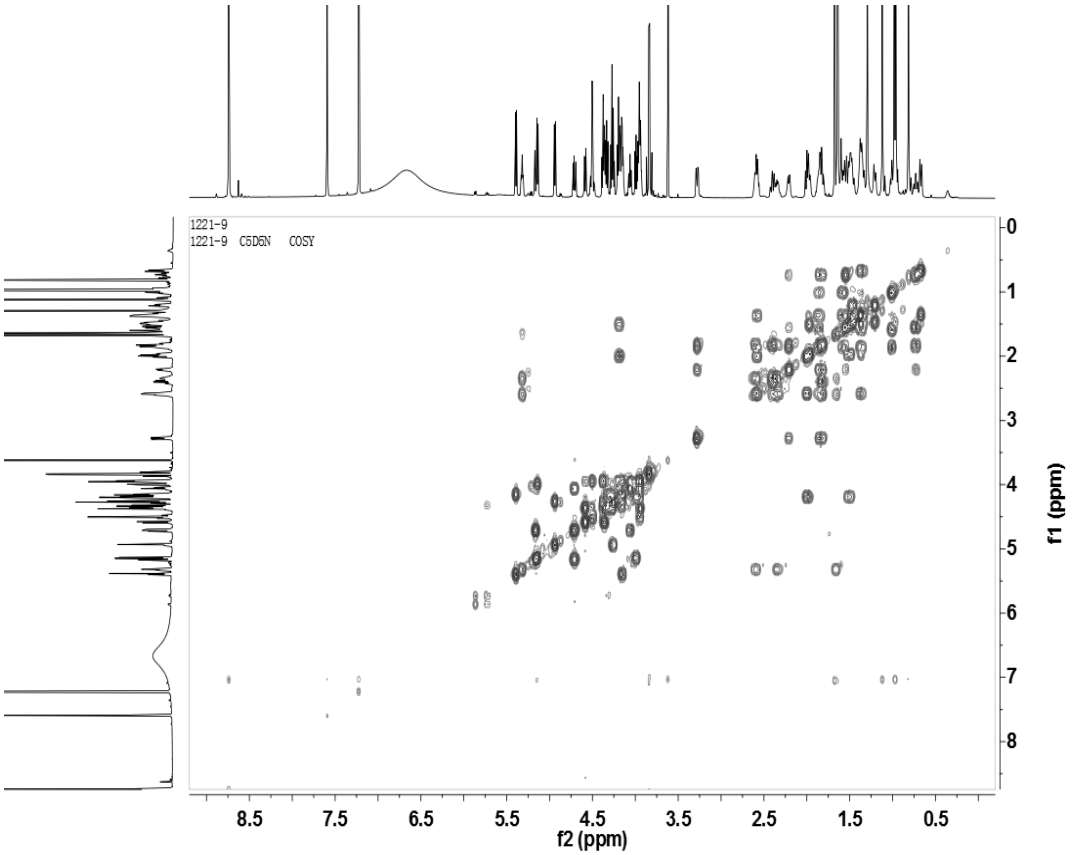


Figure S84. $^{1}$H-$^{1}$H COSY spectrum of compound **10.**

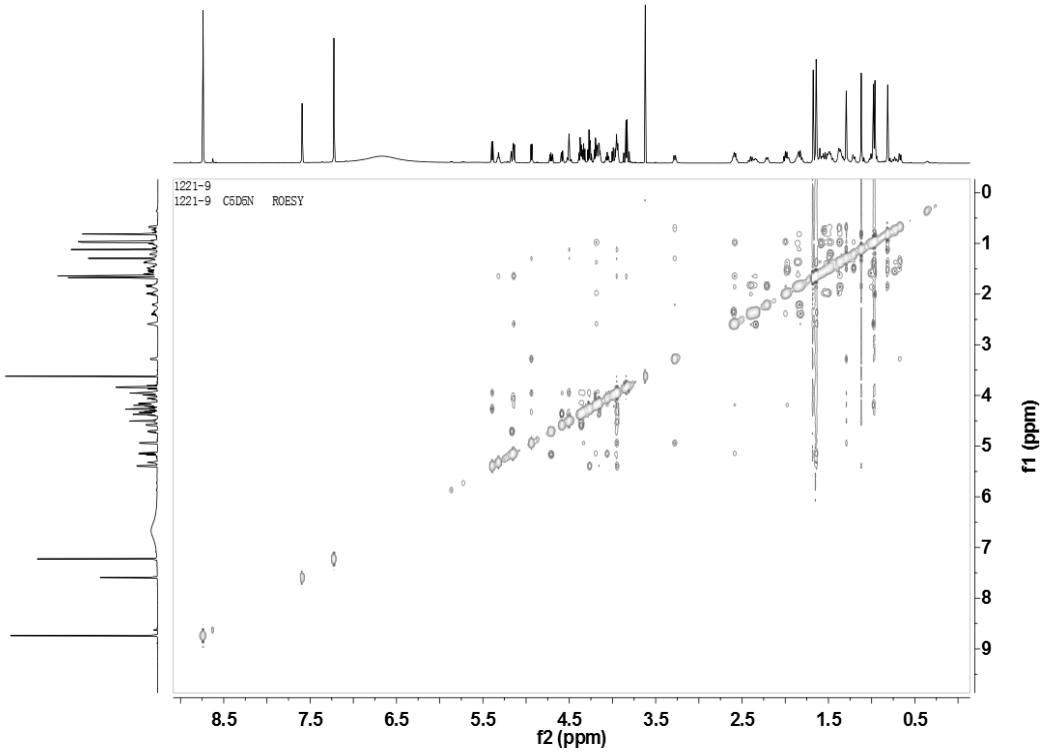


Figure S85. ROESY spectrum of compound **10.**

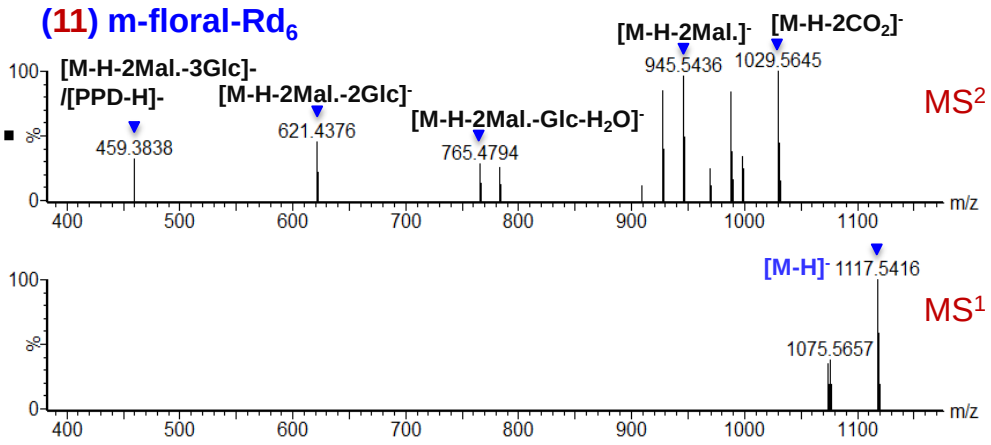


Figure S86. HRESIMS spectrum of compound **11.**

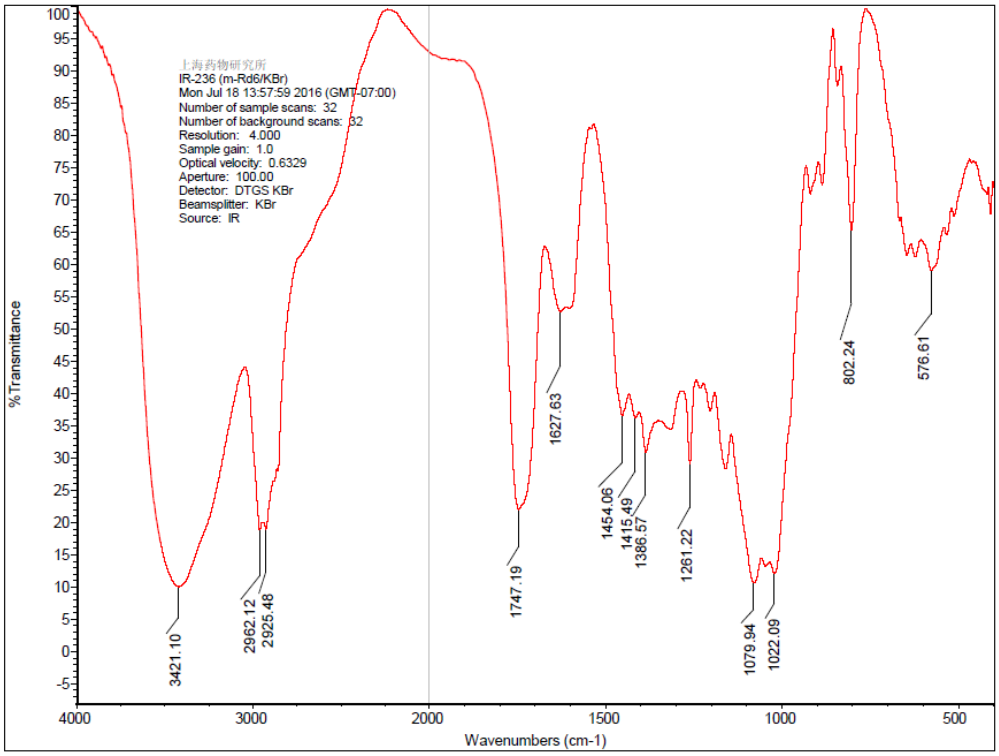


Figure S87. IR spectrum of compound **11.**

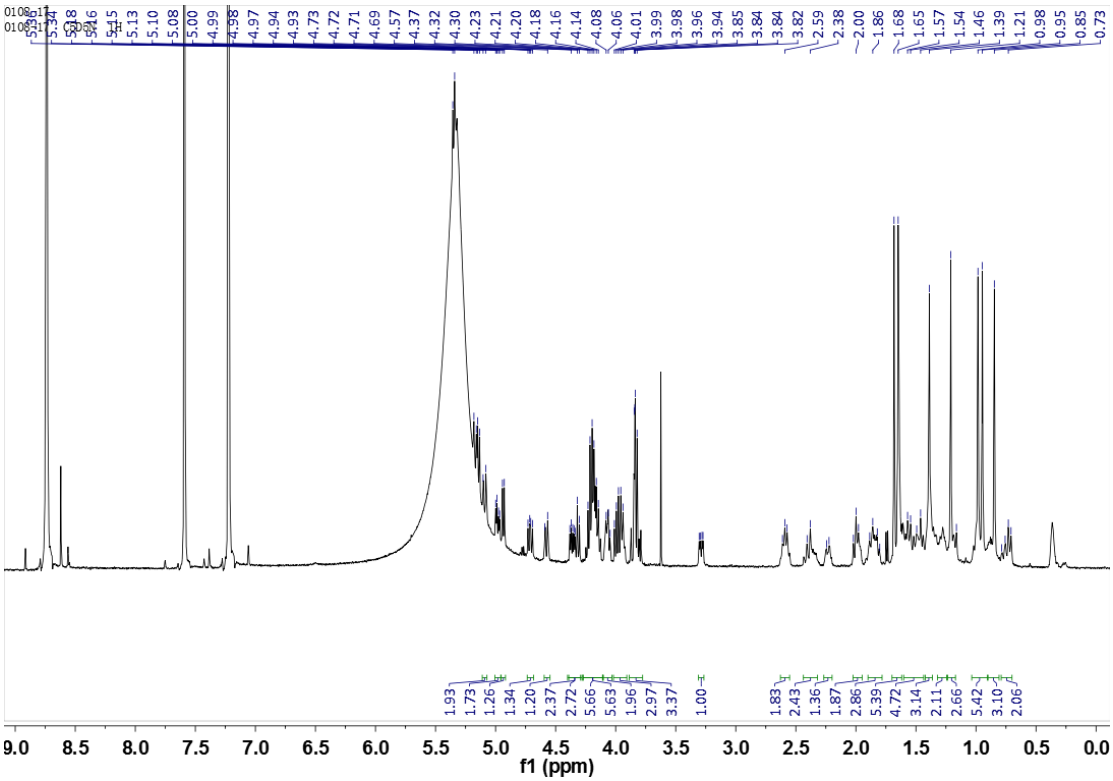


Figure S88. $^{1}$H NMR spectrum of compound **11.**

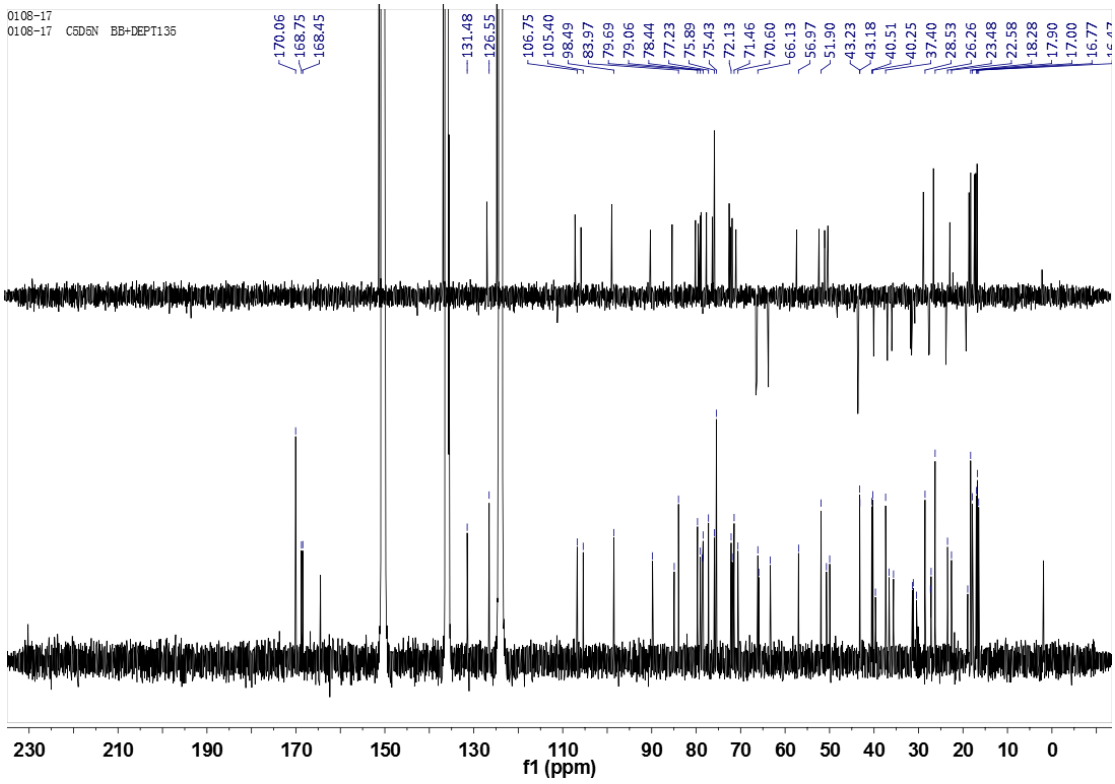


Figure S89. $^{13}$C NMR spectrum of compound **11.**

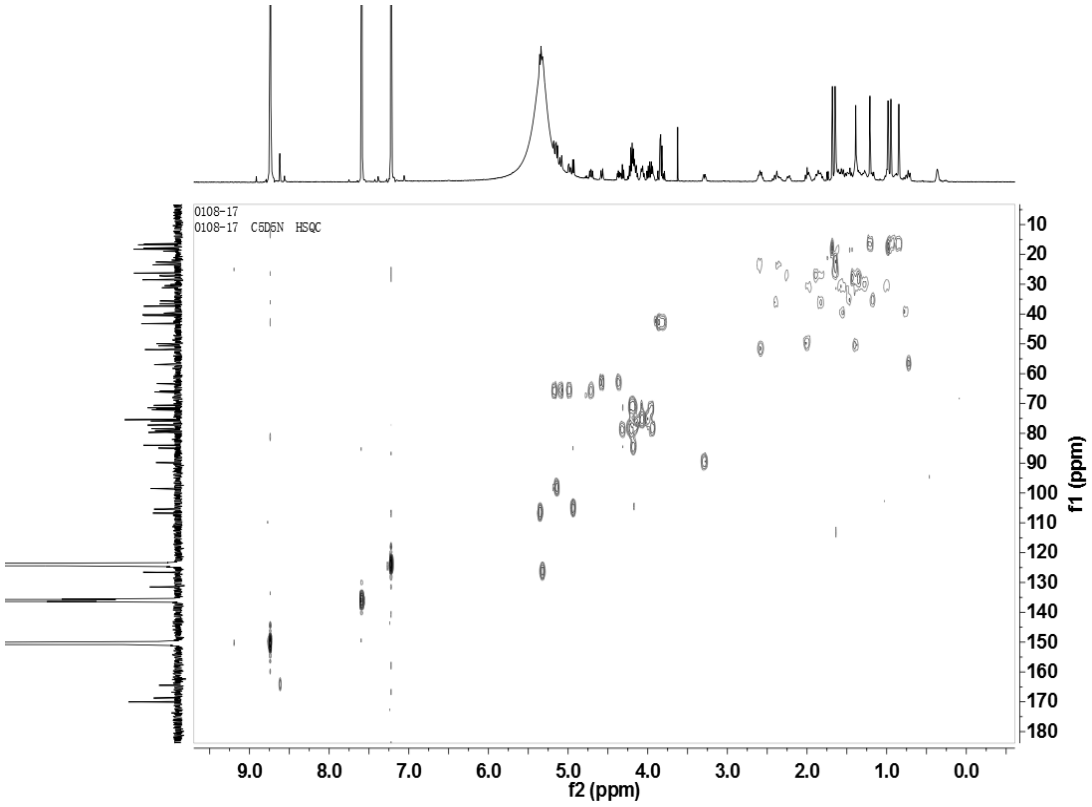


Figure S90. HSQC spectrum of compound **11.**

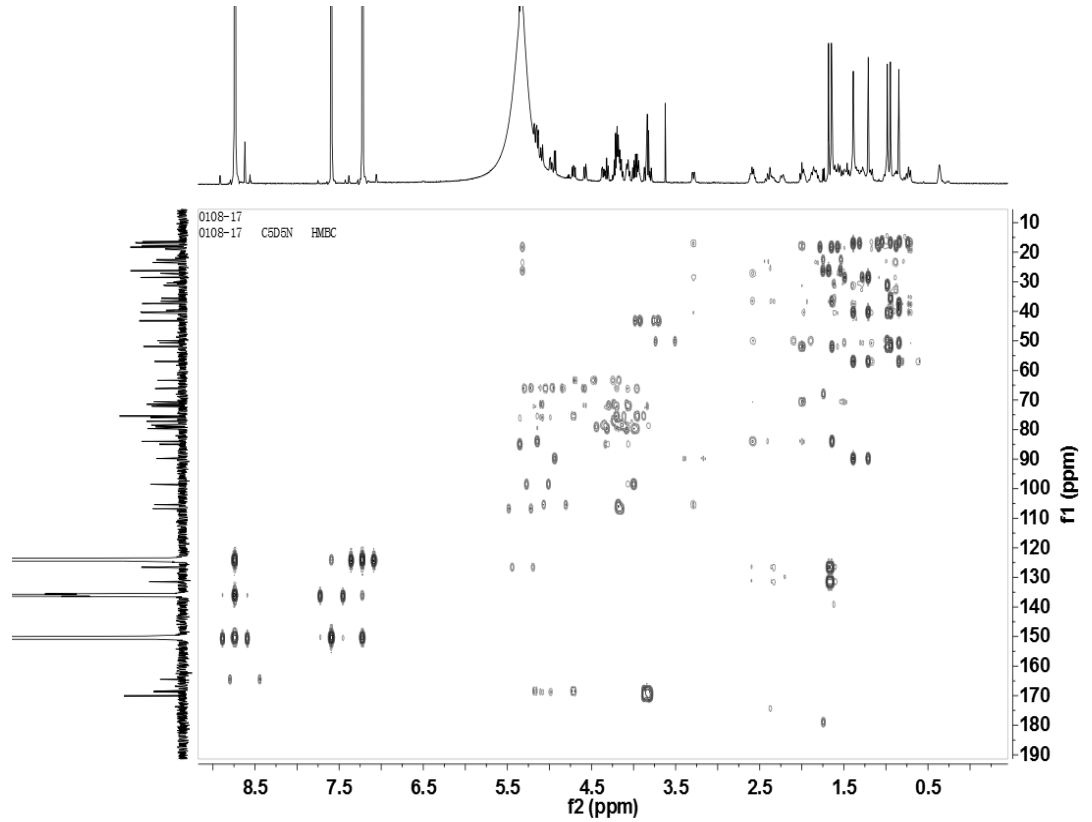


Figure S91. HMBC spectrum of compound **11.**

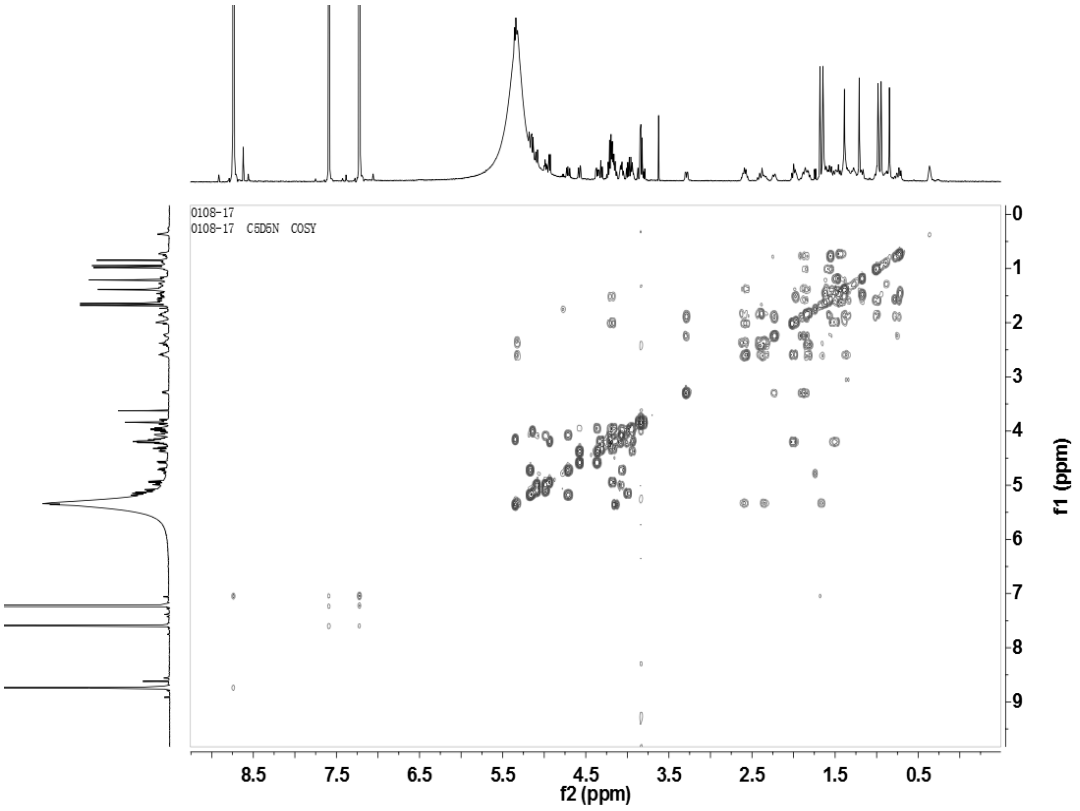


Figure S92. $^{1}$H-$^{1}$H COSY spectrum of compound **11.**

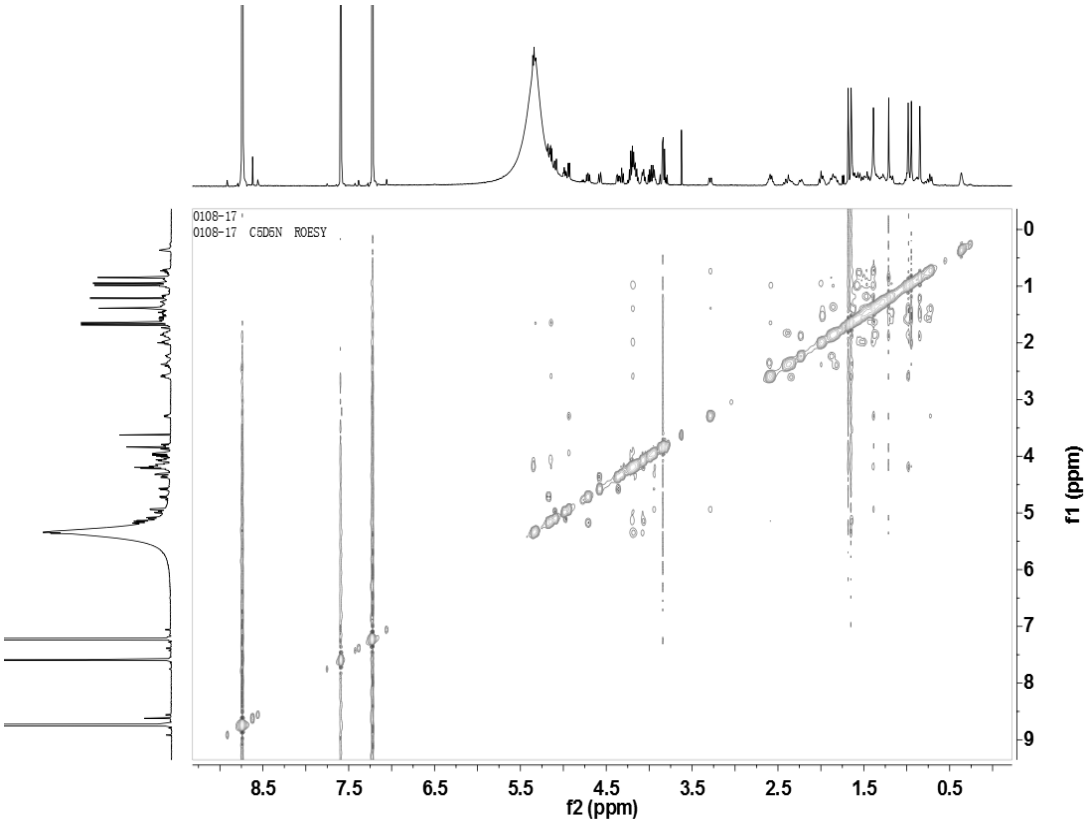


Figure S93. ROESY spectrum of compound **11.**

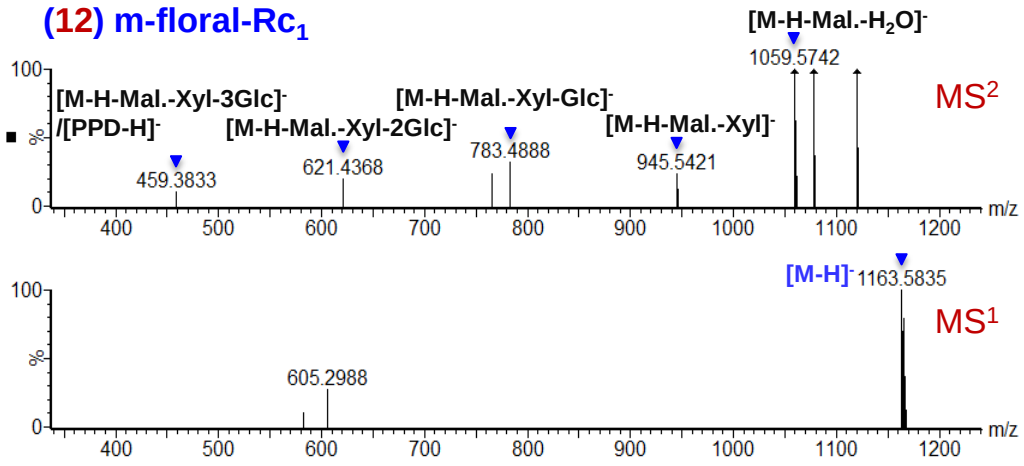


Figure S94. HRESIMS spectrum of compound **12.**

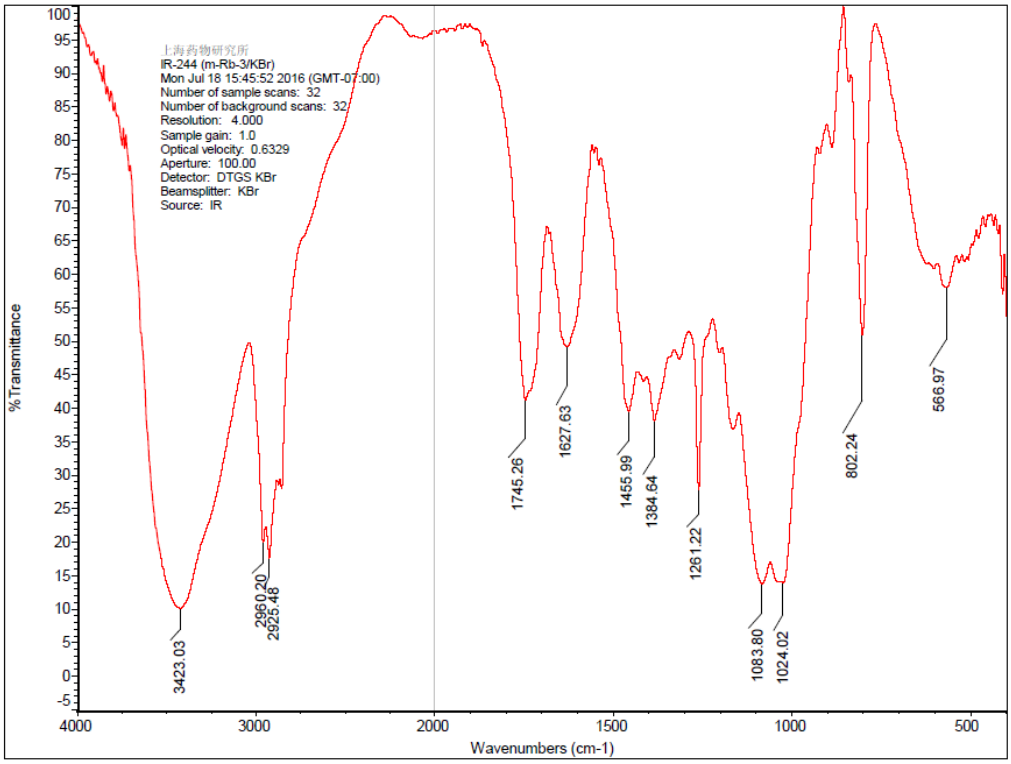


Figure S95. IR spectrum of compound **12.**

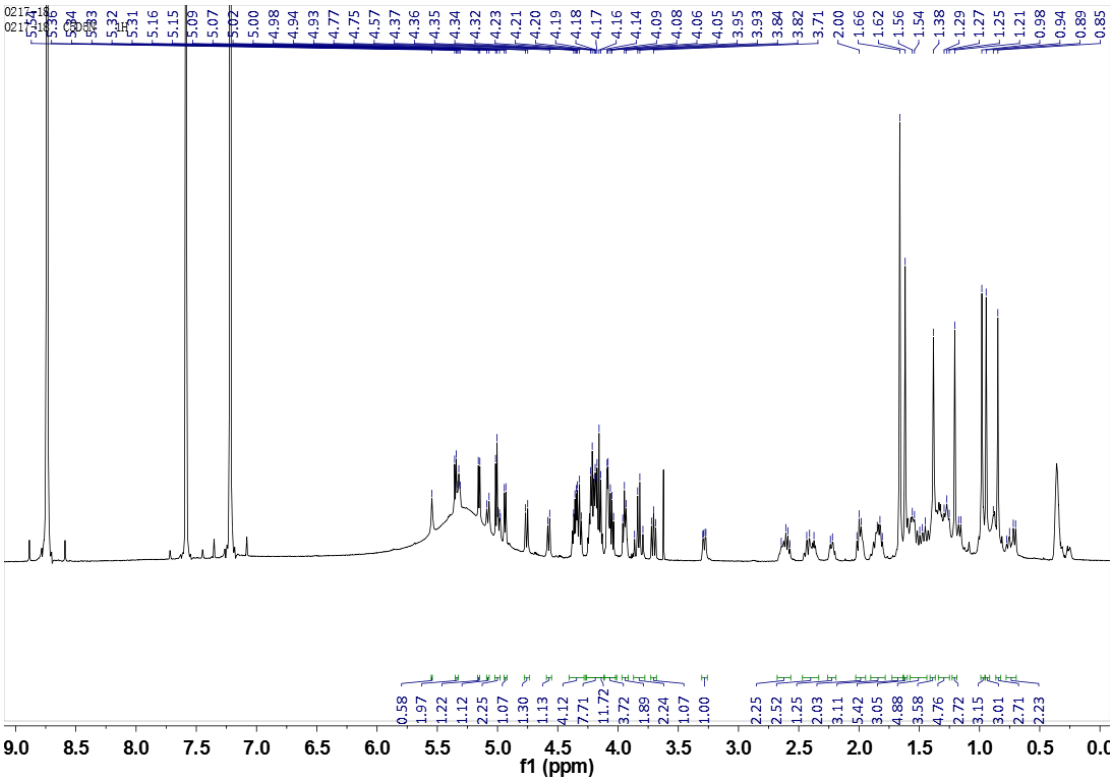


Figure S96. $^{1}$H NMR spectrum of compound **12.**

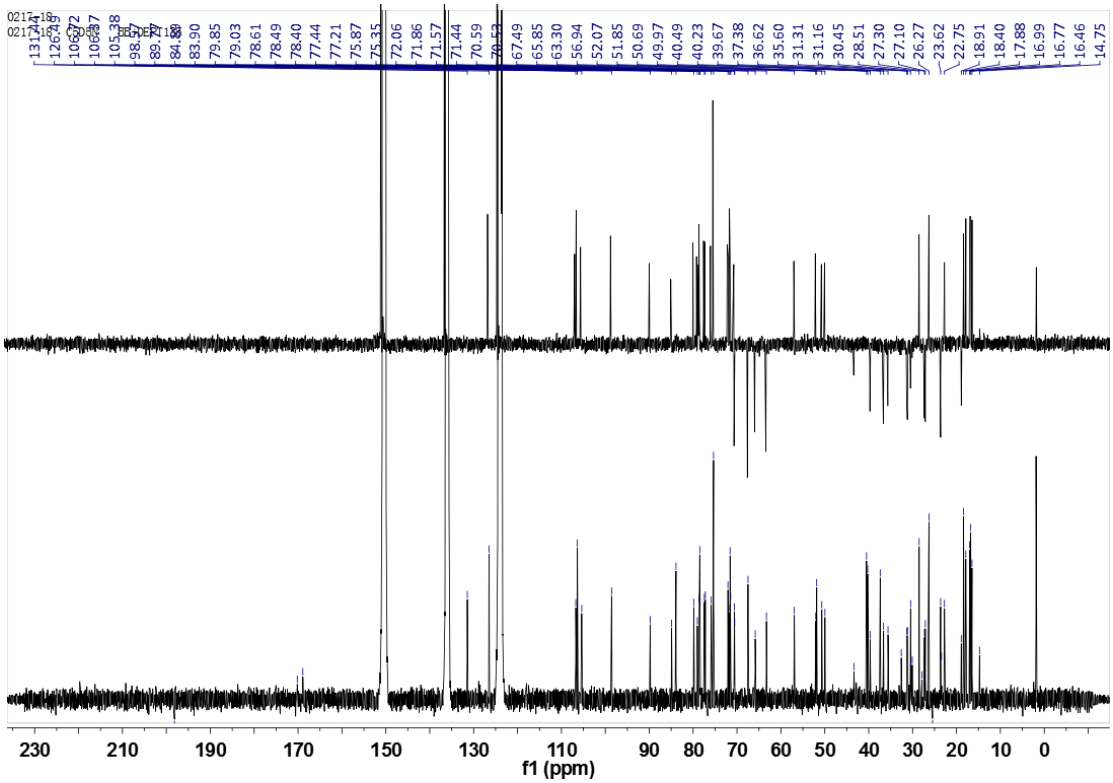


Figure S97. $^{13}$C NMR and DEPT-135 spectrum of compound **12.**

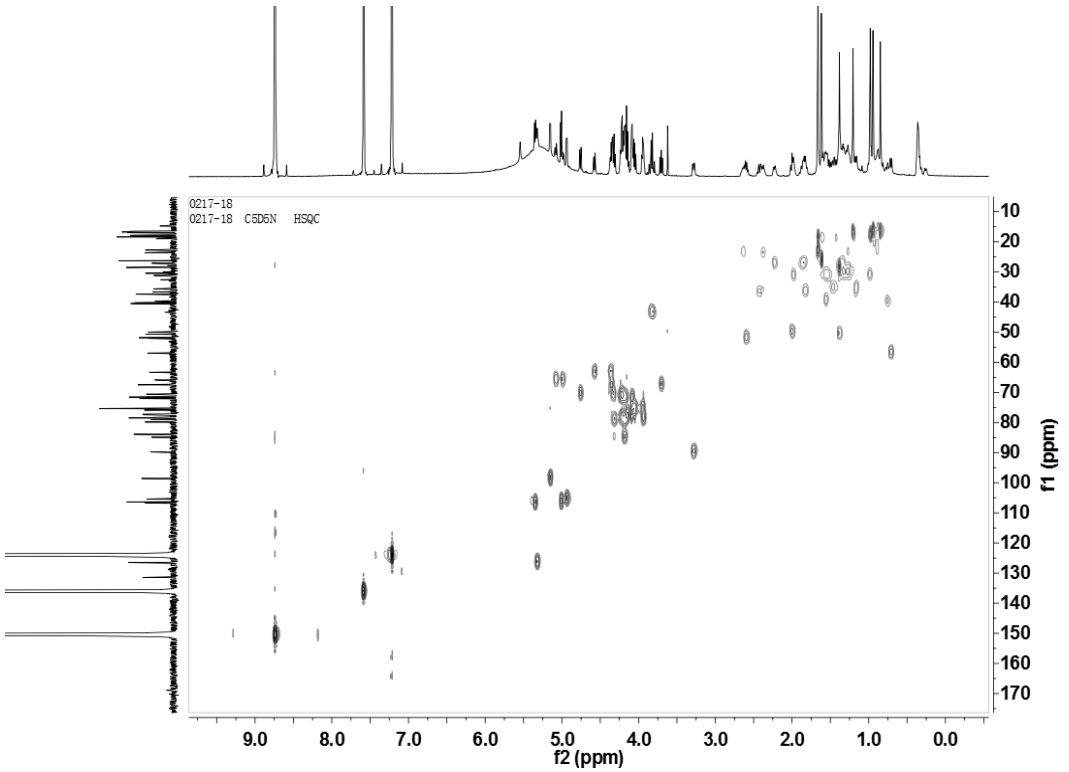


Figure S98. HSQC spectrum of compound **12.**

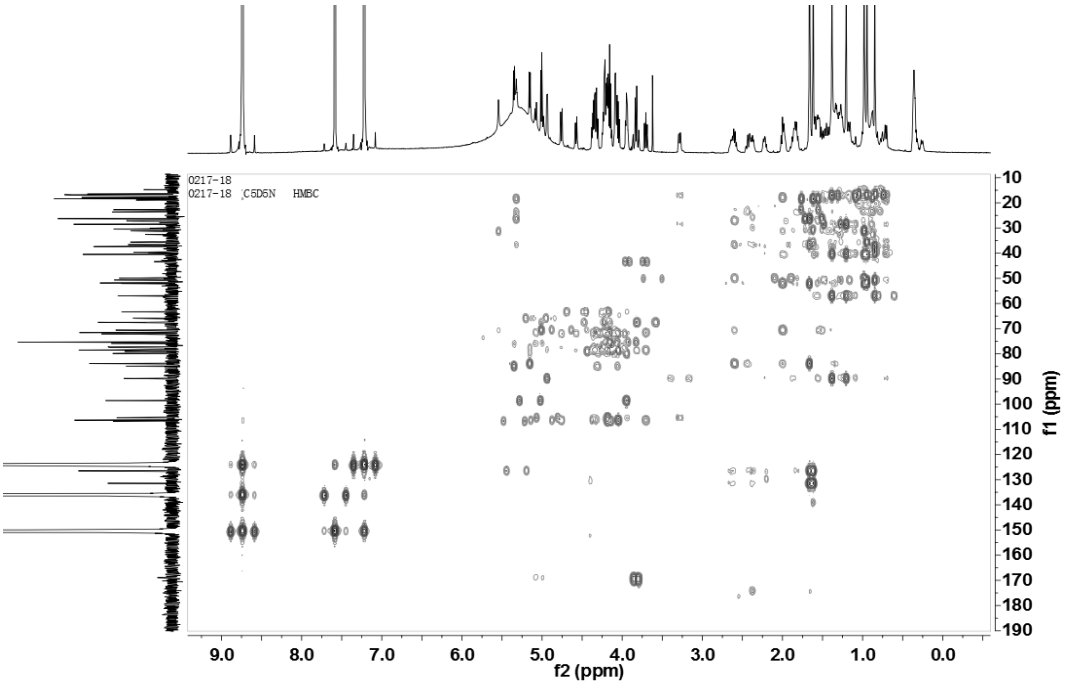


Figure S99. HMBC spectrum of compound **12.**

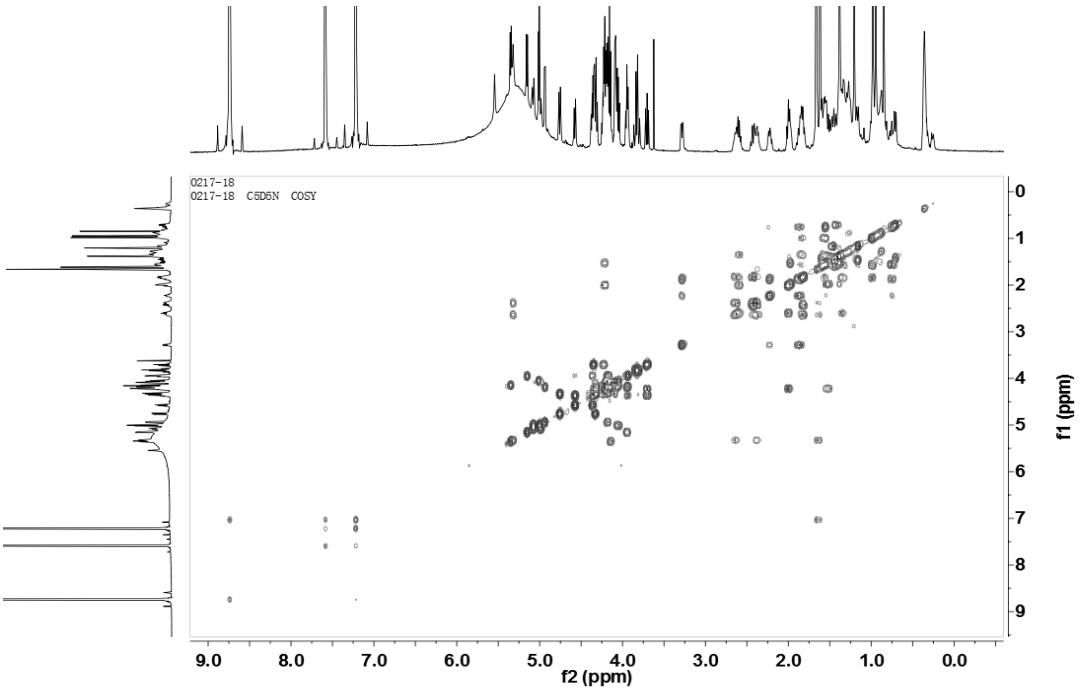


Figure S100. $^{1}$H-$^{1}$H COSY spectrum of compound **12.**

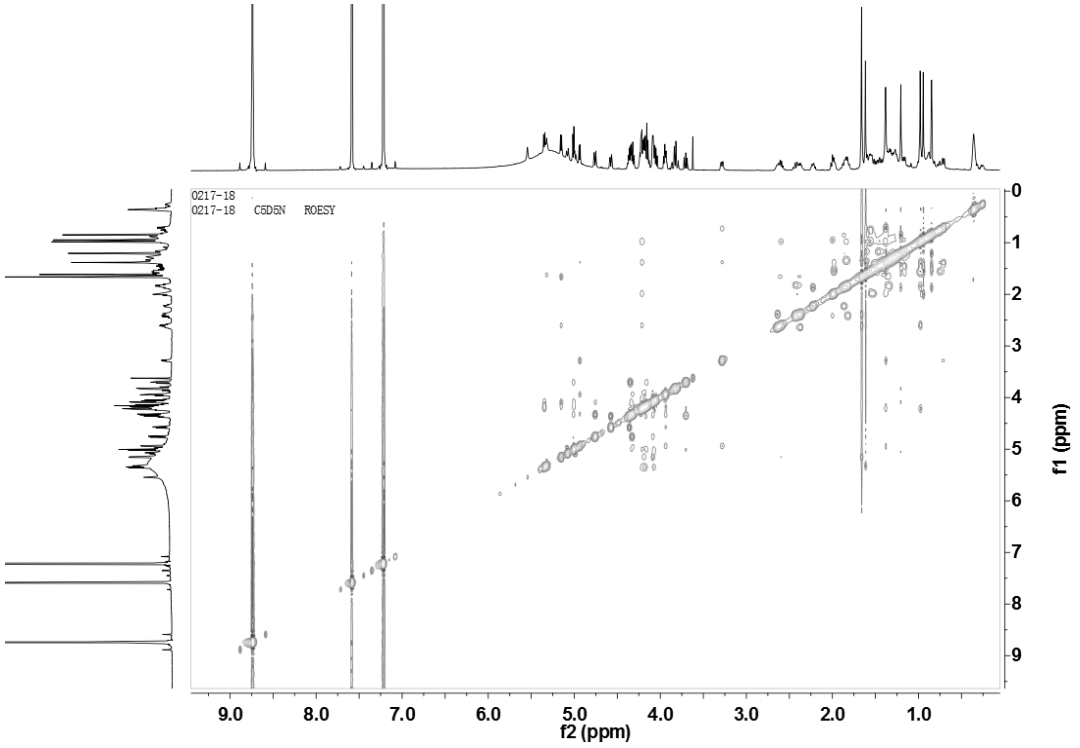


Figure S101. ROESY spectrum of compound **12.**

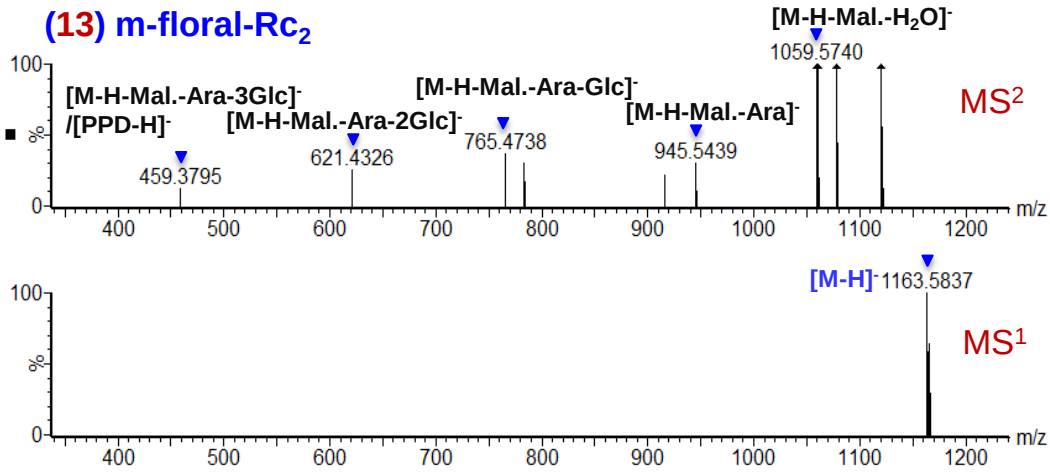


Figure S102. HRESIMS spectrum of compound **13.**

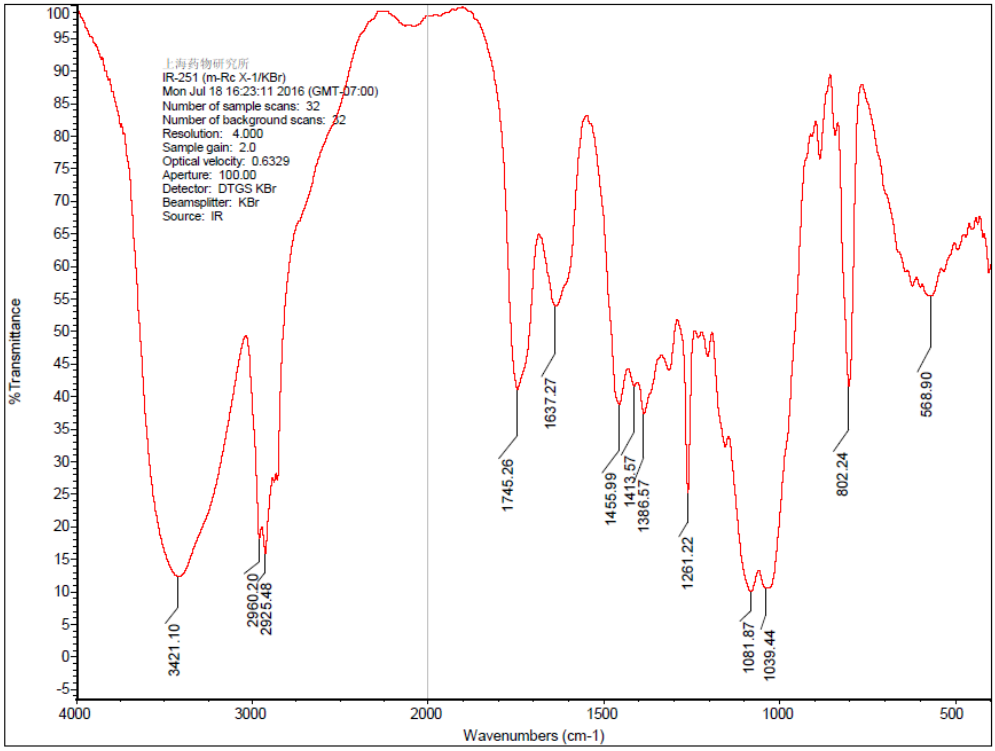


Figure S103. IR spectrum of compound 13**.**

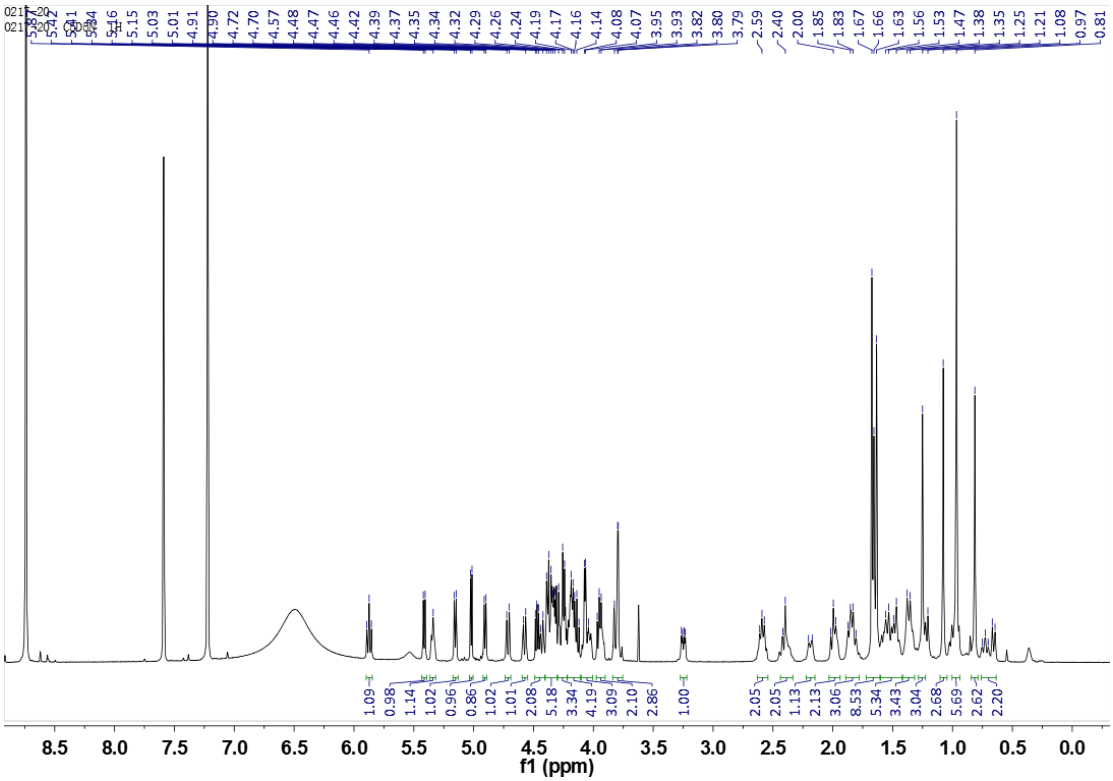


Figure S104. $^{1}$H NMR spectrum of compound **13.**

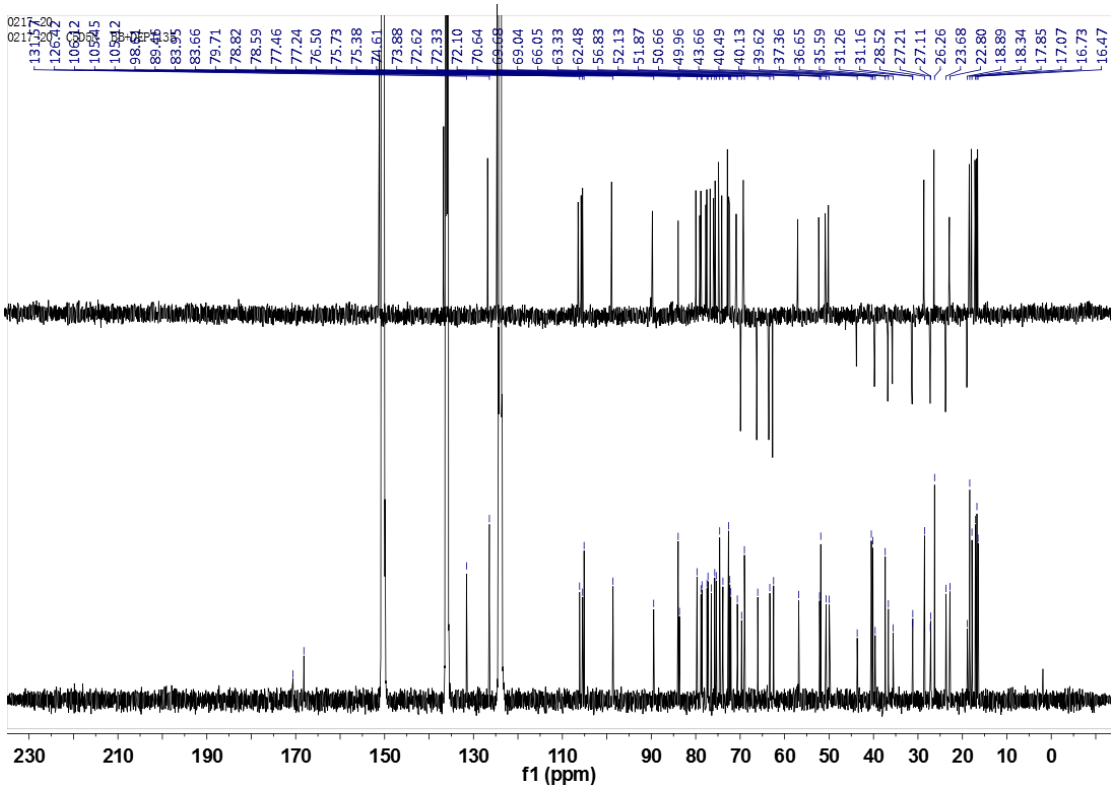


Figure S105. $^{13}$C NMR and DEPT-135 spectra of compound **13.**

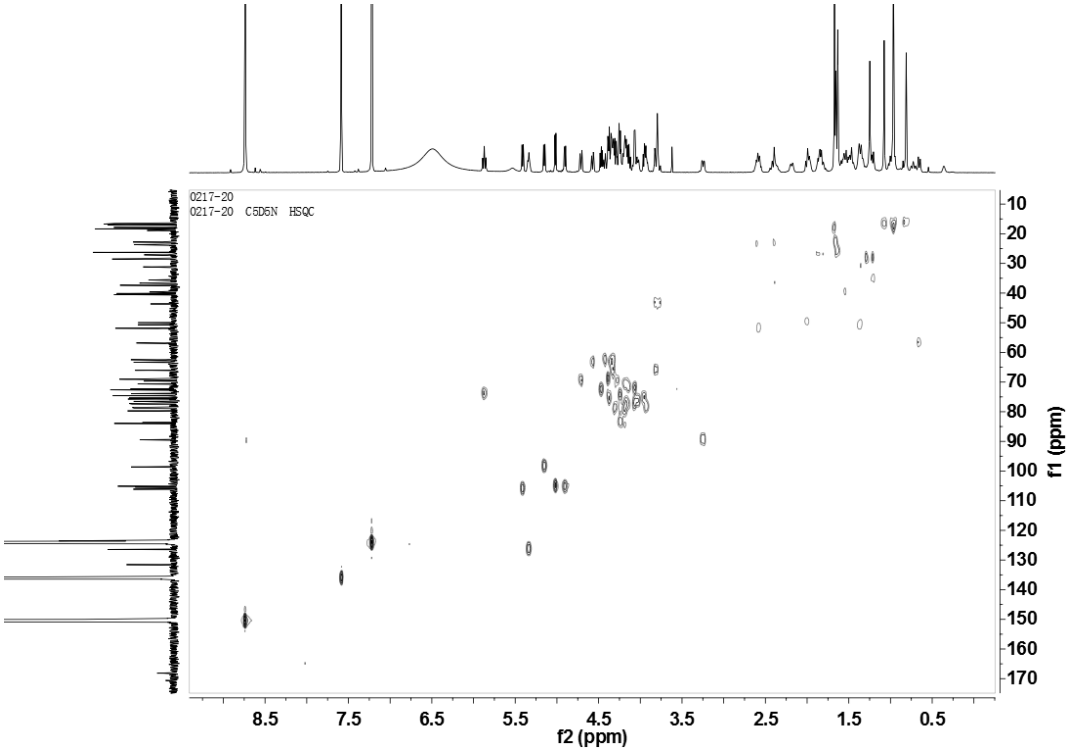


Figure S106. HSQC spectrum of compound **13.**

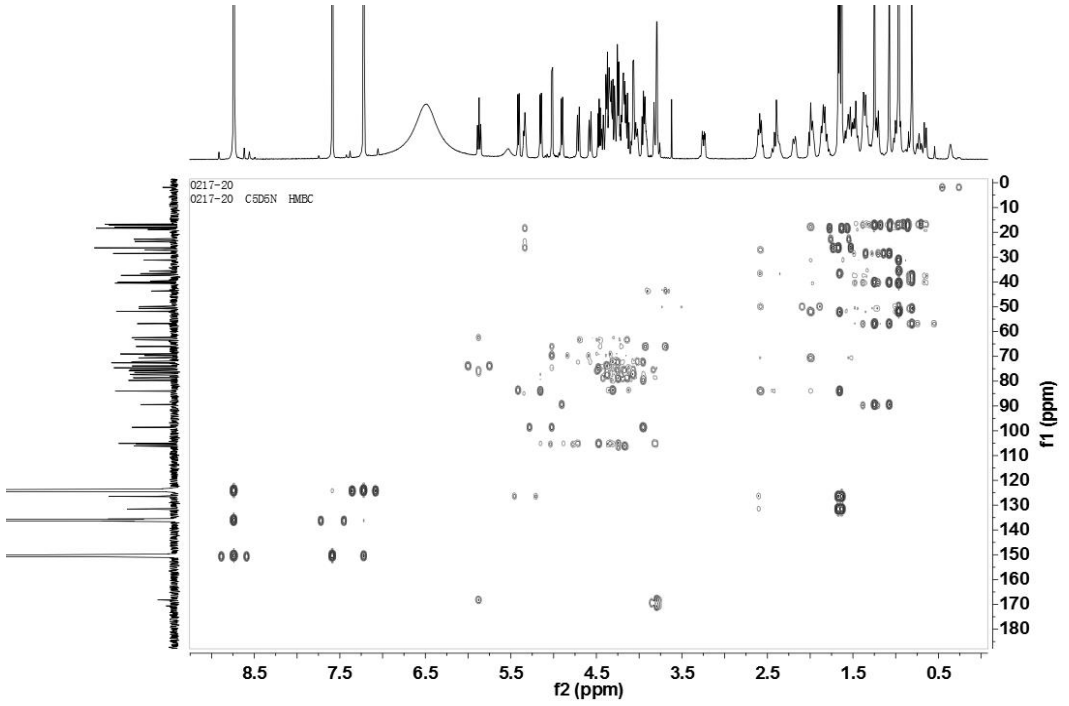


Figure S107. HMBC spectrum of compound **13.**

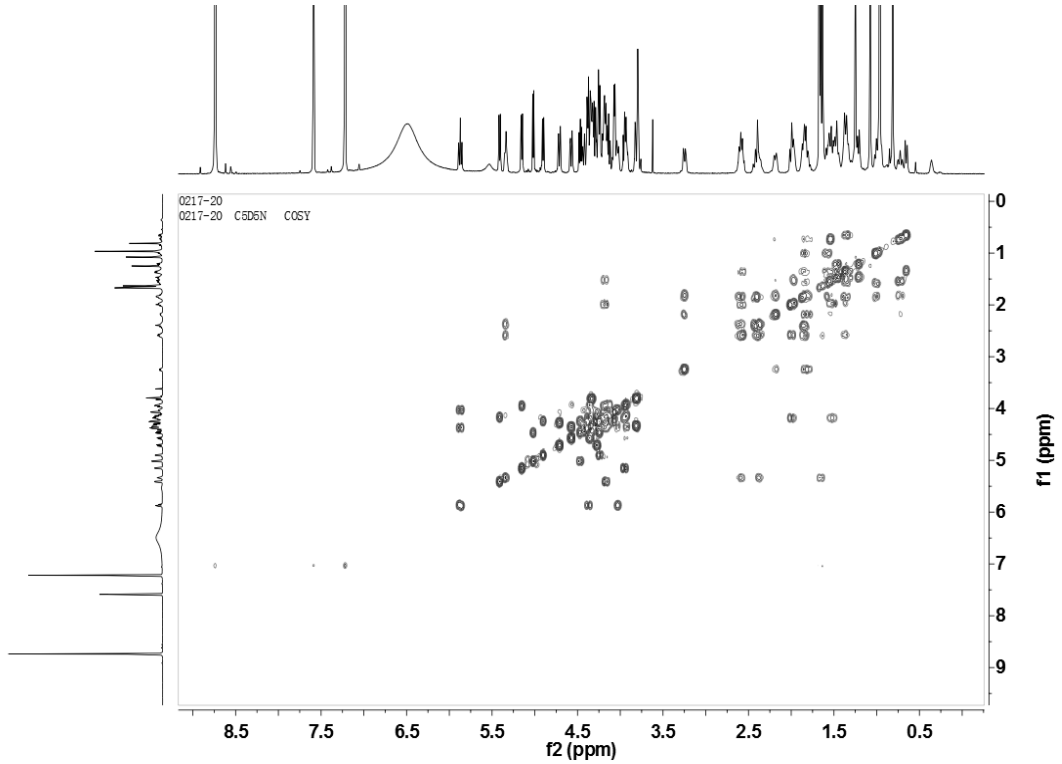


Figure S108. $^{1}$H-$^{1}$H COSY spectrum of compound **13.**

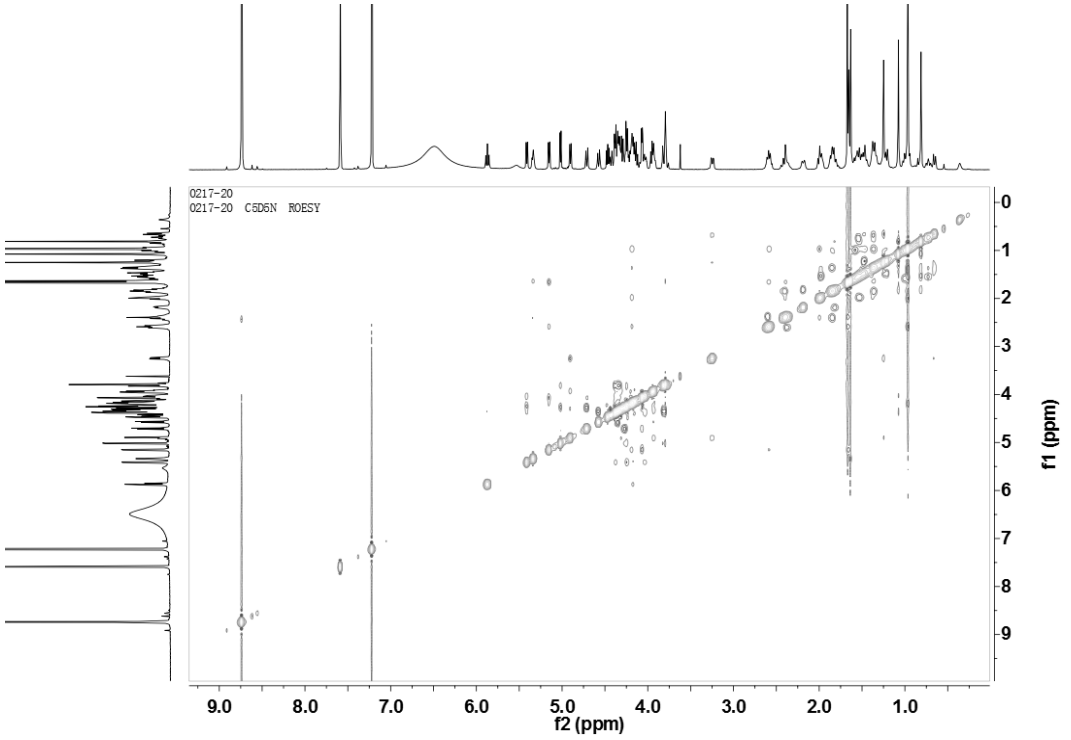


Figure S109. ROESY spectrum of compound **13.**

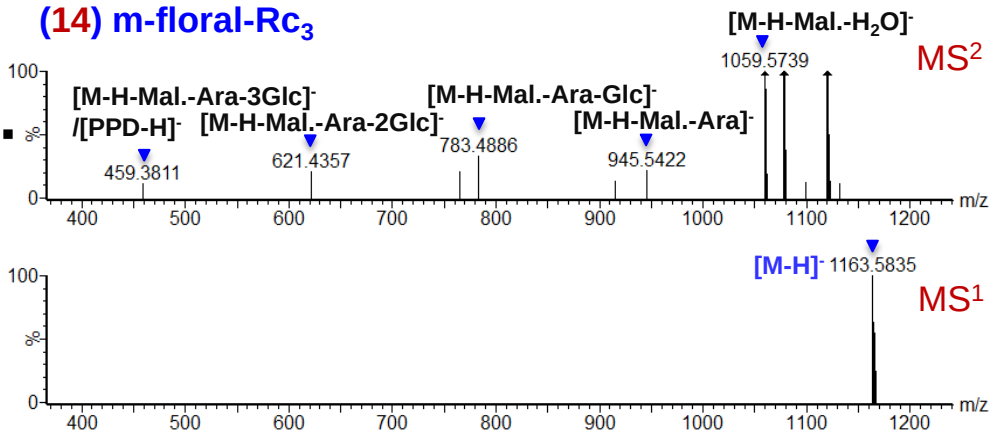


Figure S110. HRESIMS spectrum of compound **14.**

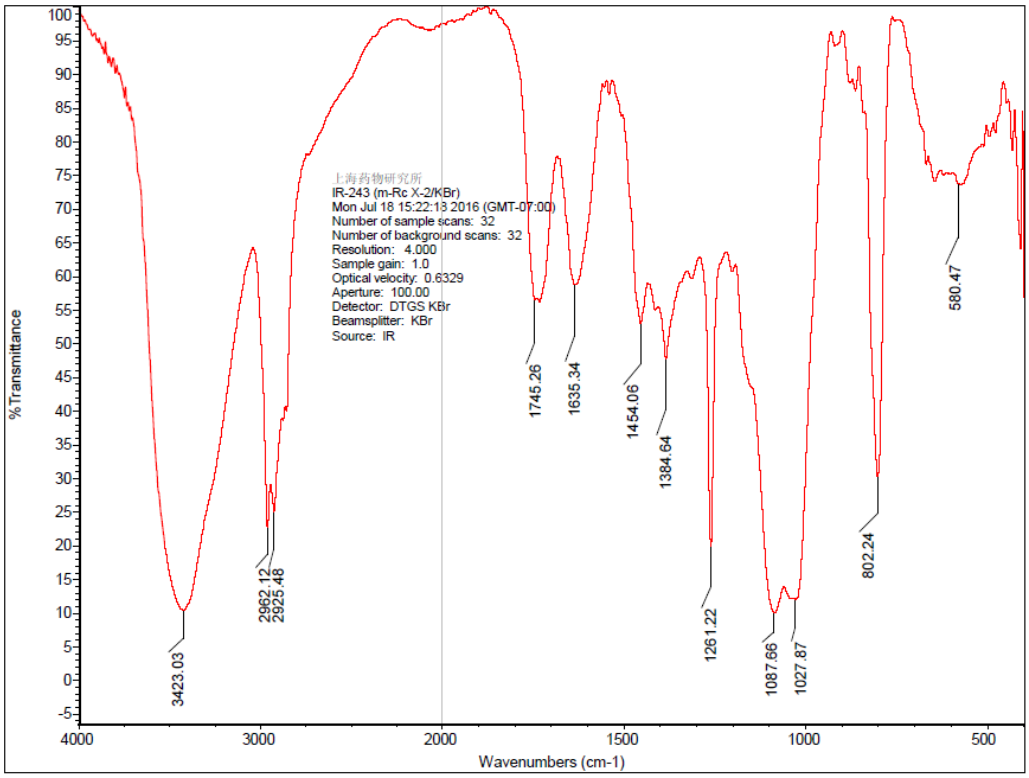


Figure S111. IR spectrum of compound **14.**

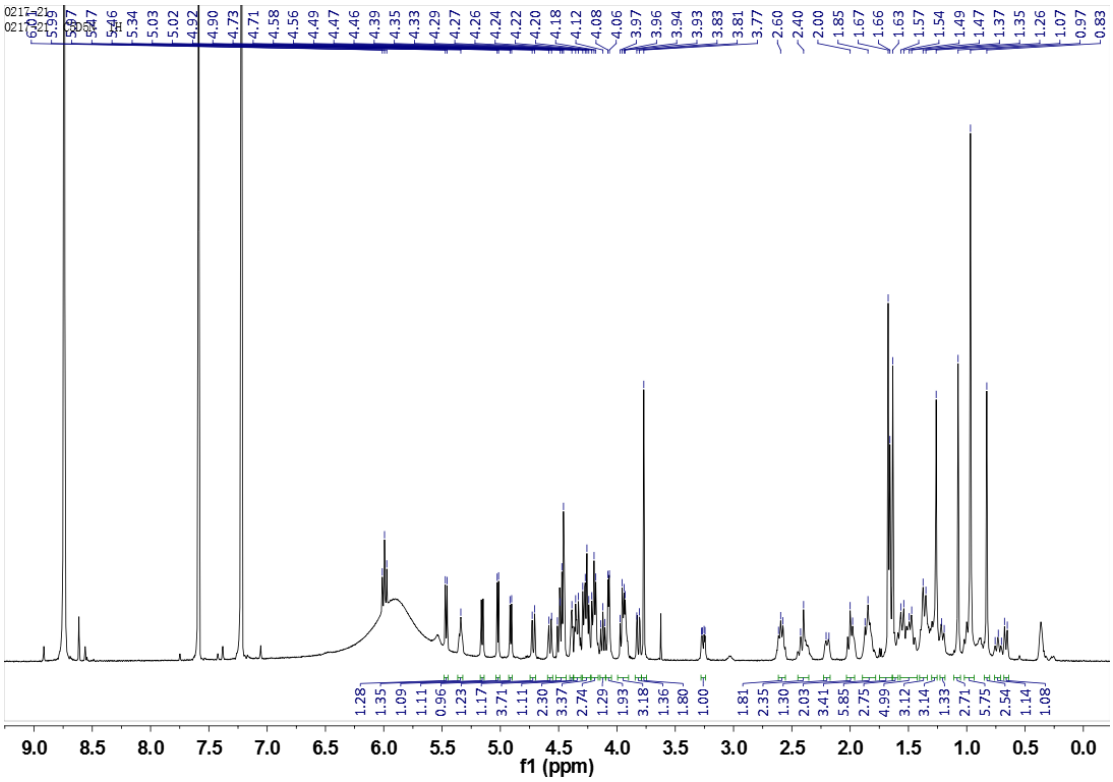


Figure S112. $^{1}$H NMR spectrum of compound **14.**

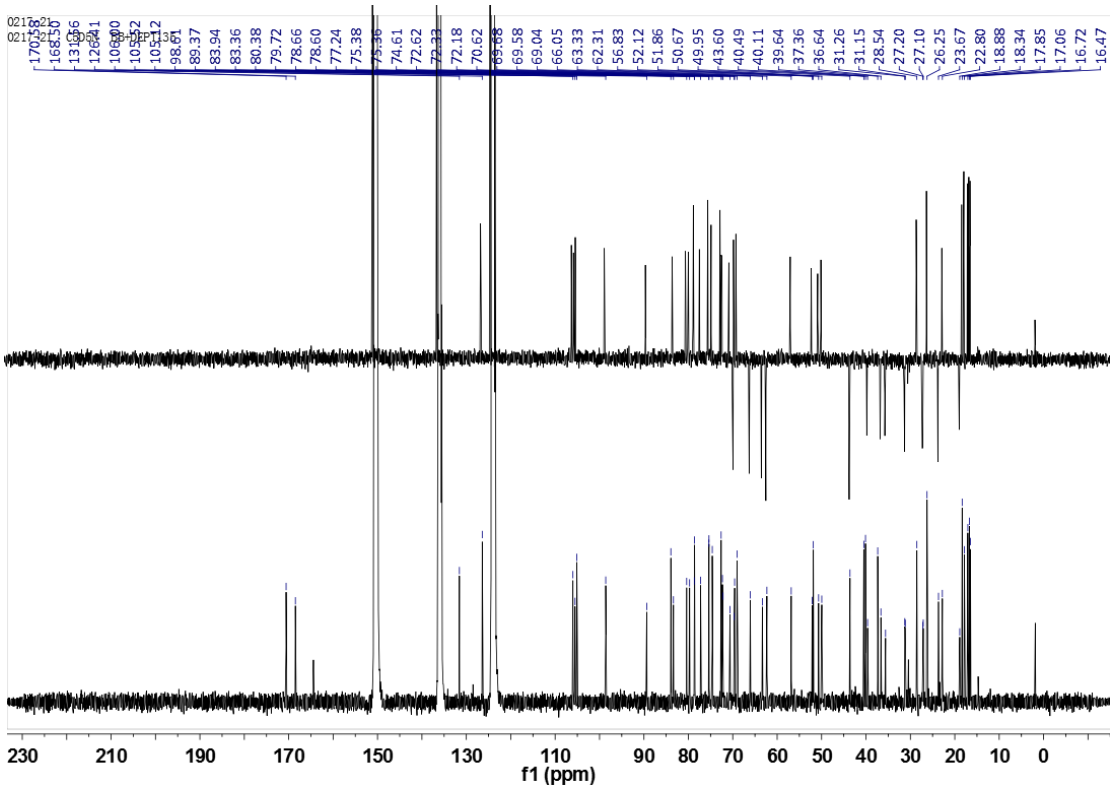


Figure S113. $^{13}$C NMR and DEPT-135 spectra of compound **14.**

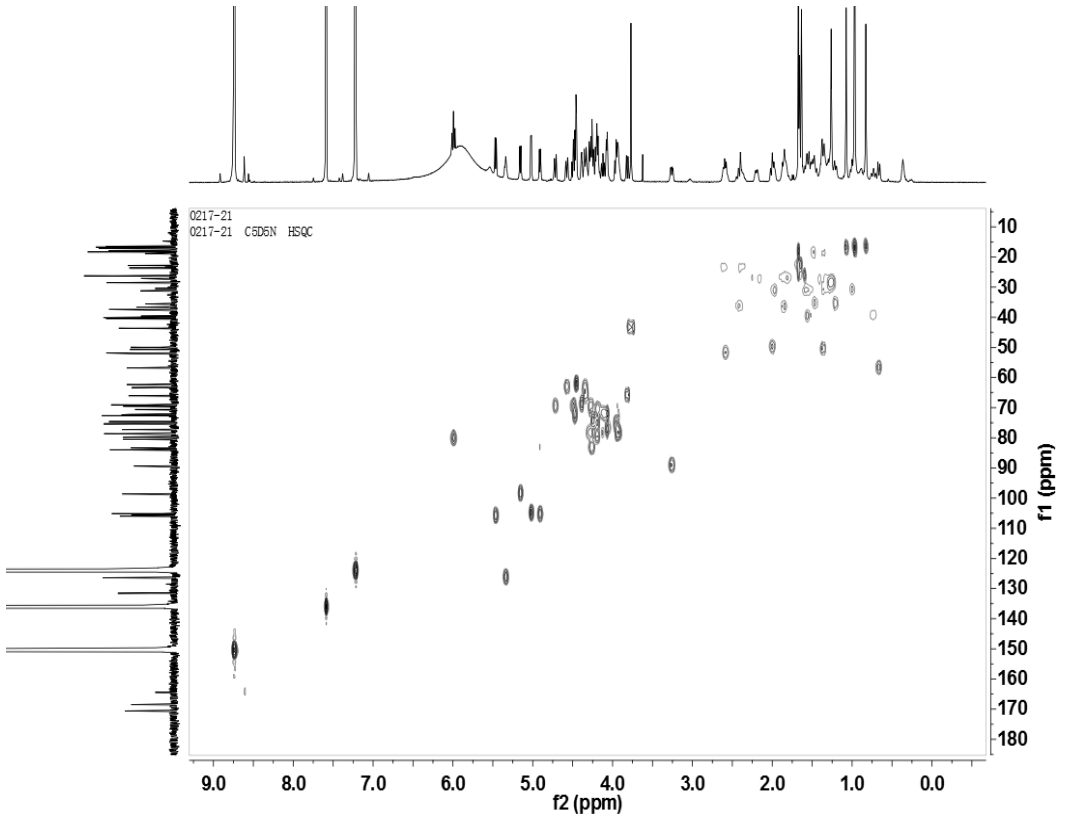


Figure S114. HSQC spectrum of compound **14.**

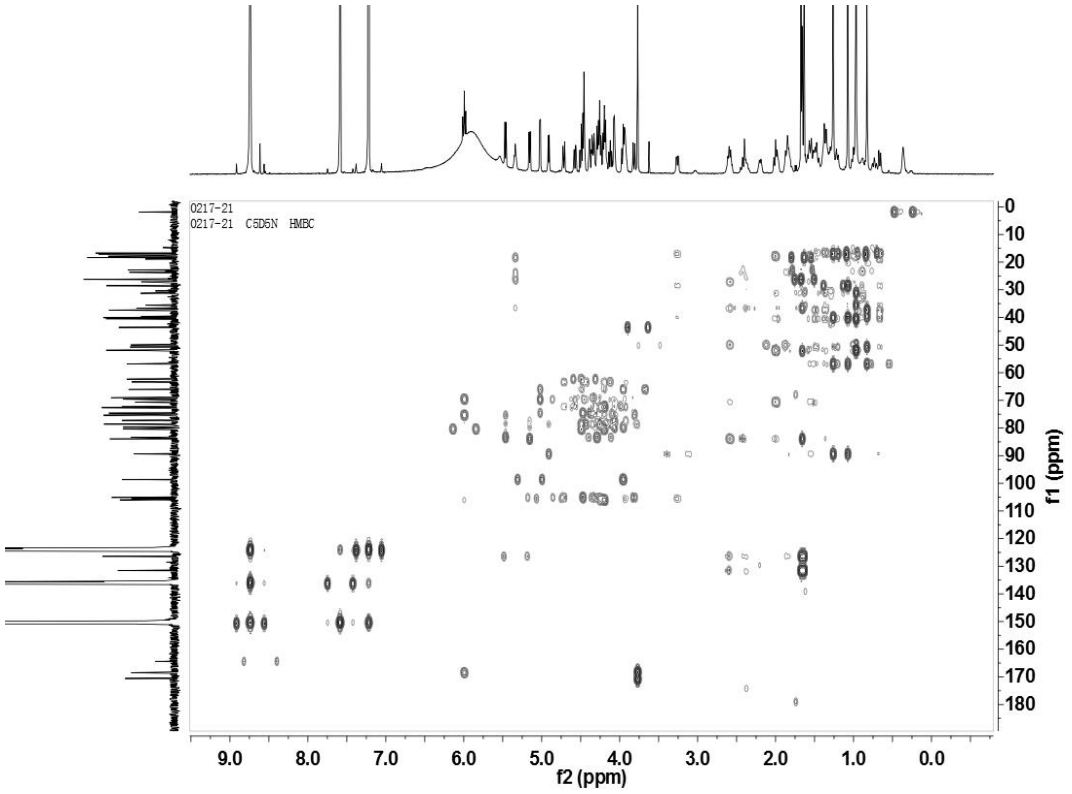


Figure S115. HMBC spectrum of compound **14.**

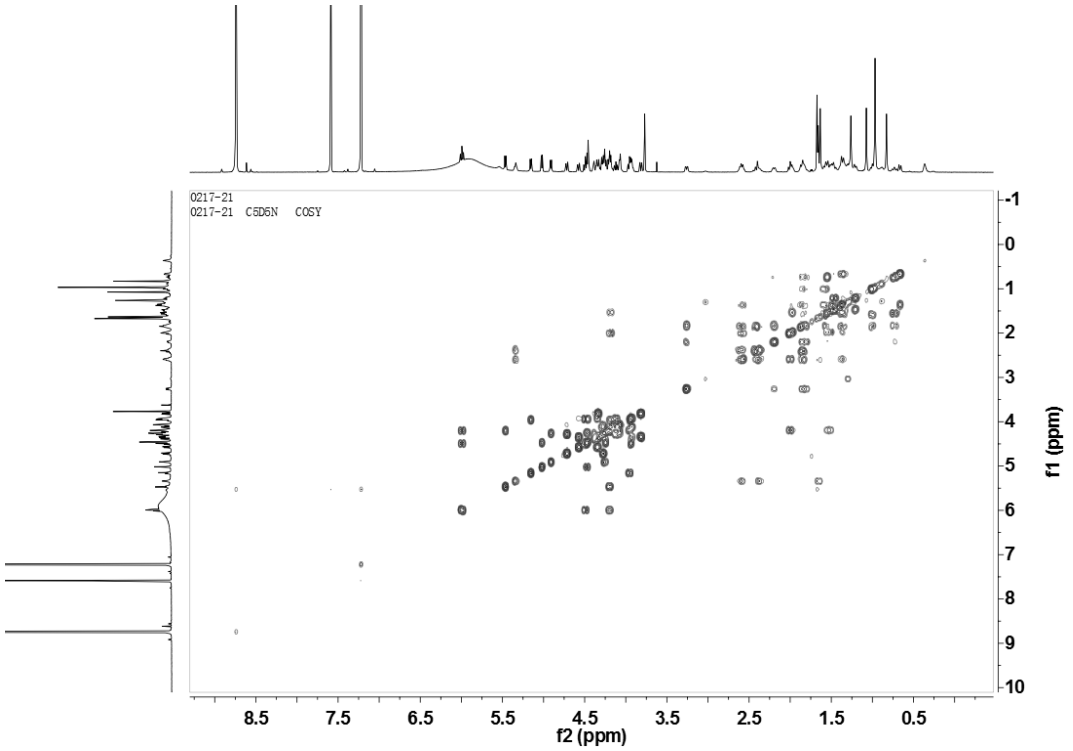


Figure S116. $^{1}$H-$^{1}$H COSY spectrum of compound **14.**

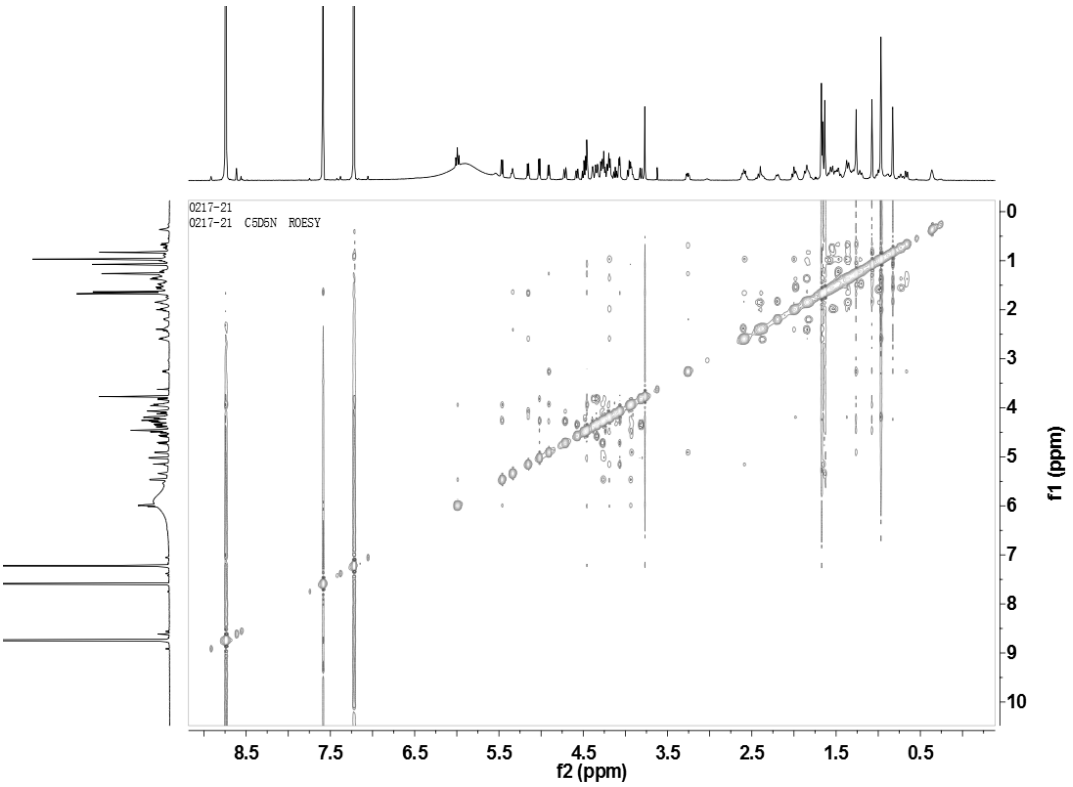


Figure S117. ROESY spectrum of compound **14.**

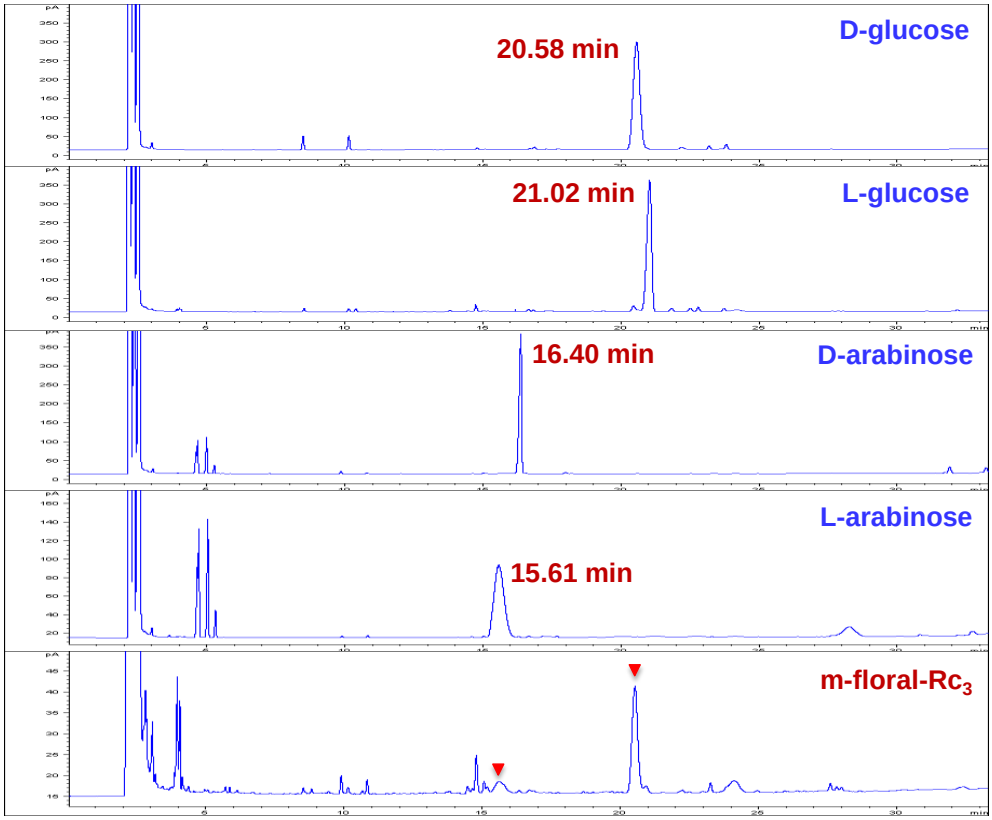


Figure S118. The GC chromatograms of compound **14** after acidic hydrolysis.

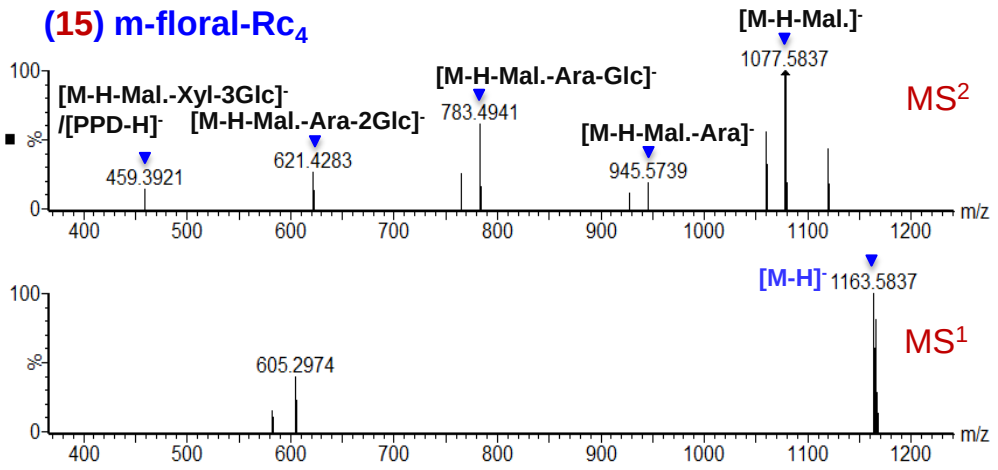


Figure S119. HRESIMS spectrum of compound **15.**

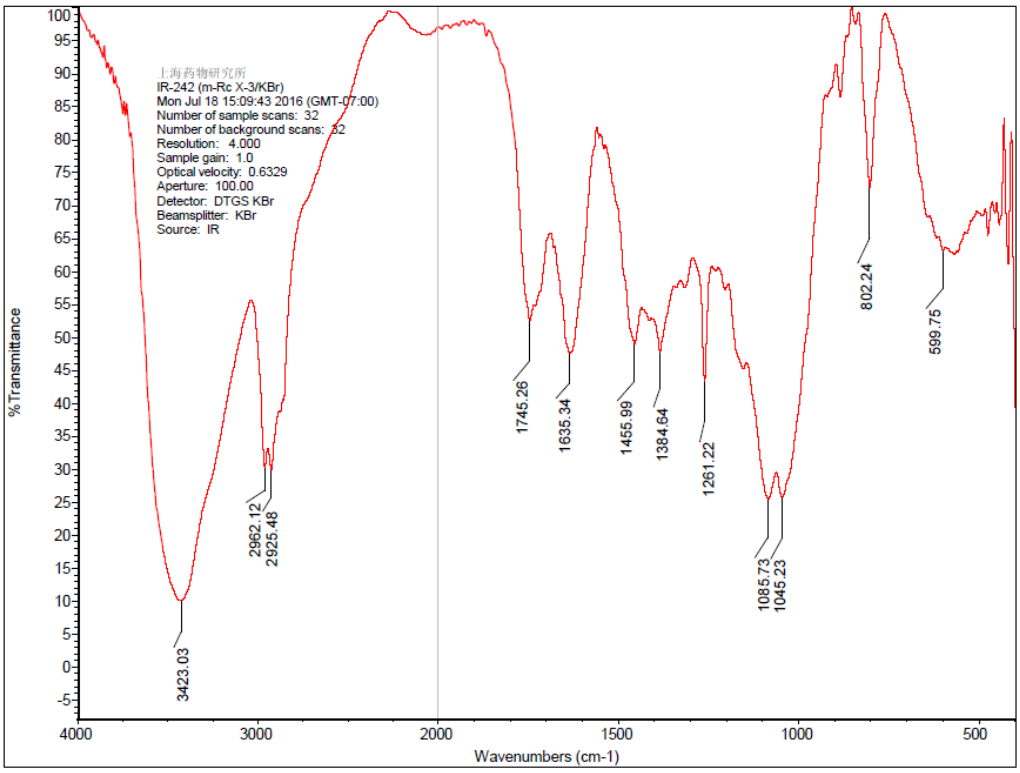


Figure S120. IR spectrum of compound **15.**

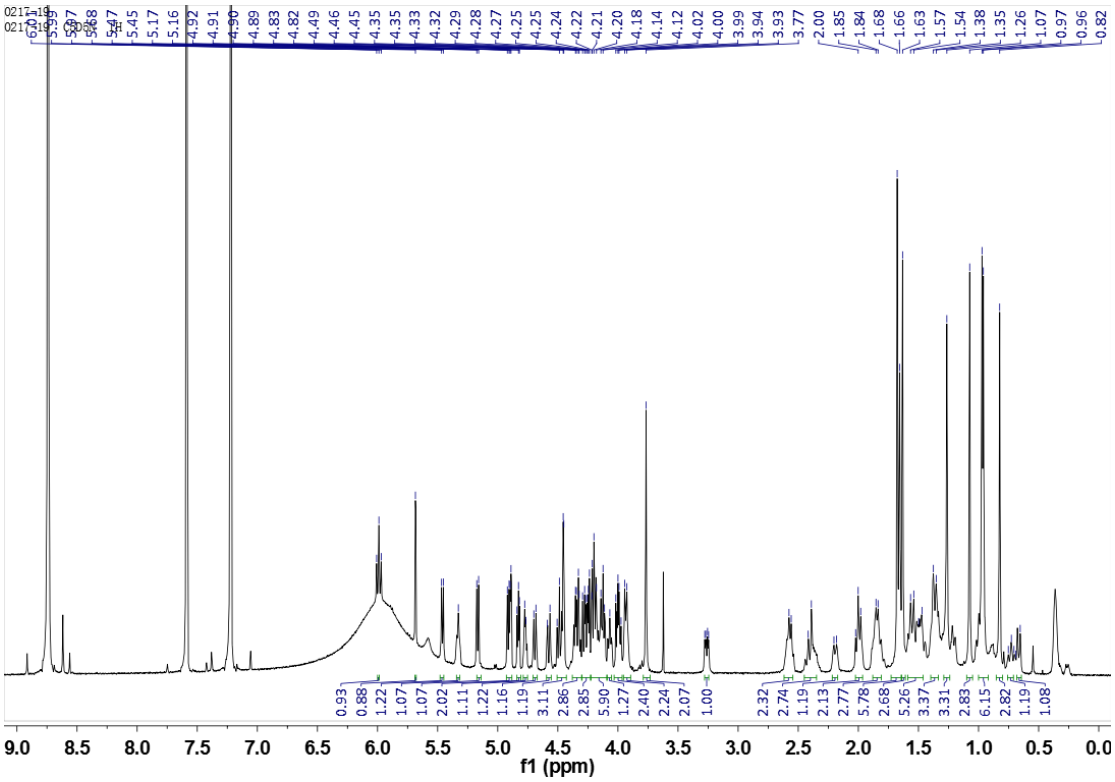


Figure S121. $^{1}$H NMR spectrum of compound **15.**

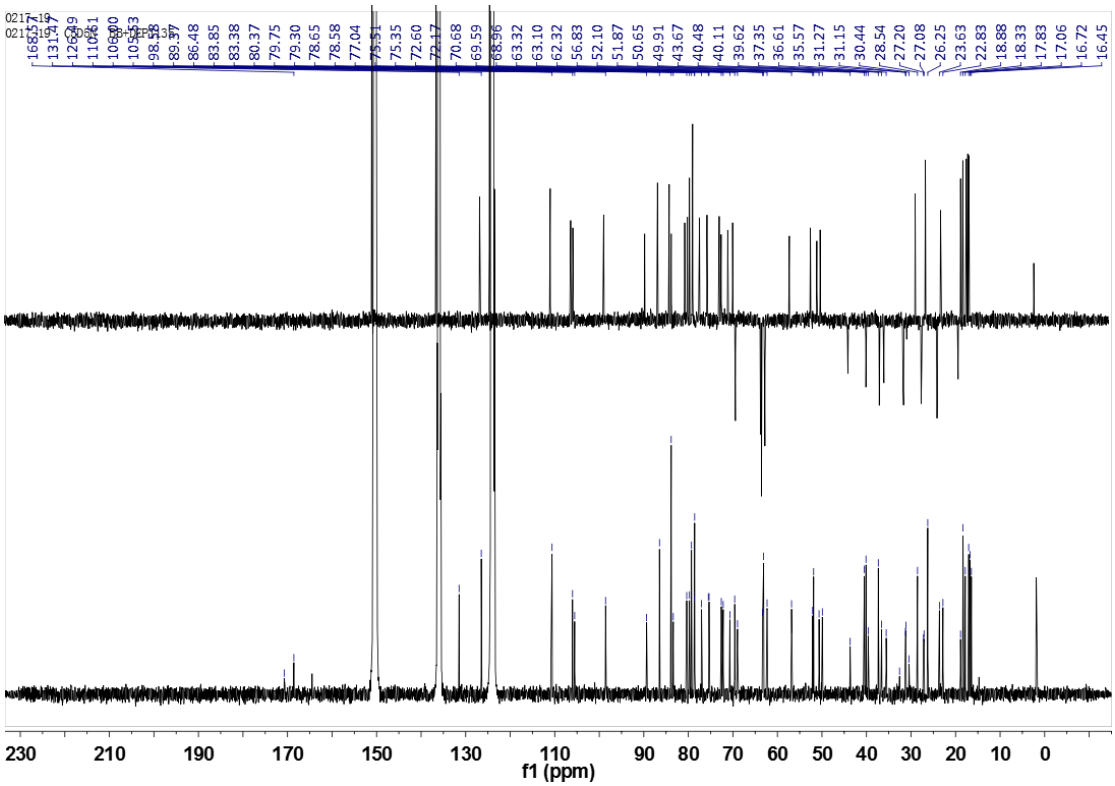


Figure S122. $^{13}$C NMR and DEPT-135 spectra of compound **15.**

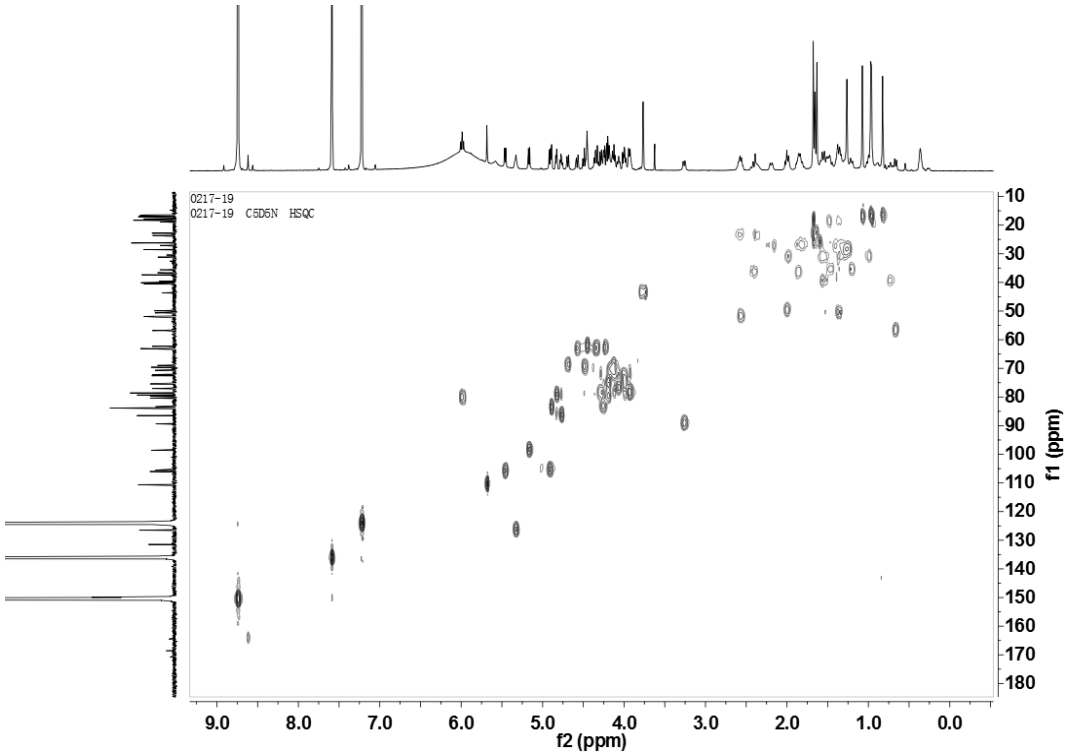


Figure S123. HSQC spectrum of compound **15.**

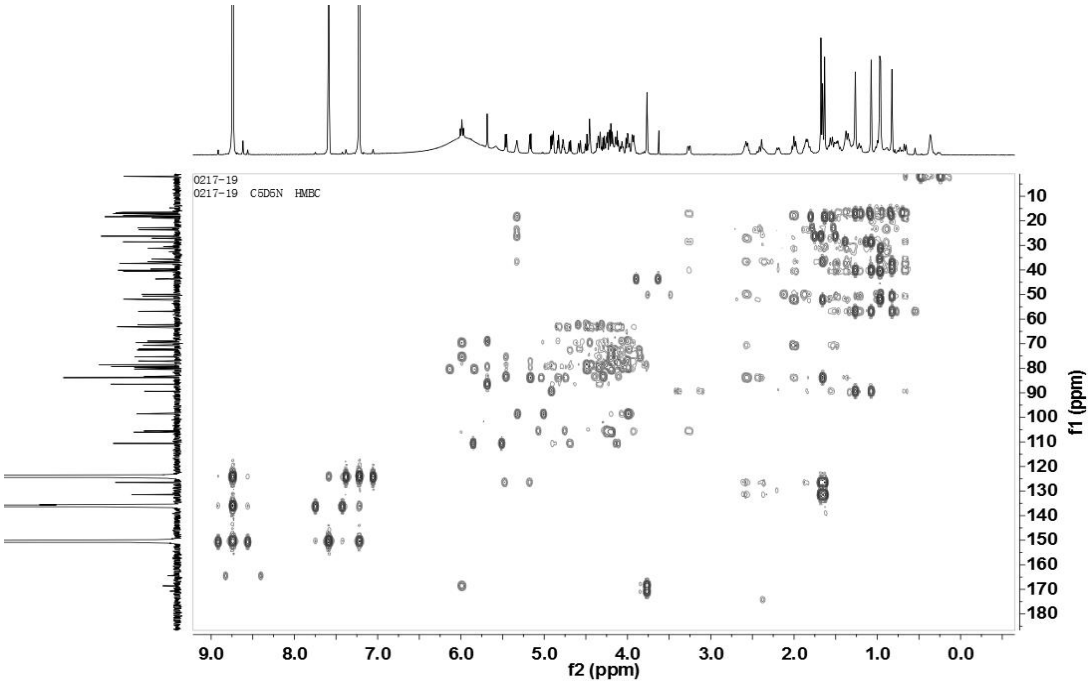


Figure S124. HMBC spectrum of compound **15.**

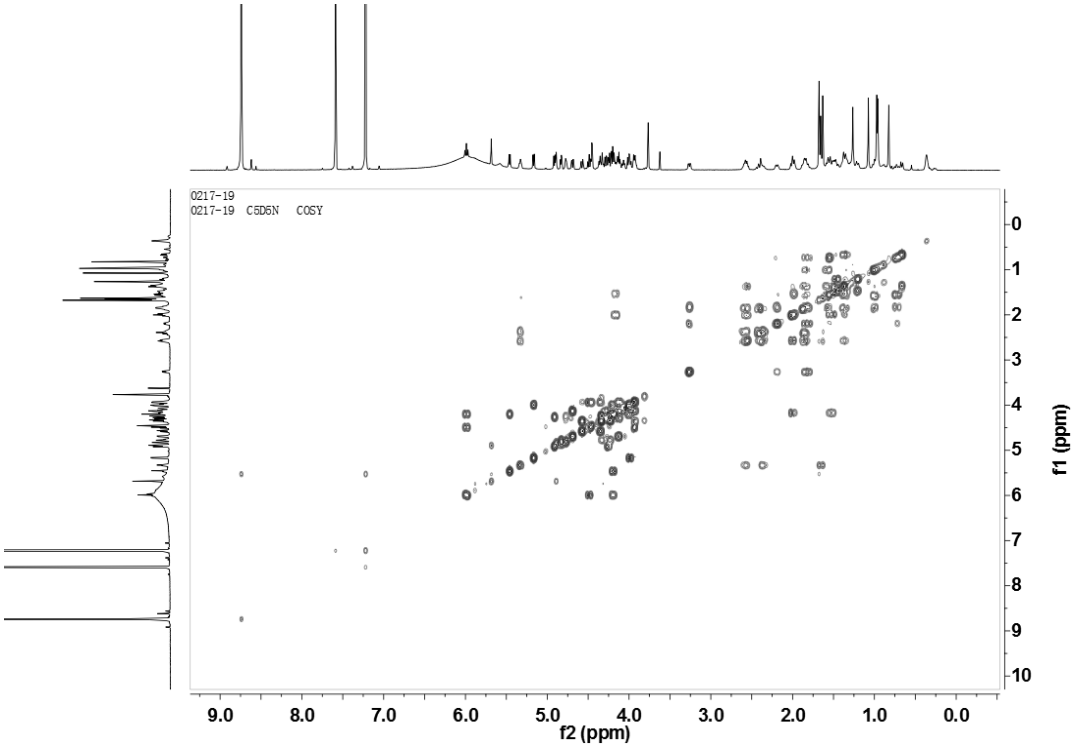


Figure S125. $^{1}$H-$^{1}$H COSY spectrum of compound **15.**

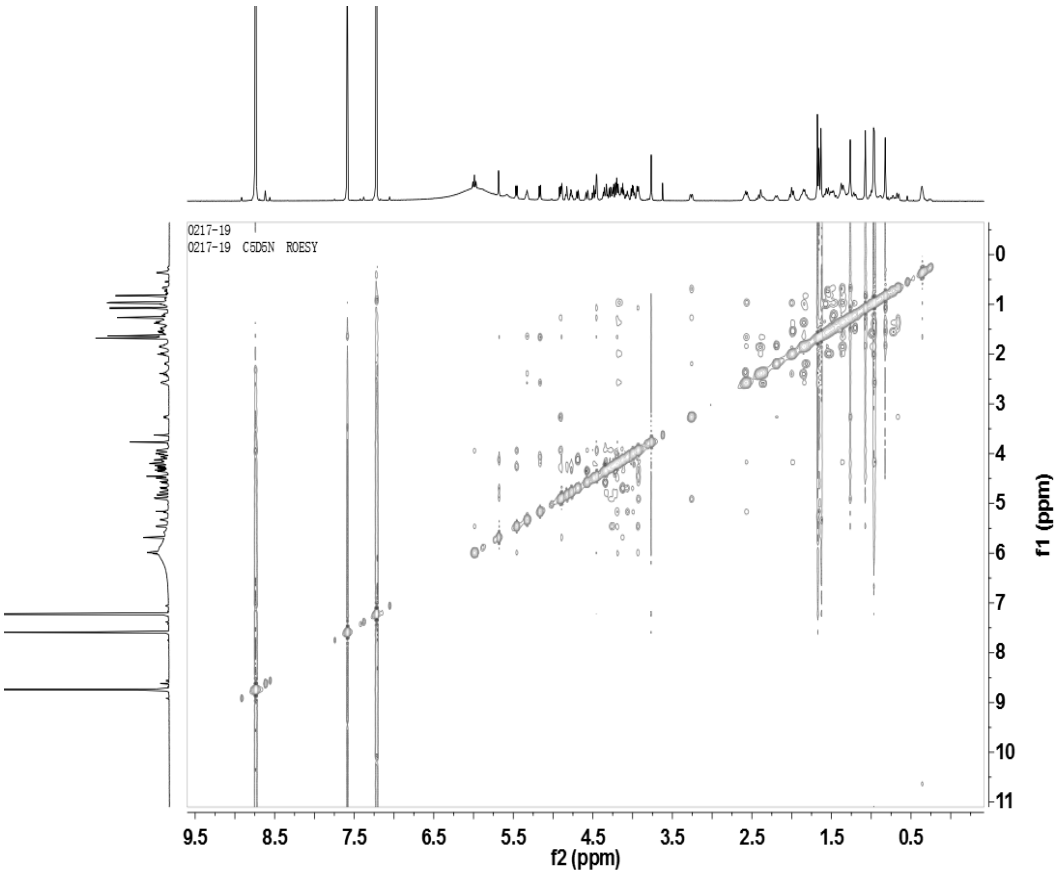


Figure S126. ROESY spectrum of compound **15**.

**Table S1.** NMR Spectroscopic Data (500 MHz, Pyridine-$d_5$) for Malonylfloralginsenosides $Rb_1$ and $Rb_2$ (4 and 5).

| | m-floral-$Rb_1$ (**4**) | | m-floral-$Rb_2$ (**5**) | |
|---|---|---|---|---|
| position | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) |
| 1 | 39.5, $CH_2$ | 1.57, m | 39.5, $CH_2$ | 1.55, m |
| | | 0.75, m | | 0.75, m |
| 2 | 27.0, $CH_2$ | 2.16, m | 27.0, $CH_2$ | 2.20, m |
| | | 1.83, m | | 1.85, m |
| 3 | 89.4, CH | 3.26, dd (11.5, 4.4) | 89.2, CH | 3.27, dd (11.7, 4.5) |
| 4 | 40.0, C | | 40.0, C | |
| 5 | 56.7, CH | 0.67, m | 56.7, CH | 0.68, m |
| 6 | 18.8, $CH_2$ | 1.48, m | 18.8, $CH_2$ | 1.49, m |
| | | 1.36, m | | 1.36, m |
| 7 | 35.5, $CH_2$ | 1.47, m | 35.5, $CH_2$ | 1.48, m |
| | | 1.22, m | | 1.22, m |
| 8 | 39.5, C | | 39.5, C | |
| 9 | 50.3, CH | 1.38, m | 50.6, CH | 1.37, m |
| 10 | 37.2, C | | 37.3, C | |
| 11 | 31.0, $CH_2$ | 1.98, m | 31.1, $CH_2$ | 1.98, m |
| | | 1.57, m | | 1.57, m |
| 12 | 70.6, CH | 4.20, m | 70.6, CH | 4.21, m |
| 13 | 49.8, CH | 1.98, m | 49.9, CH | 2.02, m |
| 14 | 52.0, C | | 52.0, C | |
| 15 | 31.2, $CH_2$ | 1.57, m | 31.2, $CH_2$ | 1.57, m |
| | | 1.01, m | | 1.00, m |
| 16 | 27.1, $CH_2$ | 1.83, m | 27.1, $CH_2$ | 1.86, m |
| | | 1.34, m | | 1.37, m |
| 17 | 51.7, CH | 2.59, m | 51.7, CH | 2.60, m |
| 18 | 16.4, $CH_3$ | 0.97, s | 16.4, $CH_3$ | 0.98, s |
| 19 | 16.6, $CH_3$ | 0.81, s | 16.6, $CH_3$ | 0.83, s |
| 20 | 83.8, C | | 83.8, C | |
| 21 | 22.7, $CH_3$ | 1.67, s | 22.8, $CH_3$ | 1.68, s |
| 22 | 36.6, $CH_2$ | 2.43, m | 36.6, $CH_2$ | 2.42, m |
| | | 1.85, m | | 1.85, m |
| 23 | 23.6, $CH_2$ | 2.62, m | 23.6, $CH_2$ | 2.62, m |
| | | 2.41, m | | 2.41, m |
| 24 | 126.3, CH | 5.33, m | 126.3, CH | 5.33, m |
| 25 | 131.4, C | | 131.4, C | |
| 26 | 26.1, $CH_3$ | 1.62, s | 26.2, $CH_3$ | 1.62, s |
| 27 | 18.3, $CH_3$ | 1.67, s | 18.3, $CH_3$ | 1.67, s |
| 28 | 28.4, $CH_3$ | 1.25, s | 28.4, $CH_3$ | 1.23, s |
| 29 | 16.9, $CH_3$ | 1.08, s | 16.9, $CH_3$ | 1.08, s |

| | | | | |
|---|---|---|---|---|
| 30 | 17.7, $CH_3$ | 0.97, s | 17.8, $CH_3$ | 0.98, s |
| | **3-Glc** | | **3-Glc** | |
| 1' | 105.3, CH | 4.91, d (7.6) | 105.4, CH | 4.91, d (7.4) |
| 2' | 83.5, CH | 4.25, m | 83.3, CH | 4.25, m |
| 3' | 78.5, CH | 4.30, m | 78.5, CH | 4.31, m |
| 4' | 71.9, CH | 4.14, m | 72.1, CH | 4.12, m |
| 5' | 78.7, CH | 3.95, m | 78.7, CH | 3.94, m |
| 6' | 63.2, $CH_2$ | 4.56, dd (12.0, 1.9) | 63.2, $CH_2$ | 4.56, m |
| | | 4.37, m | | 4.36, m |
| | **2'-Glc** | | **2'-Glc** | |
| 1'' | 106.0, CH | 5.41, d (7.6) | 105.9, CH | 5.46, d (7.6) |
| 2'' | 77.5, CH | 4.17, m | 75.2, CH | 4.21, m |
| 3'' | 78.7, CH | 4.23, m | 80.2, CH | 5.98, t (9.6) |
| 4'' | 72.0, CH | 4.35, m | 69.5, CH | 4.49, m |
| 5'' | 78.7, CH | 3.95, m | 78.7, CH | 3.95, m |
| 6'' | 63.3, $CH_2$ | 4.53, dd (12.0, 2.6) | 63.2, $CH_2$ | 4.53, m |
| | | 4.35, m | | 4.38, t (5.3) |
| | **20-Glc** | | **20-Glc** | |
| 1''' | 98.4, CH | 5.15, d (7.7) | 98.5, CH | 5.15, d (7.6) |
| 2''' | 75.6, CH | 3.94, m | 75.2, CH | 3.95, m |
| 3''' | 79.6, CH | 4.19, m | 79.6, CH | 4.19, m |
| 4''' | 72.0, CH | 4.08, m | 72.0, CH | 4.09, m |
| 5''' | 77.3, CH | 4.07, m | 77.4, CH | 4.10, m |
| 6''' | 70.5, $CH_2$ | 4.75, d (10.9) | 70.5, $CH_2$ | 4.76, d (10.7) |
| | | 4.35, m | | 4.34, m |
| | **6'''-Glc** | | **6'''-Glc** | |
| 1'''' | 105.7, CH | 5.12, d (7.7) | 105.8, CH | 5.12, d (7.7) |
| 2'''' | 75.6, CH | 4.07, m | 75.6, CH | 4.08, m |
| 3'''' | 75.2, CH | 4.37, m | 78.5, CH | 4.18, m |
| 4'''' | 73.8, CH | 5.86, t (9.7) | 72.0, CH | 4.25, m |
| 5'''' | 76.4, CH | 4.04, | 78.7, CH | 3.95, m |
| 6'''' | 62.3, $CH_2$ | 4.43, dd (12.0, 2.7) | 62.2, $CH_2$ | 4.48, t (9.4) |
| | | 4.34, m | | 4.45, m |
| | **4''''-Mal.** | | **3''-Mal.** | |
| -O-CO | 168.0, C | | 168.6, C | |
| CH2 | 43.5, $CH_2$ | 3.79, m (2H) | 43.6, $CH_2$ | 3.76, m (2H) |
| COOH | 170.5, C | | 170.7, C | |

**Table S2.** NMR Spectroscopic Data (500 MHz, Pyridine-$d_5$) for Malonylfloralginsenosides $Rd_1$−$Rd_3$ (**6**−**8**)

| | m-floral-$Rd_1$ (**6**) | | m-floral-$Rd_2$ (**7**) | | m-floral-$Rd_3$ (**8**) | |
|---|---|---|---|---|---|---|
| position | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) |
| 1 | 39.6, $CH_2$ | 1.53, m<br>0.73, m | 39.5, $CH_2$ | 1.56, m<br>0.73, m | 39.5, $CH_2$ | 1.54, m<br>0.73, m |
| 2 | 27.1, $CH_2$ | 2.15, m<br>1.85, m | 27.0, $CH_2$ | 2.20, m<br>1.85, m | 27.0, $CH_2$ | 2.18, m<br>1.85, m |
| 3 | 89.6, CH | 3.24, dd (11.5, 4.4) | 89.2, CH | 3.27, dd (11.7, 4.4) | 89.3, CH | 3.25, dd (11.7, 4.5) |
| 4 | 40.5, C | | 40.4, C | | 40.3, C | |
| ,5 | 56.8, CH | 0.69, m | 56.7, CH | 0.67, m | 56.7, CH | 0.66, m |
| 6 | 18.9, $CH_2$ | 1.52, m<br>1.36, m | 18.8, $CH_2$ | 1.48, m<br>1.36, m | 18.7, $CH_2$ | 1.46, m<br>1.34, m |
| 7 | 35.6, $CH_2$ | 1.49, m<br>1.21, m | 35.5, $CH_2$ | 1.47, m<br>1.21, m | 35.4, $CH_2$ | 1.46, m<br>1.21, m |
| 8 | 40.1, C | | 40.0, C | | 40.0, C | |
| 9 | 50.6, CH | 1.38, m | 50.5, CH | 1.38, m | 50.5, CH | 1.37, m |
| 10 | 37.4, C | | 37.2, C | | 37.2, C | |
| 11 | 31.4, $CH_2$ | 1.97, m<br>1.55, m | 31.2, $CH_2$ | 1.97, m<br>1.55, m | 31.2, $CH_2$ | 1.96, m<br>1.55, m |
| 12 | 70.6, CH | 4.18, m | 70.5, CH | 4.18, m | 70.5, CH | 4.17, m |
| 13 | 50.0, CH | 1.99, m | 49.8, CH | 1.99, m | 50.0, CH | 1.98, m |
| 14 | 51.9, C | | 51.8, C | | 51.7, C | |
| 15 | 31.2, $CH_2$ | 1.55, m<br>1.00, m | 31.1, $CH_2$ | 1.55, m<br>1.00, m | 31.1, $CH_2$ | 1.55, m<br>0.99, m |
| 16 | 27.1, $CH_2$ | 1.87, m<br>1.37, m | 27.1, $CH_2$ | 1.85, m<br>1.37, m | 27.1, $CH_2$ | 1.85, m<br>1.36, m |
| 17 | 51.9, CH | 2.59, m | 51.9, CH | 2.59, m | 51.9, CH | 2.58, dd (16.5, 8.5) |
| 18 | 16.4, $CH_3$ | 0.97, s | 16.3, $CH_3$ | 0.97, s | 16.3, $CH_3$ | 0.96, s |
| 19 | 16.7, $CH_3$ | 0.79, s | 16.6, $CH_3$ | 0.83, s | 16.6, $CH_3$ | 0.80, s |
| 20 | 83.8, C | | 83.2, C | | 83.4, C | |
| 21 | 22.8, $CH_3$ | 1.64, s | 22.7, $CH_3$ | 1.65, s | 22.7, $CH_3$ | 1.63, s |
| 22 | 36.6, $CH_2$ | 2.40, m<br>1.83, m | 36.5, $CH_2$ | 2.41, m<br>1.83, m | 36.4, $CH_2$ | 2.40, m<br>1.83, m |
| 23 | 23.7, $CH_2$ | 2.50, m<br>2.25, m | 23.5, $CH_2$ | 2.51, m<br>2.25, m | 23.5, $CH_2$ | 2.50, m<br>2.24, m |
| 24 | 126.4, CH | 5.25, t (7.0) | 126.3, CH | 5.25, t (7.2) | 126.3, CH | 5.25, t (7.0) |
| 25 | 131.3, C | | 131.2, C | | 131.2, C | |
| 26 | 26.2, $CH_3$ | 1.60, s | 26.1, $CH_3$ | 1.60, s | 26.1, $CH_3$ | 1.60, s |
| 27 | 18.2, $CH_3$ | 1.60, s | 18.1, $CH_3$ | 1.60, s | 18.1, $CH_3$ | 1.60, s |

| | | | | | | |
|---|---|---|---|---|---|---|
| 28 | 28.6, $CH_3$ | 1.33, s | 28.4, $CH_3$ | 1.27, s | 28.4, $CH_3$ | 1.24, s |
| 29 | 17.2, $CH_3$ | 1.10, s | 16.9, $CH_3$ | 1.08, s | 16.9, $CH_3$ | 1.07, s |
| 30 | 17.8, $CH_3$ | 0.94, s | 17.7, $CH_3$ | 0.96, s | 17.7, $CH_3$ | 0.95, s |
| | **3-Glc** | | **3-Glc** | | **3-Glc** | |
| 1' | 105.4, CH | 4.85, d (7.5) | 105.4, CH | 4.91, d (7.4) | 105.4, CH | 4.90, d (7.6) |
| 2' | 80.8, CH | 4.26, m | 83.6, CH | 4.26, m | 83.6, CH | 4.25, m |
| 3' | 78.5, CH | 4.35, m | 78.5, CH | 4.29, m | 78.3, CH | 4.31, m |
| 4' | 72.1, CH | 4.10, t (9.4) | 72.0, CH | 4.12, t (9.3) | 72.0, CH | 4.12, m |
| 5' | 78.5, CH | 3.88, m | 78.5, CH | 3.93, m | 78.6, CH | 3.92, m |
| 6' | 63.5, $CH_2$ | 4.51, m | 63.2, $CH_2$ | 4.57, dd (11.7, 2.2) | 63.1, $CH_2$ | 4.57, dd (11.8, 2.2) |
| | | 4.37, m | | 4.35, m | | 4.34, m |
| | **2'-Glc** | | **2'-Glc** | | **2'-Glc** | |
| 1'' | 102.0, CH | 5.83, d (7.9) | 105.8, CH | 5.46, d (7.6) | 105.9, CH | 5.42, d (7.7) |
| 2'' | 77.5, CH | 5.73, t (8.8) | 75.2, CH | 4.20, m | 77.3, CH | 4.17, m |
| 3'' | 76.9, CH | 4.33, m | 80.2, CH | 5.98, t (9.5) | 75.4, CH | 4.37, m |
| 4'' | 72.6, CH | 4.26, m | 69.5, CH | 4.48, m | 73.7, CH | 5.86, t (9.6) |
| 5'' | 78.7, CH | 3.95, m | 78.5, CH | 3.94, m | 76.4, CH | 4.03, m |
| 6'' | 63.4, $CH_2$ | 4.51, m | 63.2, $CH_2$ | 4.52, dd (11.7, 2.5) | 63.1, $CH_2$ | 4.50, dd (11.7, 2.5) |
| | | 4.36, m | | 4.36, d (4.5) | | 4.36, m |
| | **20-Glc** | | **20-Glc** | | **20-Glc** | |
| 1''' | 98.7, CH | 5.21, d (7.7) | 98.6, CH | 5.22, d (7.7) | 98.6, CH | 5.21, d (7.7) |
| 2''' | 75.6, CH | 4.03, t (8.2) | 75.5, CH | 4.03, t (8.3) | 75.5, CH | 4.02, m |
| 3''' | 79.8, CH | 4.27, m | 79.7, CH | 4.26, m | 79.5, CH | 4.25, m |
| 4''' | 72.1, CH | 4.09, m | 72.0, CH | 4.18, m | 72.0, CH | 4.18, m |
| 5''' | 78.9, CH | 3.95, m | 78.7, CH | 3.93, m | 78.6, CH | 4.03, m |
| 6''' | 63.3, $CH_2$ | 4.51, m | 62.2, $CH_2$ | 4.48, d (11.0) | 62.3, $CH_2$ | 4.42, dd (11.9, 2.8) |
| | | 4.36, m | | 4.45, m | | 4.33, m |
| | **2''-Mal.** | | **3''-Mal.** | | **4''-Mal.** | |
| -O-CO | 168.5, C | | 168.6, C | | 167.9, C | |
| CH2 | 44.7, $CH_2$ | 3.79, dd (2H, 21.4, 15.2) | 43.4, $CH_2$ | 3.77, d (2H, 15.7) | 43.4, $CH_2$ | 3.79, dd (2H, 22.1, 15.4) |
| COOH | 171.8, C | | 170.7, C | | 170.4, C | |

**Table S3.** NMR Spectroscopic Data (500 MHz, Pyridine-$d_5$) for Malonylfloralginsenosides $Rd_4$−$Rd_6$ (**9**−**11**)

| | m-floral-$Rd_4$ (**9**) | | m-floral-$Rd_5$ (**10**) | | m-floral-$Rd_6$ (**11**) | |
|---|---|---|---|---|---|---|
| position | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) |
| 1 | 39.6, $CH_2$ | 1.51, m | 39.5, $CH_2$ | 1.56, m | 39.7, $CH_2$ | 1.55, m |
| | | 0.76, m | | 0.73, m | | 0.73, m |
| 2 | 27.0, $CH_2$ | 2.23, m | 27.0, $CH_2$ | 2.20, m | 27.2, $CH_2$ | 2.26, m |
| | | 1.86, m | | 1.85, m | | 1.88, m |
| 3 | 89.4, CH | 3.29, dd (11.7, 4.3) | 89.3, CH | 3.27, dd (11.9, 4.4) | 89.8, CH | 3.29, dd (11.6, 4.4) |
| 4 | 40.5, C | | 40.3, C | | 40.5, C | |
| 5 | 56.8, CH | 0.68, m | 56.7, CH | 0.67, m | 57.0, CH | 0.72, m |
| 6 | 18.9, $CH_2$ | 1.50, m | 18.7, $CH_2$ | 1.48, m | 18.9, $CH_2$ | 1.46, m |
| | | 1.36, m | | 1.36, m | | 1.42, m |
| 7 | 35.5, $CH_2$ | 1.45, m | 35.4, $CH_2$ | 1.47, m | 35.6, $CH_2$ | 1.46, m |
| | | 1.20, m | | 1.20, m | | 1.17, m |
| 8 | 40.1, C | | 40.0, C | | 40.2, C | |
| 9 | 50.6, CH | 1.34, m | 50.5, CH | 1.38, m | 50.7, CH | 1.39, m |
| 10 | 37.3, C | | 37.2, C | | 37.4, C | |
| 11 | 31.3, $CH_2$ | 1.94, m | 31.2, $CH_2$ | 1.95, m | 31.4, $CH_2$ | 1.98, m |
| | | 1.55, m | | 1.55, m | | 1.55, m |
| 12 | 70.7, CH | 4.05, m | 70.5, CH | 4.18, m | 70.6, CH | 4.19, m |
| 13 | 49.8, CH | 1.95, m | 50.0, CH | 2.00, m | 50.0, CH | 2.01, m |
| 14 | 51.9, C | | 51.7, C | | 51.9, C | |
| 15 | 31.2, $CH_2$ | 1.55, m | 31.1, $CH_2$ | 1.56, m | 31.2, $CH_2$ | 1.56, m |
| | | 1.00, m | | 0.99, m | | 1.00, m |
| 16 | 27.1, $CH_2$ | 1.87, m | 27.1, $CH_2$ | 1.85, m | 27.3, $CH_2$ | 1.88, m |
| | | 1.37, m | | 1.36, m | | 1.42, m |
| 17 | 51.9, CH | 2.52, m | 51.9, CH | 2.58, m | 51.9, CH | 2.59, m |
| 18 | 16.4, $CH_3$ | 0.95, s | 16.3, $CH_3$ | 0.98, s | 16.5, $CH_3$ | 0.98, s |
| 19 | 16.7, $CH_3$ | 0.82, s | 16.6, $CH_3$ | 0.81, s | 16.8, $CH_3$ | 0.85, s |
| 20 | 84.0, C | | 83.8, C | | 84.0, C | |
| 21 | 22.8, $CH_3$ | 1.60, s | 22.5, $CH_3$ | 1.64, s | 22.6, $CH_3$ | 1.64, s |
| 22 | 36.6, $CH_2$ | 2.36, m | 36.5, $CH_2$ | 2.40, m | 36.6, $CH_2$ | 2.39, m |
| | | 1.83, m | | 1.82, m | | 1.82, m |
| 23 | 23.7, $CH_2$ | 2.46, m | 23.3, $CH_2$ | 2.59, m | 23.5, $CH_2$ | 2.60, m |
| | | 2.24, m | | 2.34, m | | 2.36, m |
| 24 | 126.3, CH | 5.24, m | 126.4, CH | 5.32, t (7.1) | 126.5, CH | 5.32, m |
| 25 | 131.4, C | | 131.4, C | | 131.5, C | |
| 26 | 26.2, $CH_3$ | 1.61, s | 26.1, $CH_3$ | 1.64, s | 26.3, $CH_3$ | 1.64, s |
| 27 | 18.2, $CH_3$ | 1.61, s | 18.1, $CH_3$ | 1.67, s | 18.3, $CH_3$ | 1.68, s |
| 28 | 28.6, $CH_3$ | 1.30, s | 28.4, $CH_3$ | 1.29, s | 28.5, $CH_3$ | 1.39, s |

| | | | | | | |
|---|---|---|---|---|---|---|
| 29 | 17.1, $CH_3$ | 1.12, s | 16.9, $CH_3$ | 1.12, s | 17.0, $CH_3$ | 1.21, s |
| 30 | 17.7, $CH_3$ | 0.92, s | 17.7, $CH_3$ | 0.96, s | 17.9, $CH_3$ | 0.95, s |
| | **3-Glc** | | **3-Glc** | | **3-Glc** | |
| 1' | 105.6, CH | 4.94, d (7.6) | 105.5, CH | 4.94, d (7.5) | 105.4, CH | 4.94, d (7.6) |
| 2' | 84.2, CH | 4.27, m | 83.8, CH | 4.26, m | 84.9, CH | 4.19, m |
| 3' | 78.8, CH | 4.30, m | 78.3, CH | 4.33, m | 78.6, CH | 4.32, m |
| 4' | 72.1, CH | 4.16, m | 72.0, CH | 4.16, m | 71.9, CH | 4.17, m |
| 5' | 78.8, CH | 3.94, m | 78.6, CH | 3.95, m | 78.5, CH | 3.95, m |
| 6' | 63.4, $CH_2$ | 4.59, dd (12.0, 1.9) | 63.2, $CH_2$ | 4.58, dd (11.8, 2.2) | 63.2, $CH_2$ | 4.58, dd (11.8, 2.0) |
| | | 4.36, m | | 4.37, m | | 4.36, m |
| | **2'-Glc** | | **2'-Glc** | | **2'-Glc** | |
| 1'' | 106.6, CH | 5.40, d (7.6) | 106.4, CH | 5.39, d (7.6) | 106.7, CH | 5.35, d (7.6) |
| 2'' | 77.7, CH | 4.17, m | 77.6, CH | 4.15, m | 77.2, CH | 4.15, m |
| 3'' | 78.6, CH | 4.27, m | 78.5, CH | 4.27, m | 79.1, CH | 4.22, m |
| 4'' | 72.1, CH | 4.37, m | 72.0, CH | 4.37, m | 71.5, CH | 4.33, m |
| 5'' | 78.8, CH | 3.95, m | 78.7, CH | 3.95, m | 75.9, CH | 4.09, m |
| 6'' | 63.2, $CH_2$ | 4.51, m | 63.0, $CH_2$ | 4.52, m | 65.9, $CH_2$ | 5.10, dd (11.8, 1.6) |
| | | 4.36, m | | 4.36, m | | 4.99, dd (11.8, 5.0) |
| | **20-Glc** | | **20-Glc** | | **20-Glc** | |
| 1''' | 98.5, CH | 5.24, d (7.8) | 98.3, CH | 5.14, d (7.7) | 98.5, CH | 5.14, d (7.8) |
| 2''' | 73.4, CH | 4.07, m | 75.3, CH | 3.99, m | 75.4, CH | 4.01, m |
| 3''' | 81.7, CH | 5.95, t (9.2) | 79.5, CH | 4.20, m | 79.7, CH | 4.21, m |
| 4''' | 69.7, CH | 4.29, m | 72.0, CH | 4.18, m | 72.1, CH | 4.18, m |
| 5''' | 78.4, CH | 3.98, m | 75.3, CH | 4.06, m | 75.9, CH | 4.07, m |
| 6''' | 62.7, $CH_2$ | 4.46, m | 65.9, $CH_2$ | 5.16, dd (11.6, 1.8) | 66.1, $CH_2$ | 5.17, dd (11.8, 1.9) |
| | | 4.33, m | | 4.71, dd (11.7, 7.6) | | 4.72, dd (11.6, 7.4) |
| | **3'''-Mal.** | | **6'''-Mal.** | | **6''-Mal.** | |
| -O-CO | 169.1, C | | 168.4, C | | 168.4, C | |
| CH2 | 44.1, $CH_2$ | 3.72, t (2H, 16.3) | 43.4, $CH_2$ | 3.84, dd (2H, 22.3, 15.5) | 43.4, $CH_2$ | 3.83, m (2H) |
| COOH | 171.3, C | | 170.0, C | | 170.1, C | |
| | | | | | **6'''-Malonyl** | |
| -O-CO | | | | | 168.7, C | |
| CH2 | | | | | 43.2, $CH_2$ | 3.83, m (2H) |
| COOH | | | | | 170.1, C | |

**Table S4.** NMR Spectroscopic Data (500 MHz, Pyridine-$d_5$) for Malonylfloralginsenosides $Rc_1$-$Rc_4$ (**12-15**)

| | m-floral-$Rc_1$ (**12**) | | m-floral-$Rc_2$ (**13**) | | m-floral-$Rc_3$ (**14**) | | m-floral-$Rc_4$ (**15**) | |
|---|---|---|---|---|---|---|---|---|
| position | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) | $\delta_C$, type | $\delta_H$, mult (*J* in Hz) |
| 1 | 39.7, $CH_2$ | 1.56, m | 39.6, $CH_2$ | 1.54, m | 39.6, $CH_2$ | 1.56, m | 39.6, $CH_2$ | 1.56, m |
| | | 0.75, m | | 0.73, m | | 0.73, m | | 0.73, m |
| 2 | 27.3, $CH_2$ | 2.22, m | 27.2, $CH_2$ | 2.21, m | 27.2, $CH_2$ | 2.20, m | 27.2, $CH_2$ | 2.19, m |
| | | 1.84, m | | 1.81, m | | 1.81, m | | 1.82, m |
| 3 | 89.8, CH | 3.27, dd (11.5, 4.2) | 89.5, CH | 3.24, dd (11.5, 4.2) | 89.4, CH | 3.26, dd (11.6, 4.3) | 89.4, CH | 3.26, dd (11.7, 4.3) |
| 4 | 40.5, C | | 40.5, C | | 40.5, C | | 40.5, C | |
| 5 | 56.9, CH | 0.70, m | 56.8, CH | 0.65, m | 56.8, CH | 0.67, m | 56.8, CH | 0.66, m |
| 6 | 18.9, $CH_2$ | 1.47, m | 18.9, $CH_2$ | 1.47, m | 18.9, $CH_2$ | 1.47, m | 18.9, $CH_2$ | 1.48, m |
| | | 1.41, m | | 1.35, m | | 1.36, m | | 1.36, m |
| 7 | 35.6, $CH_2$ | 1.47, m | 35.6, $CH_2$ | 1.46, m | 35.6, $CH_2$ | 1.47, m | 35.6, $CH_2$ | 1.46, m |
| | | 1.16, m | | 1.21, m | | 1.22, m | | 1.21, m |
| 8 | 40.2, C | | 40.1, C | | 40.1, C | | 40.1, C | |
| 9 | 50.7, CH | 1.39, m | 50.7, CH | 1.35, m | 50.7, CH | 1.37, m | 50.6, CH | 1.37, m |
| 10 | 37.4, C | | 37.4, C | | 37.4, C | | 37.3, C | |
| 11 | 31.2, $CH_2$ | 1.98, m | 31.2, $CH_2$ | 1.99, m | 31.1, $CH_2$ | 1.97, m | 31.1, $CH_2$ | 1.98, m |
| | | 1.54, m | | 1.58, m | | 1.58, m | | 1.55, m |
| 12 | 70.6, CH | 4.21, m | 70.6, CH | 4.17, m | 70.6, CH | 4.19, m | 70.7, CH | 4.17, m |
| 13 | 50.0, CH | 2.00, m | 50.0, CH | 1.97,m | 50.0, CH | 2.00, m | 49.9, CH | 2.00, m |
| 14 | 51.8, C | | 51.9, C | | 51.9, C | | 51.9, C | |
| 15 | 31.3, $CH_2$ | 1.54, m | 31.3, $CH_2$ | 1.58, m | 31.3, $CH_2$ | 1.58, m | 31.3, $CH_2$ | 1.58, m |
| | | 0.99, m | | 1.03, m | | 1.00, m | | 0.99, m |
| 16 | 27.1, $CH_2$ | 1.84, m | 27.1, $CH_2$ | 1.86, m | 27.1, $CH_2$ | 1.85, m | 27.1, $CH_2$ | 1.87, m |
| | | 1.34, m | | 1.38, m | | 1.40, m | | 1.40, m |
| 17 | 52.1, CH | 2.60, m | 52.1, CH | 2.58, m | 52.1, CH | 2.59, m | 52.1, CH | 2.57, m |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 18 | 16.5, $CH_3$ | 0.94, s | 16.5, $CH_3$ | 0.96, s | 16.5, $CH_3$ | 0.97, s | 16.4, $CH_3$ | 0.97, s |
| 19 | 16.8, $CH_3$ | 0.85, s | 16.7, $CH_3$ | 0.82, s | 16.7, $CH_3$ | 0.83, s | 16.7, $CH_3$ | 0.82, s |
| 20 | 83.9, C | | 83.9, C | | 83.9, C | | 83.9, C | |
| 21 | 22.7, $CH_3$ | 1.66, s | 22.8, $CH_3$ | 1.66, s | 22.8, $CH_3$ | 1.64, s | 22.8, $CH_3$ | 1.63, s |
| 22 | 36.6, $CH_2$ | 2.41, m | 36.6, $CH_2$ | 2.38, m | 36.6, $CH_2$ | 2.42, m | 36.6, $CH_2$ | 2.41, m |
| | | 1.82, m | | 1.86, m | | 1.85, m | | 1.85, m |
| 23 | 23.6, $CH_2$ | 2.64, m | 23.7, $CH_2$ | 2.59, m | 23.7, $CH_2$ | 2.60, m | 23.6, $CH_2$ | 2.57, m |
| | | 2.37, m | | 2.39, m | | 2.40, m | | 2.39, m |
| 24 | 126.5, CH | 5.32, t (7.0) | 126.4, CH | 5.34, m | 126.4, CH | 5.34, m | 126.5, CH | 5.32, m |
| 25 | 131.4, C | | 131.6, C | | 131.6, C | | 131.5, C | |
| 26 | 26.3, $CH_3$ | 1.61, s | 26.3, $CH_3$ | 1.63, s | 26.2, $CH_3$ | 1.67, s | 26.2, $CH_3$ | 1.67, s |
| 27 | 18.4, $CH_3$ | 1.66, s | 18.3, $CH_3$ | 1.67, s | 18.3, $CH_3$ | 1.67, s | 18.3, $CH_3$ | 1.67, s |
| 28 | 28.5, $CH_3$ | 1.38, s | 28.5, $CH_3$ | 1.29, s | 28.5, $CH_3$ | 1.26, s | 28.5, $CH_3$ | 1.26, s |
| 29 | 17.0, $CH_3$ | 1.20, s | 17.1, $CH_3$ | 1.07, s | 17.1, $CH_3$ | 1.07, s | 17.1, $CH_3$ | 1.07, s |
| 30 | 17.9, $CH_3$ | 0.97, s | 17.8, $CH_3$ | 0.96, s | 17.8, $CH_3$ | 0.97, s | 17.8, $CH_3$ | 0.96, s |
| | **3-Glc** | | **3-Glc** | | **3-Glc** | | **3-Glc** | |
| 1' | 105.4, CH | 4.93, d (7.5) | 105.4, CH | 4.90, d (7.5) | 105.5, CH | 4.91, d (7.4) | 105.5, CH | 4.91, d (7.4) |
| 2' | 84.9, CH | 4.19, m | 83.7, CH | 4.24, m | 83.4, CH | 4.26, m | 83.4, CH | 4.26, m |
| 3' | 78.6, CH | 4.32, m | 78.8, CH | 4.31, m | 78.8, CH | 4.27, m | 78.6, CH | 4.27, m |
| 4' | 72.1, CH | 4.17, m | 72.3, CH | 4.15, m | 72.3, CH | 4.12, t (9.2) | 72.2, CH | 4.12, t (9.2) |
| 5' | 78.5, CH | 3.94, m | 78.6, CH | 3.93, m | 78.7, CH | 3.94, m | 78.6, CH | 3.93, m |
| 6' | 63.2, $CH_2$ | 4.57, dd (12.1, 2.3) | 63.3, $CH_2$ | 4.57, dd (11.9, 2.1) | 63.3, $CH_2$ | 4.57, dd (12.1, 2.1) | 63.3, $CH_2$ | 4.57, dd (11.8, 2.1) |
| | | 4.37, m | | 4.37, m | | 4.35, m | | 4.34, m |
| | **2'-Glc** | | **2'-Glc** | | **2'-Glc** | | **2'-Glc** | |
| 1" | 106.7, CH | 5.35, d (7.7) | 106.1, CH | 5.41, d (7.7) | 106.0, CH | 5.46, d (7.6) | 106.0, CH | 5.46, d (7.6) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2" | 77.4, CH | 4.15, m | 77.5, CH | 4.17, m | 75.4, CH | 4.20, m | 75.3, CH | 4.20, m |
| 3" | 78.5, CH | 4.22, m | 75.7, CH | 4.37, m | 80.4, CH | 5.99, t (9.6) | 80.4, CH | 5.99, t (9.5) |
| 4" | 71.9, CH | 4.27, m | 73.9, CH | 5.87, t (9.6) | 69.6, CH | 4.49, m | 69.6, CH | 4.49, t (9.4) |
| 5" | 75.9, CH | 4.06, m | 76.5, CH | 4.03, m | 78.6, CH | 3.94, m | 78.6, CH | 3.94, m |
| 6" | 65.8, $CH_2$ | 5.07, d (11.2) | 62.5, $CH_2$ | 4.42, m | 62.2, $CH_2$ | 4.46, m | 62.3, $CH_2$ | 4.45, m |
| | | 4.99, m | | 4.33, m | | 4.33, m | | 4.33, m |
| | **20-Glc** | | **20-Glc** | | **20-Glc** | | **20-Glc** | |
| 1''' | 98.6, CH | 5.15, d (7.6) | 98.6, CH | 5.15, d (7.7) | 98.6, CH | 5.15, d (7.6) | 98.6, CH | 5.16, d (7.8) |
| 2''' | 75.4, CH | 3.95, m | 75.4, CH | 3.95, m | 75.4, CH | 3.96, m | 75.5, CH | 3.99, m |
| 3''' | 79.8, CH | 4.19, m | 79.7, CH | 4.19, m | 79.7, CH | 4.19, m | 79.7, CH | 4.20, m |
| 4''' | 71.6, CH | 4.08, m | 72.1, CH | 4.07, m | 72.2, CH | 4.07, m | 72.6, CH | 4.06, m |
| 5''' | 77.2, CH | 4.09, m | 77.2, CH | 4.04, m | 77.2, CH | 4.07, m | 77.0, CH | 4.06, m |
| 6''' | 70.5, $CH_2$ | 4.76, d (10.8) | 69.7, $CH_2$ | 4.71, d (10.8) | 69.7, $CH_2$ | 4.72, d (11.0) | 69.0, $CH_2$ | 4.69, dd (10.7, 2.0) |
| | | 4.33, m | | 4.27, m | | 4.28, m | | 4.13, m |
| | **6'''-Xyl** | | **6'''-Ara (*p*)** | | **6'''-Ara (*p*)** | | **6'''-Ara (*f*)** | |
| 1'''' | 106.4, CH | 5.01, d (7.4) | 105.1, CH | 5.02, d (6.0) | 105.1, CH | 5.02, d (6.1) | 110.6, CH | 5.68, d (1.2) |
| 2'''' | 75.3, CH | 4.05, m | 72.6, CH | 4.47, dd（7.7，6.2） | 72.6, CH | 4.48, m | 83.9, CH | 4.90, m |
| 3'''' | 78.6, CH | 4.20, m | 74.6, CH | 4.24, m | 74.6, CH | 4.25, m | 79.3, CH | 4.83, m |
| 4'''' | 71.4, CH | 4.23, m | 69.0, CH | 4.39, m | 69.0, CH | 4.38, m | 86.5, CH | 4.77, m |
| 5'''' | 67.5, $CH_2$ | 4.35, dd (11.1, 10.1) | 66.0, $CH_2$ | 4.33, m | 66.0, $CH_2$ | 4.33, m | 63.1, $CH_2$ | 4.35, m |
| | | 3.70, m | | 3.82, m | | 3.82, dd (11.8, 2.0) | | 4.24, m |
| | **6''-Mal.** | | **4''-Mal.** | | **3''-Mal.** | | **3''-Mal.** | |
| -O-CO | 169.4, C | | 168.2, C | | 168.5, C | | 168.6, C | |
| CH2 | 43.5, | 3.82, dd | 43.7, | 3.79, dd | 43.6, $CH_2$ | 3.77, s | 43.7, $CH_2$ | 3.74, s (2H) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $CH_2$ | (2H, 26.4, 15.7) | $CH_2$ | (2H, 26.4, 15.7) | | (2H) | | |
| COOH | 174.2, C | | 170.6, C | | 170.6, C | | 170.7, C | |