## Supporting Information

***Rec. Nat. Prod.*** **X:X (202X) XX-XX**

# GLUT4 tanslocation active flavonoids from *Caragana jubata*

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## 1. Characterization of Compounds

*Caraganin E (**1**):* Brown oily; $[\alpha]_D^{20}$ +1.4 (*c* 0.50, MeOH); UV (MeOH); $\lambda_{max}$ (log $\varepsilon$): 225 (4.28), 280 (4.18), 350 (3.86) nm; IR *v*KBr max ($cm^{-1}$) 3225, 1654, 1616, 1519; $^1H$ and $^{13}C$ NMR spectroscopic data can be found in **Table 1**; HR-ESI-MS *m/z* 301.0731 $[M-H]^-$ (calcd for $C_{16}H_{13}O_6^-$, 301.0718).

**(***3R)-Caraganin F (**2**):* Amorphous powder; $[\alpha]_D^{20}$ -5 (*c* 0.40, MeOH); UV (MeOH); $\lambda_{max}$ (log $\varepsilon$): 225 (4.25) 300 (3.95) nm; IR *v*KBr max ($cm^{-1}$) 3410, 2916, 1620, 1338; CD (*c* 0.50, MeOH) $\lambda_{max\ (\Delta\varepsilon)}$ 216 (-5.88) nm, 239 (-3.84) nm, 282 (1.55) nm; $^1H$ and $^{13}C$ NMR spectroscopic data can be found in **Table 1**; HR-ESI-MS *m/z* 317.1020 $[M+H]^+$ (calcd for $C_{17}H_{17}O_{10}^+$, 317.1020).

*7,3'-Dihydroxyl-5'-methoxyisoflavone (**3**):* $^1H$-NMR (600 MHz, $CD_3OD$) $\delta_H$: 8.10 (1H, s, H-2), 8.02 (1H, d, *J* = 8.8 Hz, H-5), 7.01 (1H, d, *J* = 1.2 Hz, H-4'), 6.94 (2H, s, H-2', 6'), 6.91 (1H, dd, *J* = 8.8, 2.3 Hz, H-6), 6.82 (1H, d, *J* = 2.3 Hz, H-8), 3.86 (3H, s, 5'-$OCH_3$); $^{13}C$-NMR (150 MHz, $CD_3OD$) $\delta_C$: 178.01 (C-4), 164.76 (C-7), 159.76 (C-9), 154.85 (C-2), 149.15 (C-5'), 147.41 (C-3'), 128.51 (C-5), 126.19 (C-3), 125.77 (C-1'), 121.59 (C-6'), 118.13 (C-10), 117.38 (C-4'), 116.51 (C-6), 112.57 (C-2'), 103.24 (C-8), 56.38 (5'-$OCH_3$).

*(6aR,11aR)-3,4-Dihydroxy-9-methoxypterocarpan (**4**):* $^1H$-NMR (600 MHz, $CD_3OD$) $\delta_H$: 7.16 (1H, d, *J* = 8.2, H-7), 6.84 (1H, d, *J* = 8.4 Hz, H-1), 6.53 (1H, d, *J* = 8.4 Hz, H-2), 6.44 (1H, dd, *J* = 8.2, 2.3 Hz, H-8), 6.37 (1H, d, *J* = 2.3, H-10), 5.48 (1H, d, *J* = 6.5 Hz, H-11a), 4.34 (1H, m, $H_\alpha$-6), 3.73 (3H, s, 9-$OCH_3$), 3.56 (1H, s, $H_\beta$-6), 3.52 (1H, m, H-6a); $^{13}C$-NMR (150 MHz, $CD_3OD$) $\delta_C$: 162.59 (C-9), 162.02 (C-10a), 147.14 (C-3), 145.81 (C-4a), 134.32 (C-4), 125.98 (C-7), 122.11 (C-1), 120.73 (C-6b), 113.75 (C-11b), 110.40 (C-2), 107.22 (C-8), 97.51 (C-10), 80.29 (C-11a), 67.91 (C-6), 55.88 (9-$OCH_3$), 40.99 (C-6a).

*(6aR,11aR)-3,8-Dihydroxy-9-methoxypterocarpan* (*5*): $^1H$-NMR (600 MHz, $CD_3OD$) $\delta_H$: 7.25 (1H, dd, *J* = 8.4 Hz, H-1), 6.76 (1H, s, H-7), 6.46 (2H, m, H-2, 10), 6.28 (1H, d, *J* = 2.4 Hz, H-4), 5.38 (1H, d, *J* = 6.8 Hz, H-11a), 4.19 (1H, dd, *J* = 10.6, 4.6, H-6), 3.78 (3H, s, 9-$OCH_3$), 3.51 (1H, t, *J* = 10.6 Hz, H$\alpha$-6), 3.44 (1H, m, H-6a); $^{13}C$-NMR (150M, $CD_3OD$) $\delta_C$: 160.00 (C-3), 158.00 (C-4a), 154.06 (C-10a), 149.51 (C-9), 141.61 (C-8), 133.14 (C-1), 119.42 (C-6b), 113.08 (C-11b), 112.44 (C-7), 110.65 (C-2), 104.04 (C-4), 96.22 (C-10), 79.54 (C-11a), 67.51 (C-6), 56.62 (MeO-9), 41.61 (C-6a).

*Lespedezol $D_1$ (**6**):* $^1H$-NMR (600 MHz, DMSO-$d_6$) $\delta_H$: 7.24 (1H, d, *J* = 8.4 Hz, H-1), 6.98 (1H, s, H-7), 6.46 (1H, dd, *J* = 8.4, 2.4 Hz, H-2), 6.28 (1H, s, H-10), 6.26 (1H, d, *J* = 2.4 Hz, H-4), 5.43 (1H, d, *J* = 6.8, H-11a), 4.22 (1H, m, H-6$\alpha$), 3.70 (3H, s, 8-$OCH_3$), 3.54 (2H, m, H-6$\beta$, 6a); $^{13}C$-NMR (150 MHz, DMSO-$d_6$) $\delta_C$: 158.60 (C-3), 156.27 (C-4a), 153.33 (C-10a), 147.39 (C-9), 141.91 (C-8), 132.09 (C-1), 116.31 (C-6b), 111.51 (C-11b), 110.41 (C-7), 109.58 (C-2), 102.77 (C-4), 98.18 (C-10), 77.47 (C-11a), 65.91 (C-6), 56.81 (8-$OCH_3$), 40.11 (C-6a).

*Pinoresinol (**7**):* $^1H$-NMR (600 MHz, $CD_3OD$) $\delta_H$: 6.95 (2H, d, *J* = 1.9 Hz, H-2, 2'), 6.81 (2H, dd, *J* = 8.0, 1.9 Hz, H-6, 6'), 6.77 (2H, d, *J* = 8.0 Hz, H-5, 5'), 4.70 (2H, d, *J* = 4.6 Hz, H-7, 7'), 4.23 (2H, dd, *J* = 9.0, 6.9 Hz, H-9a, 9a'), 3.85 (6H, s, 3, 3'-$OCH_3$), 3.83 (2H, m, H-9b, 9b'), 3.14 (2H, m, H-8, 8'); $^{13}C$-NMR (150M, $CD_3OD$) $\delta_C$: 149.11 (C-3, 3'), 147.30 (C-4, 4'), 133.78 (C-

1, 1'), 120.05 (C-6, 6'), 116.06 (C-5, 5'), 110.93 (C-2, 2'), 87.51 (C-7, 7'), 72.59 (C-9, 9'), 56.37 (3, 3'-$OCH_3$), 55.36 (C-8, 8').

*kaempferol (**8**):* $^1$H-NMR (600 MHz, $CD_3OD$) $\delta_H$: 8.08 (2H, d, *J* = 8.8 Hz, H-2', 6'), 6.89 (2H, d, *J* = 8.8 Hz, H-3', 5'), 6.38 (1H, d, *J* = 1.8 Hz, H-8), 6.17 (1H, d, *J* = 1.8 Hz, H-6); $^{13}$C-NMR (150 MHz, $CD_3OD$) $\delta_C$: 177.41 (C-4), 165.60 (C-7), 162.54 (C-5), 160.57 (C-4′), 158.26 (C-9), 148.05 (C-2), 137.19 (C-3), 130.68 (C-2', 6'), 123.74 (C-1'), 116.30 (C-3', 5'), 104.54 (C-10), 99.25 (C-6), 94.44 (C-8).

*Liquiritigenin (**9**):* $^1$H-NMR (600 MHz, $CD_3OD$) $\delta_H$: 7.71 (1H, d, *J* = 8.7 Hz, H-5), 7.30 (2H, d, *J* = 8.5 Hz, H-2', 6'), 6.80 (2H, d, *J* = 8.5 Hz, H-3', 5'), 6.48 (1H, dd, *J* = 8.7, 2.3 Hz, H-6), 6.33 (1H, d, *J* = 2.3 Hz, H-8), 5.36 (1H, dd, *J* = 13.1, 2.8 Hz, H-2), 3.30 (1H, dd, *J* = 16.9, 13.1 Hz, H-3b), 2.67 (1H, dd, *J* = 16.9, 2.9 Hz, H-3a); $^{13}$C-NMR (150 MHz, $CD_3OD$) $\delta_C$: 193.56 (C-4), 166.82 (C-7), 165.58 (C-5), 158.98 (C-4'), 131.34 (C-1'), 129.86 (C-5), 129.02 (C-2', 6'), 116.30 (C-3', 5'), 114.96 (C-10), 111.75 (C-6), 103.81 (C-8), 81.05 (C-2), 44.95 (C-3).

*Erycibenin D (**10**):* $^1$H-NMR (600 MHz, $CD_3OD$) $\delta_H$: 7.73 ( 1H, d, *J* = 8.7 Hz, H-5), 7.13 (1H, d, *J* = 1.9 Hz, H-2'), 6.99 (1H, dd, *J* = 8.1, 1.9 Hz, H-6'), 6.84 (1H, d, *J* = 8.1 Hz, H-5'), 6.54 (1H, dd, *J* = 8.7, 2.2 Hz, H-6), 6.34 (1H, d, *J* = 2.2 Hz, H-8), 5.01 (1H, d, *J* = 11.9 Hz, H-2), 4.58 (1H, d, *J* = 11.9 Hz, H-3), 3.89 (3H, s, 3'-OCH3); $^{13}$C-NMR (150 MHz, $CD_3OD$) $\delta_C$: 194.50 (C-4), 166.88 (C-7), 165.07 (C-9), 148.90 (C-3'), 148.28 (C-4'), 130.10 (C-1'), 130.03 (C-5), 122.20 (C-6'), 115.94 (C-5'), 113.46 (C-10), 112.42 (C-2'), 112.13 (C-6), 103.71 (C-8), 85.74 (C-2), 74.54 (C-3), 56.43 (3'-OCH3).

*Quercetin 3-O-β-glucopyranoside (**11**):* $^1$H-NMR (600 MHz, DMSO-$d_6$) $\delta_H$: 7.57 (2H, m, H-2', 5'), 6.83 (1H, d, *J* = 9.0 Hz, H-6'), 6.38 (1H, s, H-6), 6.17 (1H, s, H-8), 5.47 (1H, d, *J* = 7.3 Hz, Glu-1), 3.21 (6H, m, Glc-2-Glc-6); $^{13}$C-NMR (150 MHz, DMSO-$d_6$) $\delta_C$: 177.36 (C-4), 164.87 (C-7), 161.24 (C-5), 156.41 (C-2), 156.07 (C-9), 148.63 (C-4'), 144.92 (C-3'), 133.26 (C-3), 121.60 (C-6'), 121.12 (C-1'), 116.18 (C-5'), 115.25(C-2'), 103.73 (C-10), 100.90 (Glc-1), 98.88(C-6), 93.63(C-8), 77.61 (Glc-5), 76.53 (Glc-3), 74.12 (Glc-2), 69.94 (Glc-4), 60.98 (Glc-6).

*Calycosin (**12**):* $^1$H-NMR (600 MHz, DMSO-$d_6$) $\delta_H$: 8.28 (1H, s, H-2), 7.96 (1H, d, *J* = 8.8 Hz, H-5), 7.04 (1H, d, *J* = 1.6 Hz, H-2'), 6.94 (2H, m, H-5', 6'), 6.93 (1H, m, H-6), 6.85 (1H, d, *J* = 2.2 Hz, H-8), 3.79 (3H, s, 4'-$OCH_3$); $^{13}$C-NMR (150 MHz, DMSO-$d_6$) $\delta_C$: 174.63 (C-4), 162.76 (C-7), 157.46 (C-9), 153.11 (C-2), 147.52 (C-4'), 146.04 (C-3'), 127.34 (C-5), 124.73 (C-1'), 123.38 (C-3), 119.74 (C-6'), 116.59 (C-10), 116.46 (C-2'), 115.27 (C-6), 111.95 (C-5'), 102.14 (C-8), 55.68 (4'-$OCH_3$).

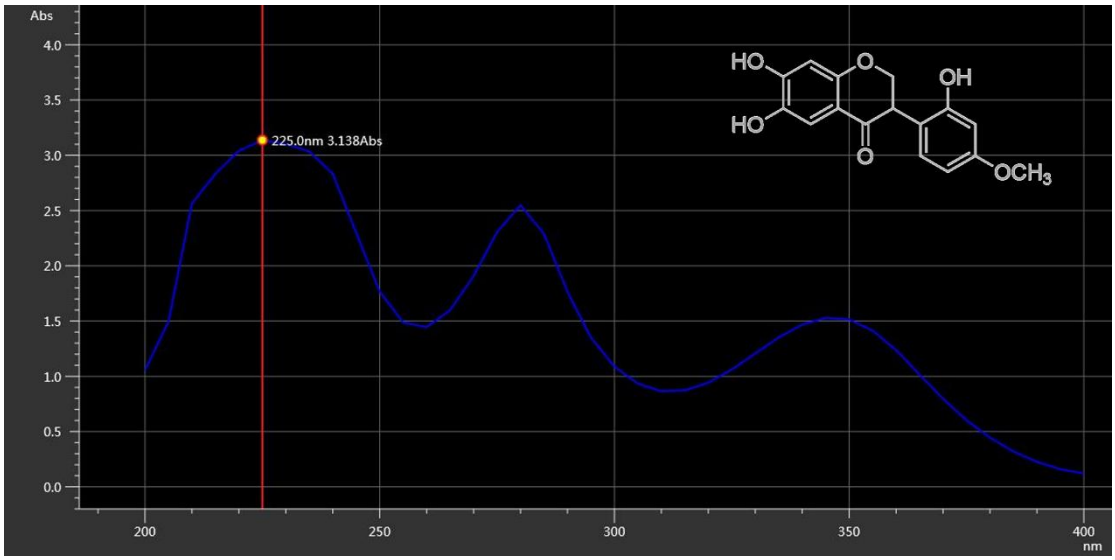



**Figure S1:** UV spectrum of Compound **1**

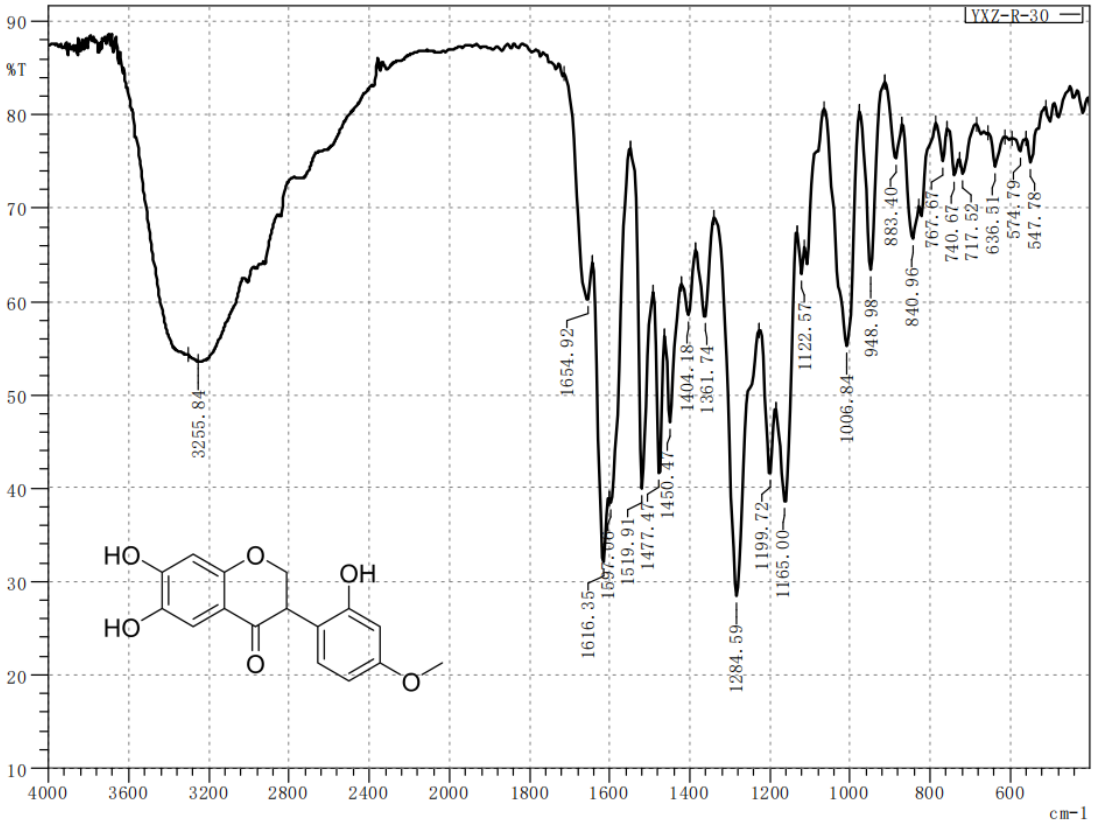



**Figure S2:** IR spectrum of Compound **1**

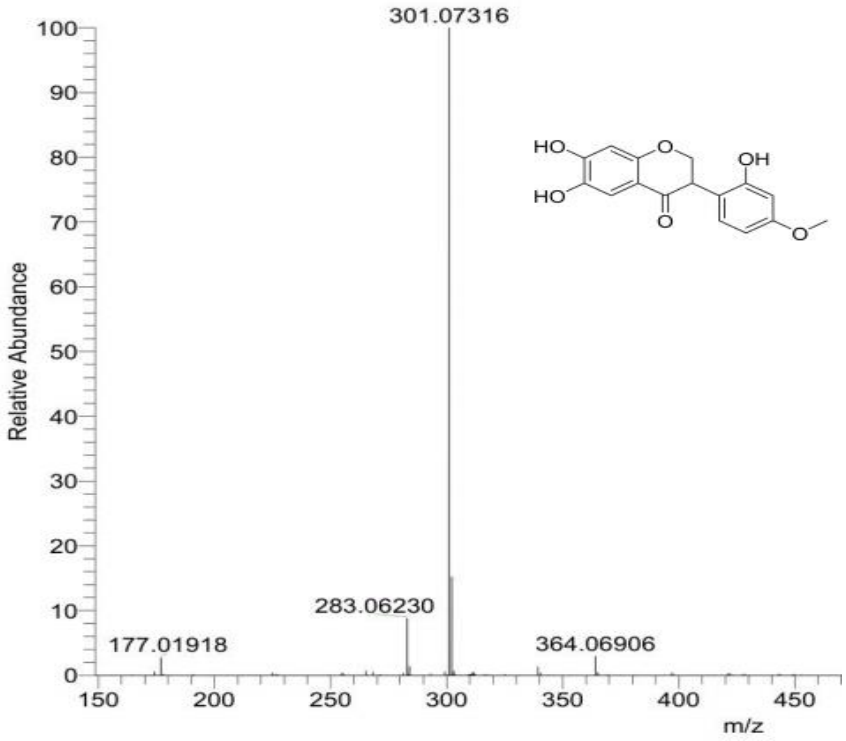



**Figure S3:** HR-ESI-M of Compound **1**

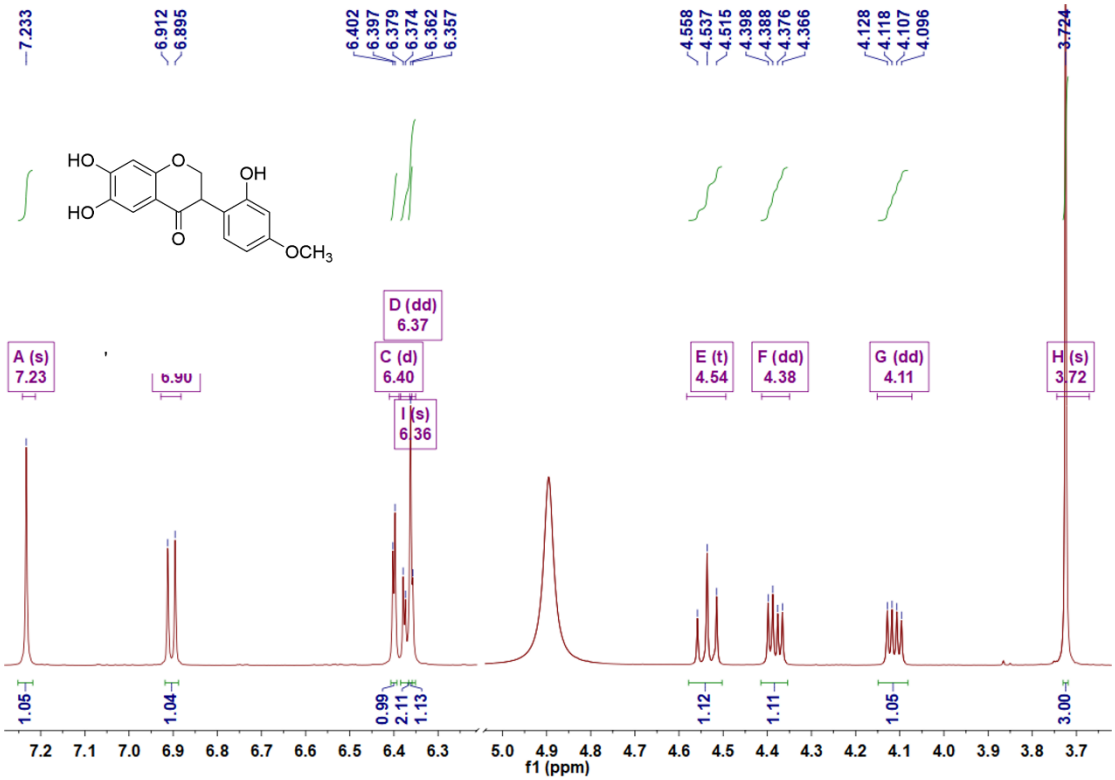



**Figure S4:** $^{1}$H NMR spectrum (600 MHz, DMSO-$d_6$) of Compound **1**

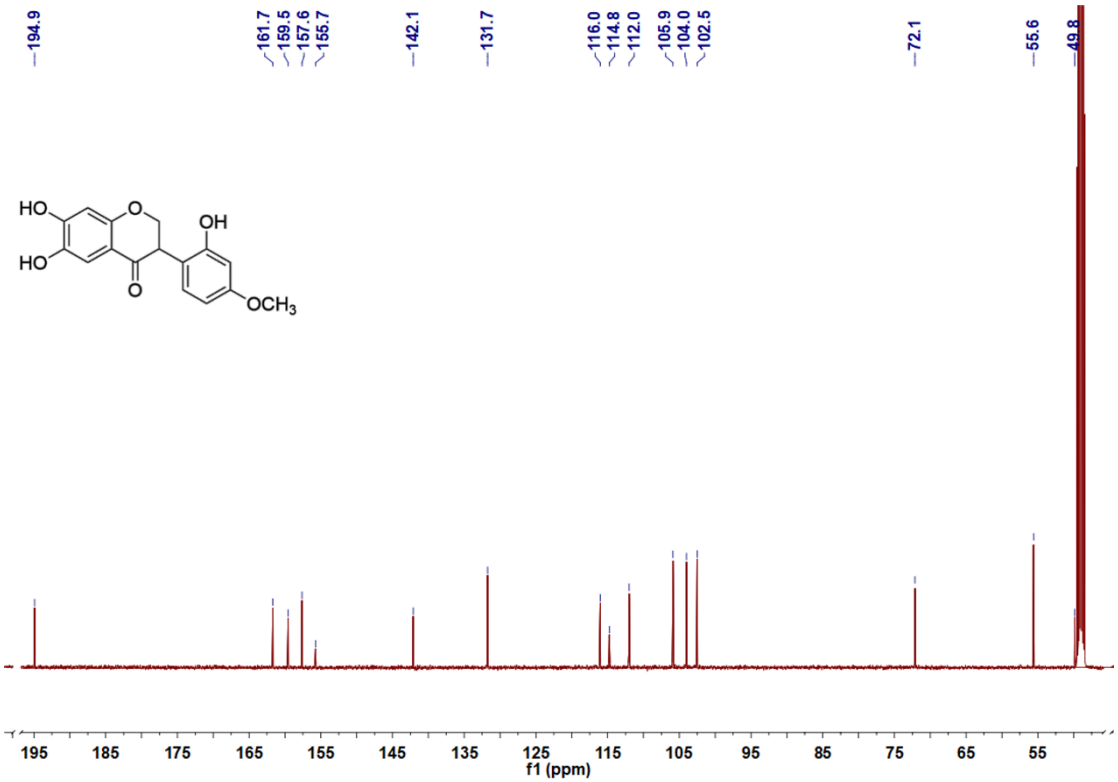



**Figure S5:** $^{13}$C NMR spectrum (150 MHz, DMSO-$d_6$) of Compound **1**

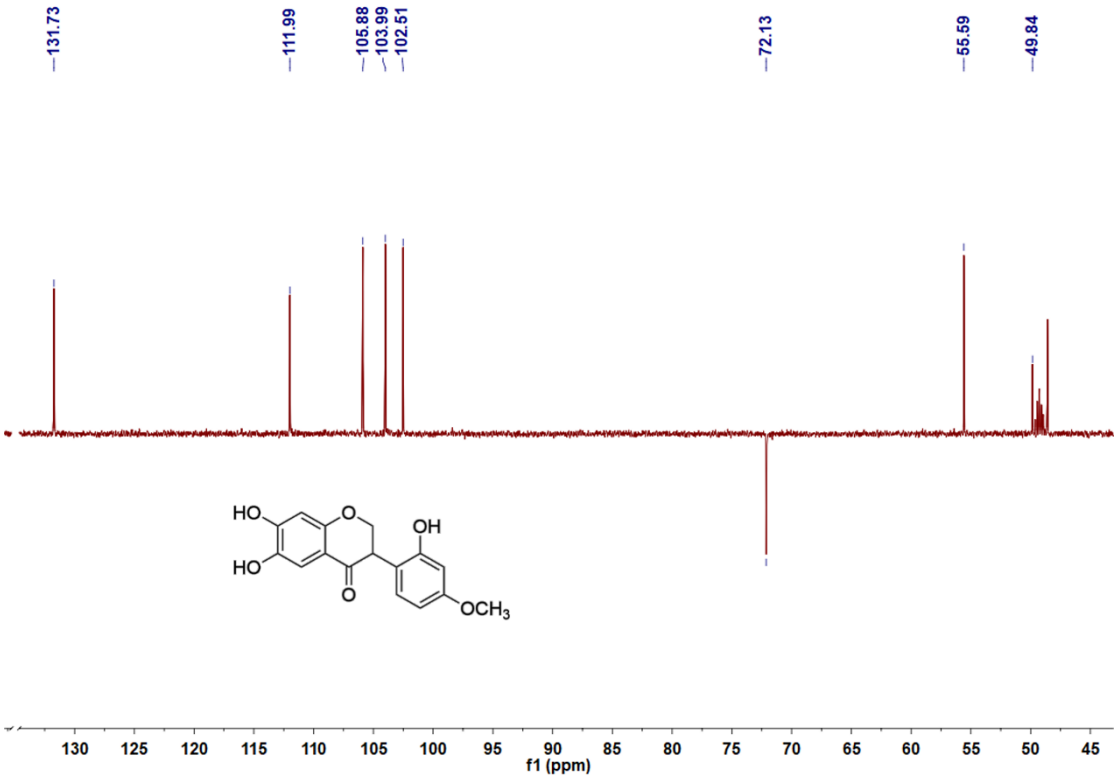



**Figure S6:** DEPT 135° spectrum (150 MHz, DMSO-$d_6$) of Compound **1**

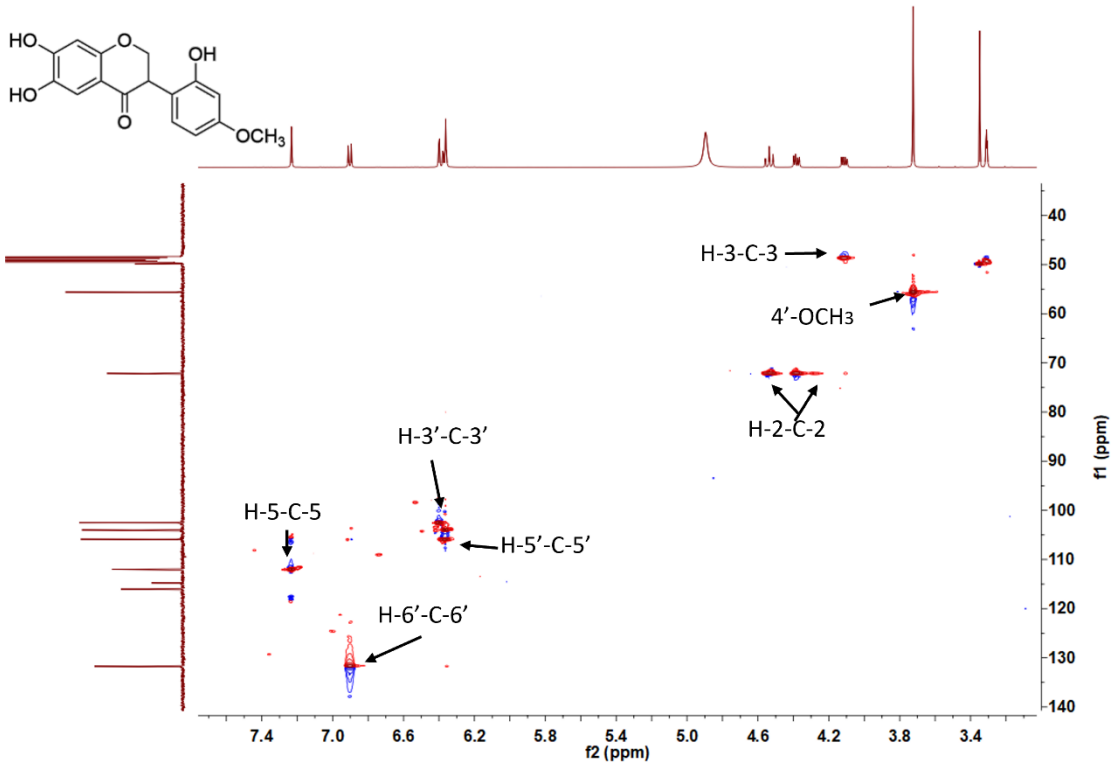



**Figure S7:** HSQC spectrum of Compound **1**

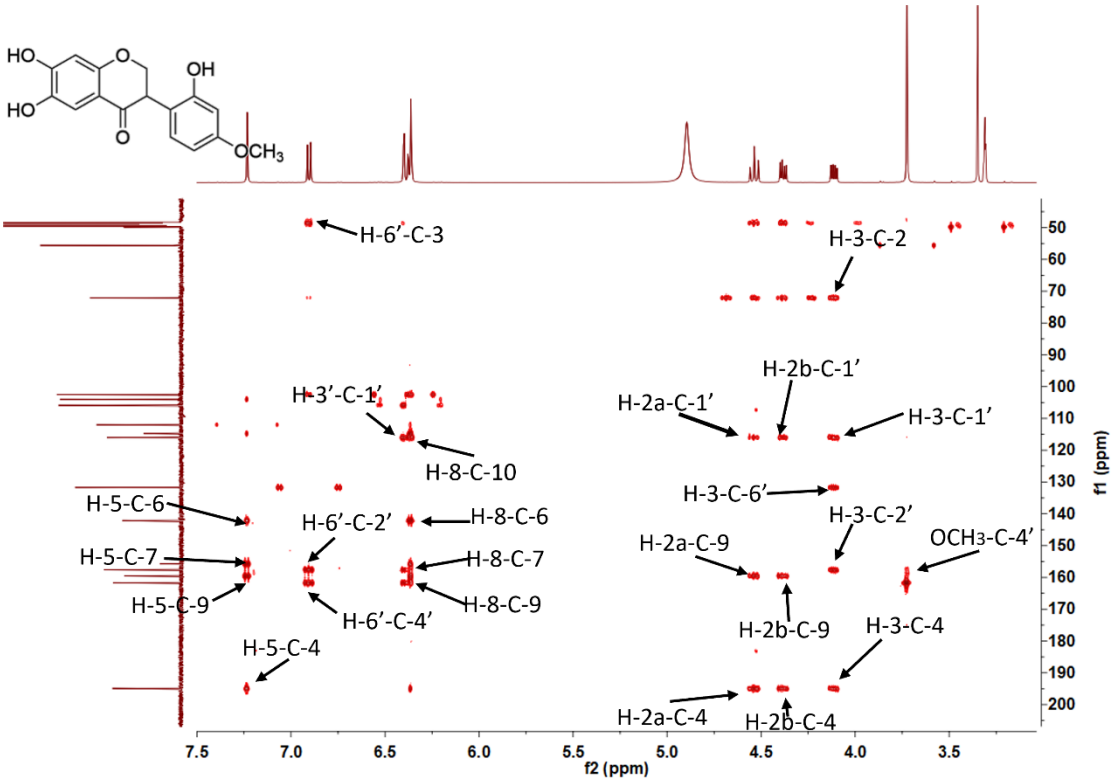



**Figure S8:** HMBC spectrum of Compound **1**

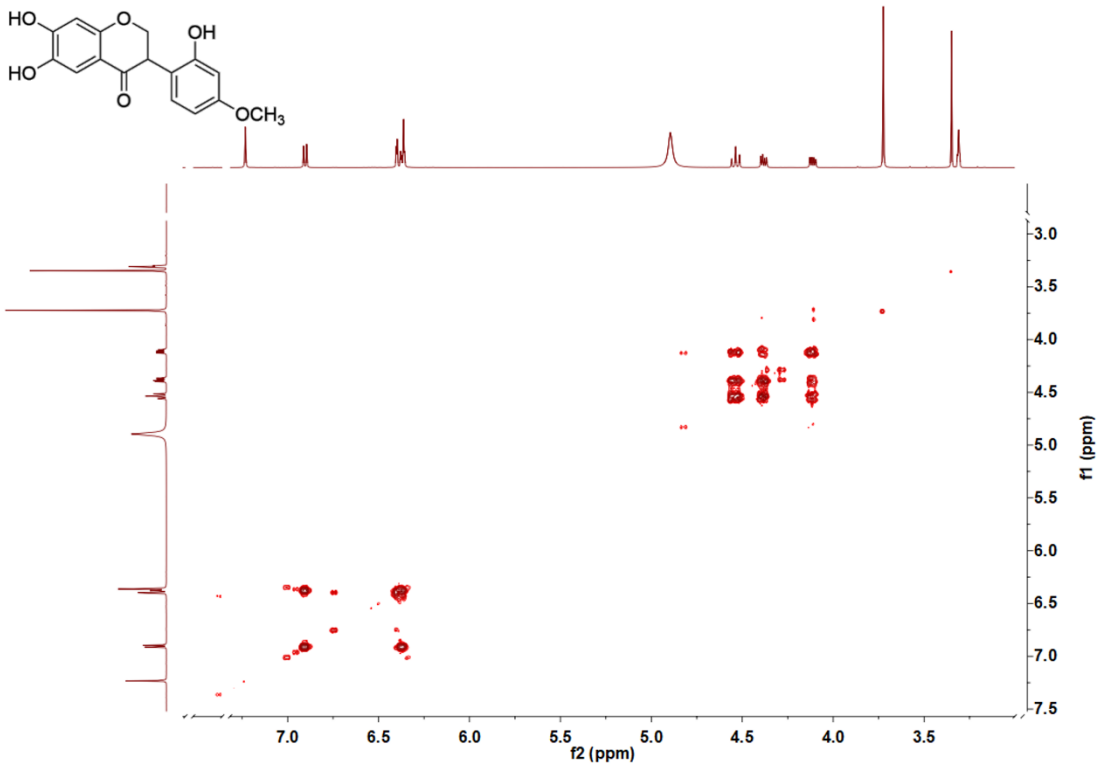



**Figure S9:** $^{1}$H-$^{1}$H COSY spectrum of Compound **1**

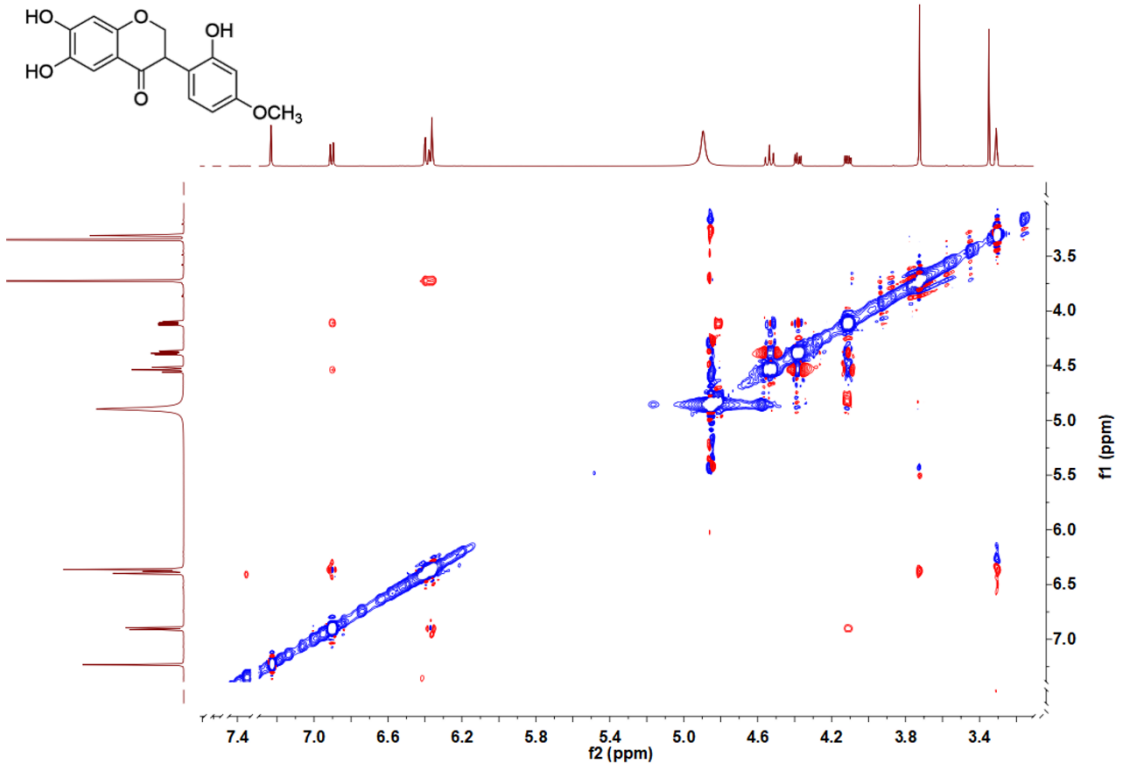



**Figure S10:** ROESY spectrum of Compound **1**

**Figure S11.** CD spectrum of Compound **1**

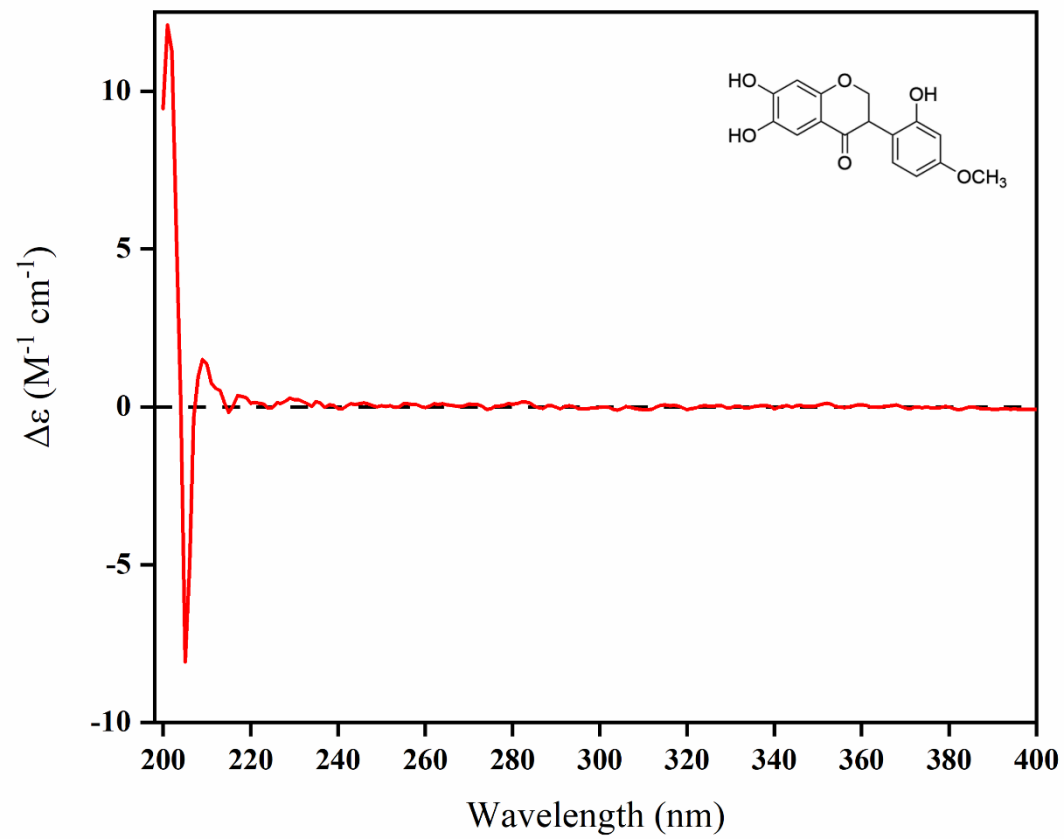



**Figure S11:** CD spectrum of Compound **1**

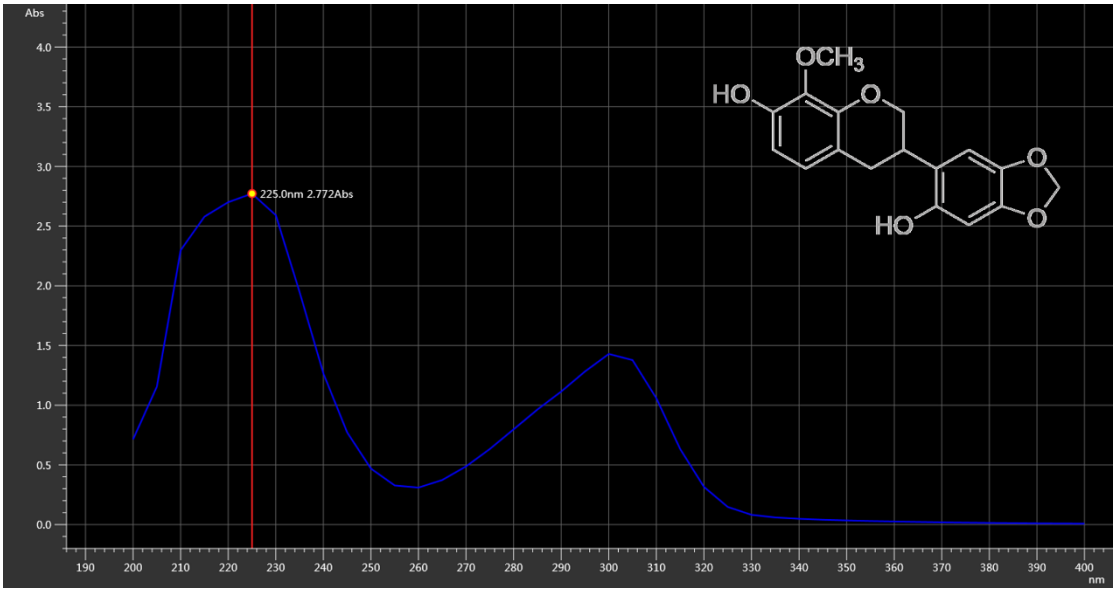



**Figure S12:** UV spectrum of Compound **2**

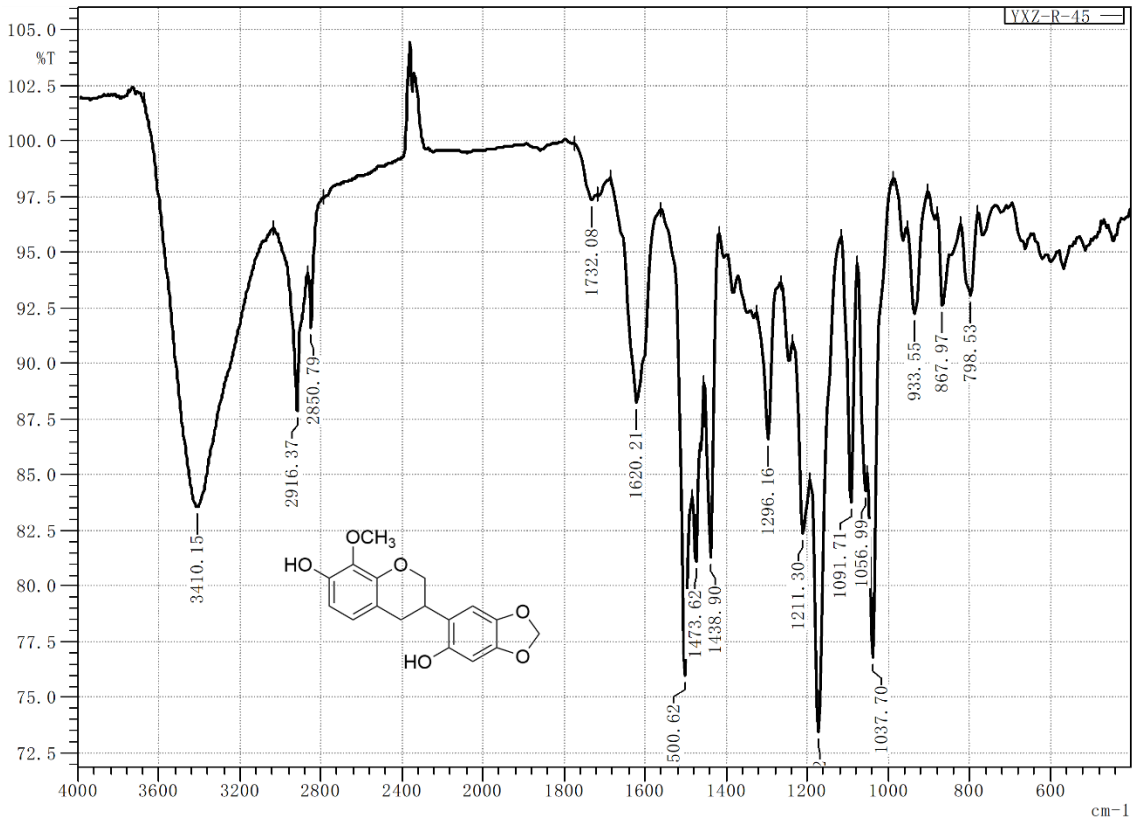



**Figure S13:** IR spectrum of Compound **2**

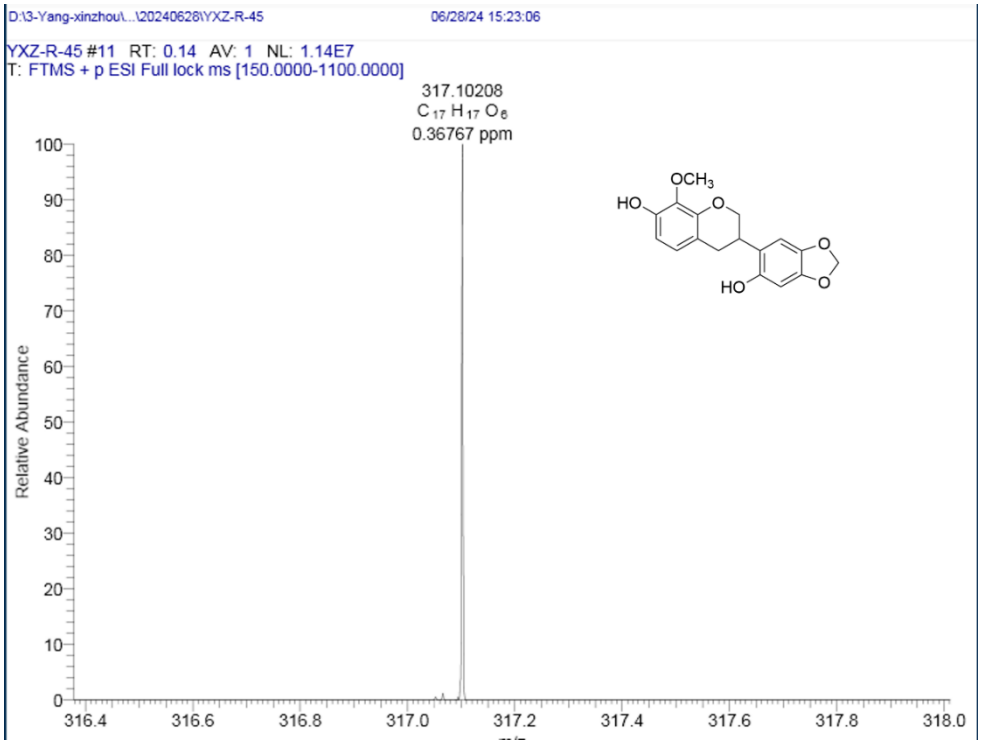



**Figure S14:** HR-ESI-M of Compound **2**

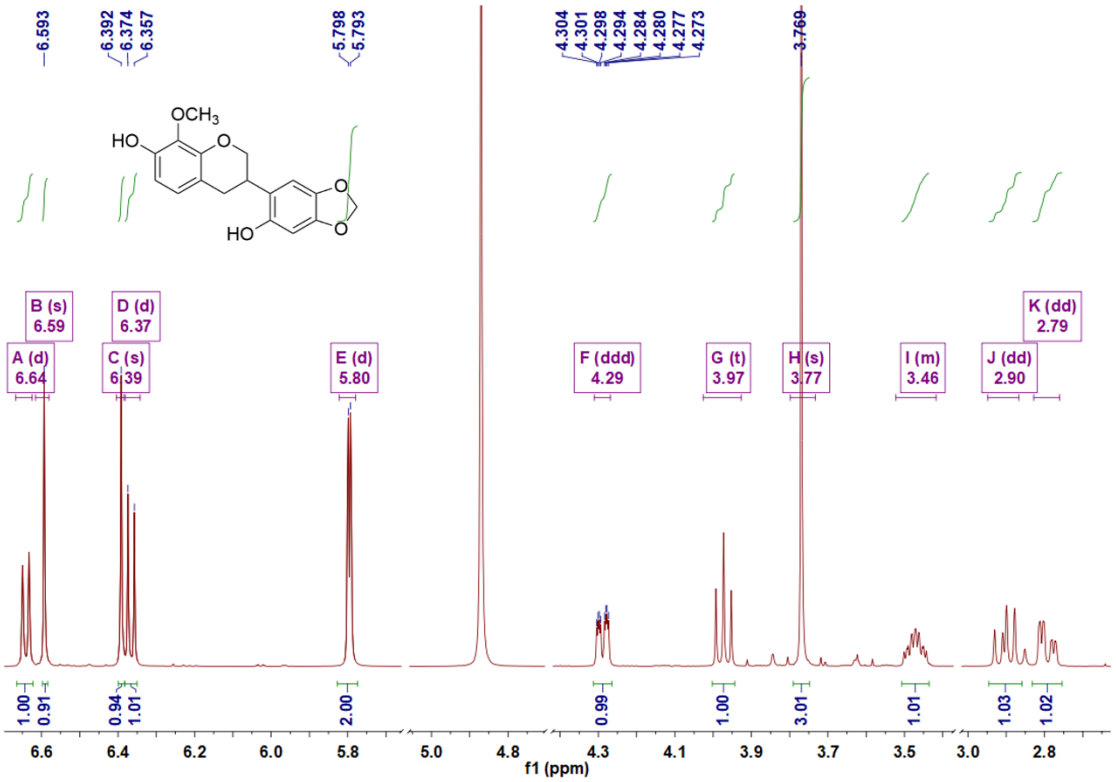



**Figure S15:** $^{1}$H NMR spectrum (600 MHz, DMSO-$d_6$) of Compound **2**

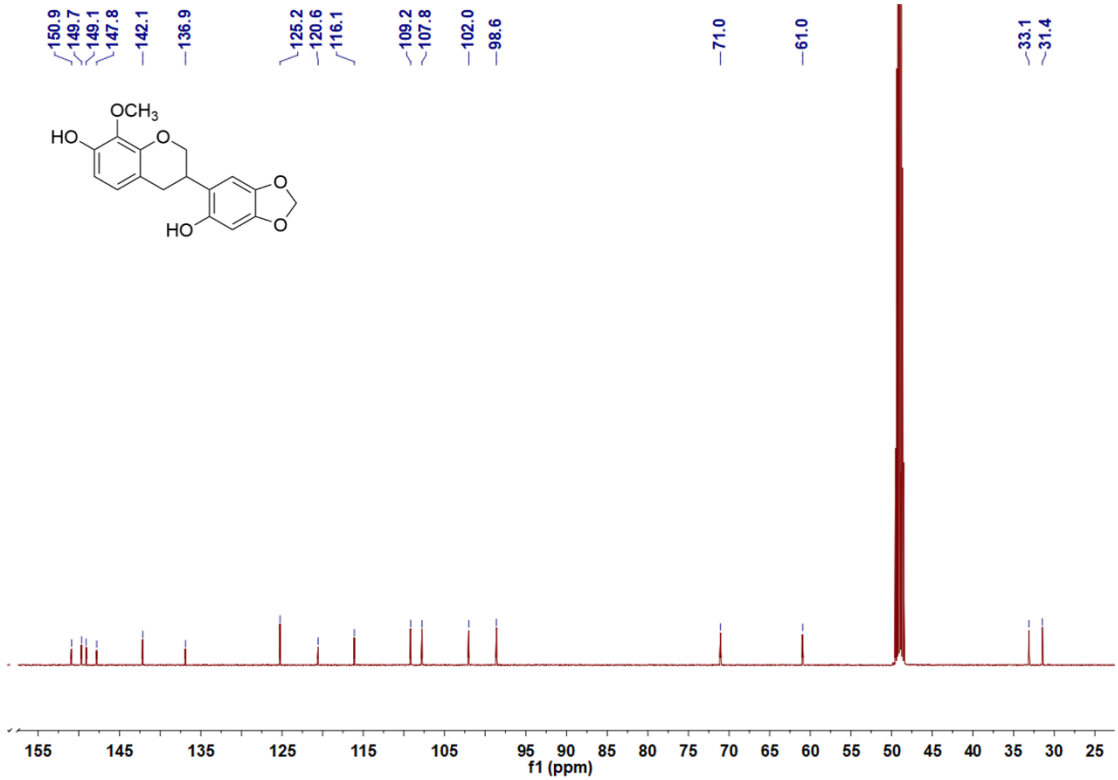



**Figure S16:** $^{13}$C NMR spectrum (150 MHz, DMSO-$d_6$) of Compound **2**

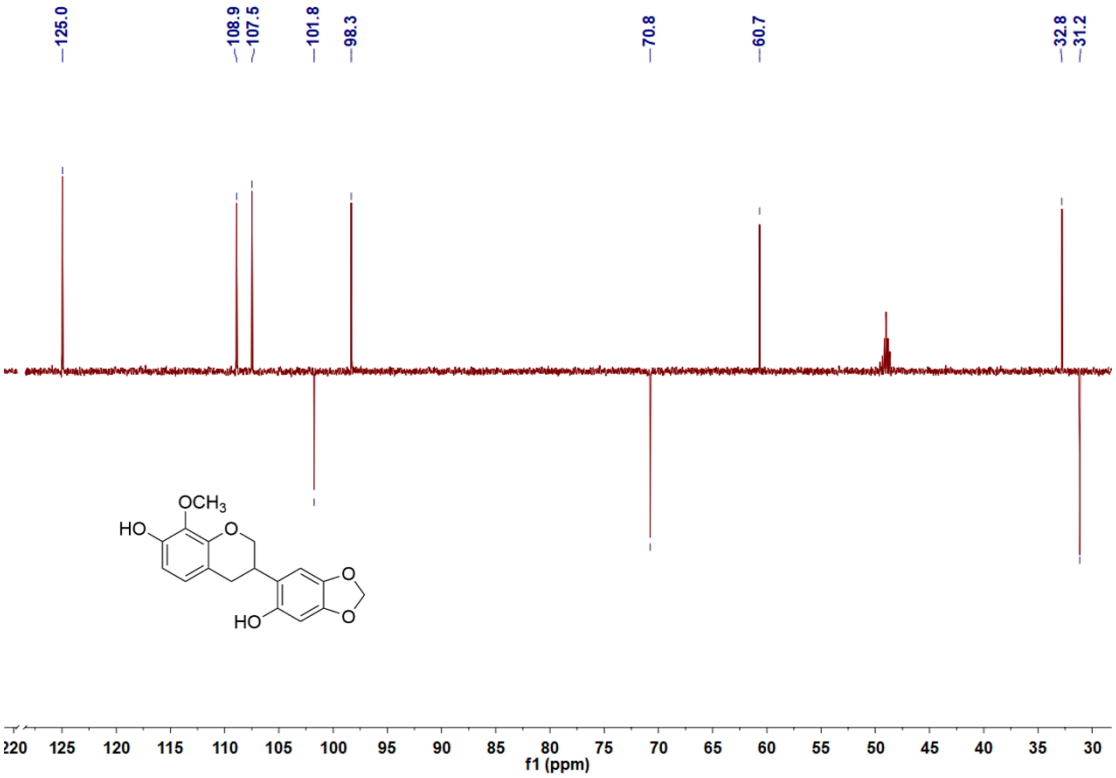



**Figure S17:** DEPT 135° spectrum (150 MHz, DMSO-$d_6$) of Compound **2**

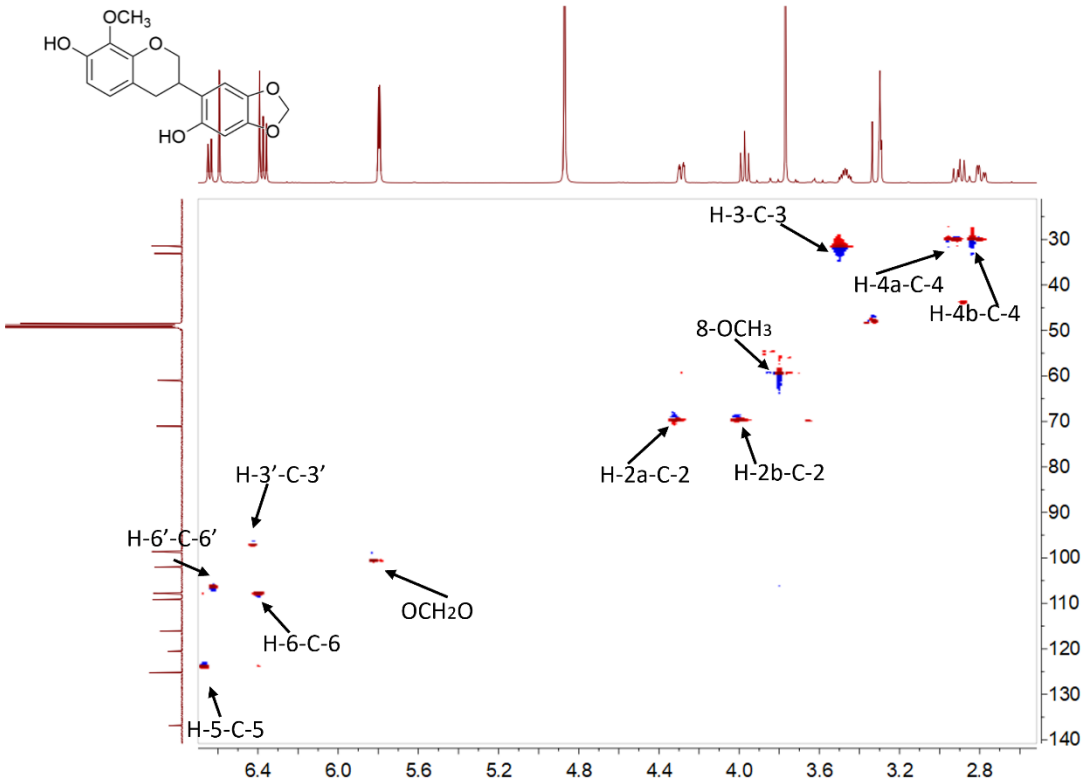



**Figure S18:** HSQC spectrum of Compound **2**

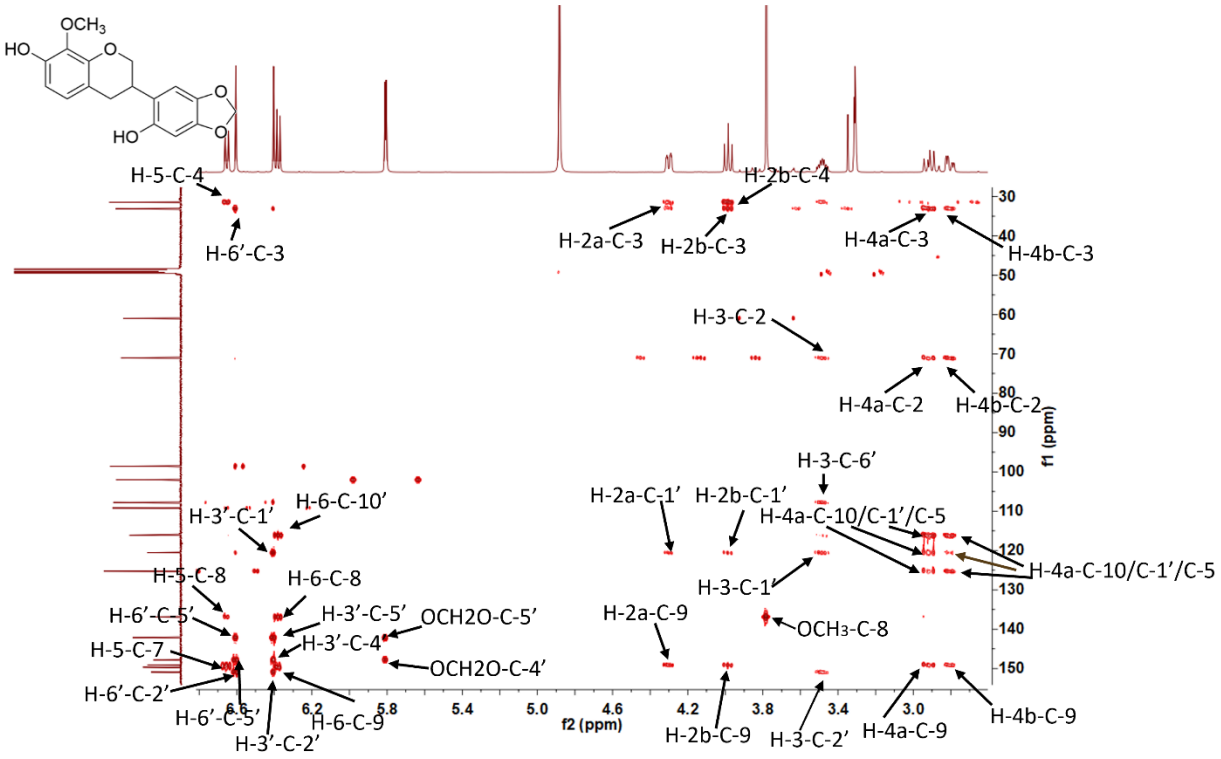



**Figure S19:** HMBC spectrum of Compound **2**

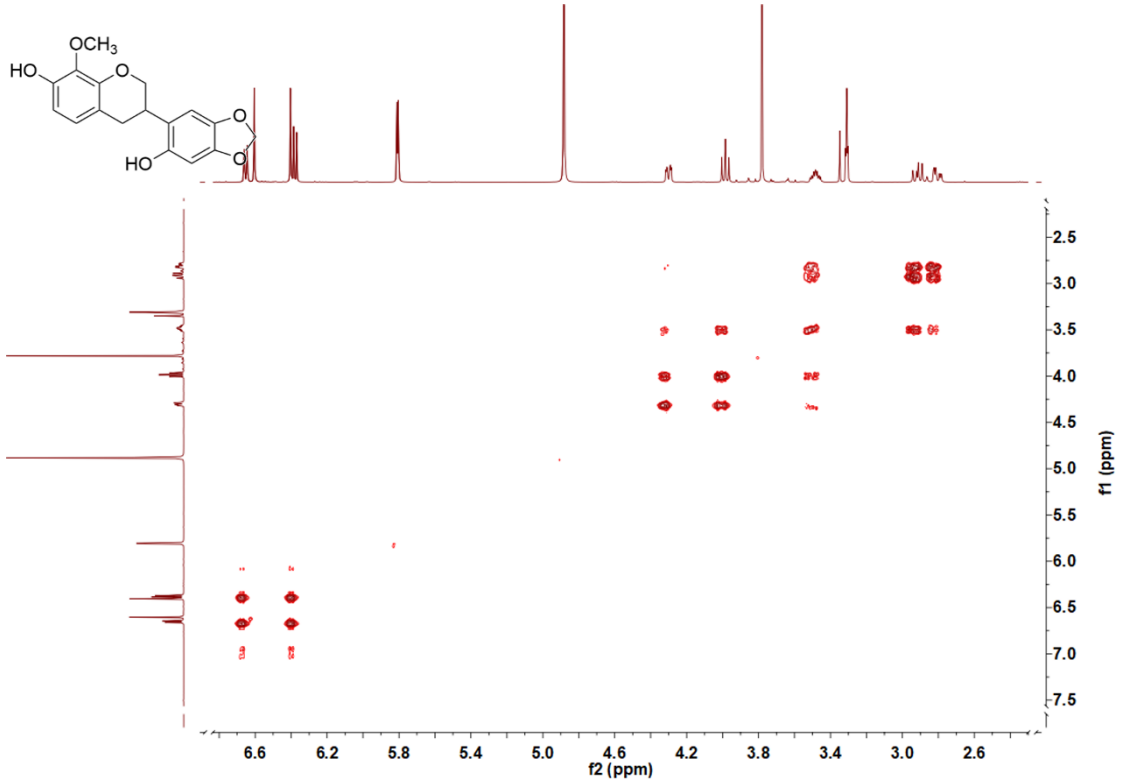



**Figure S20:** $^{1}$H-$^{1}$H COSY spectrum of Compound **2**

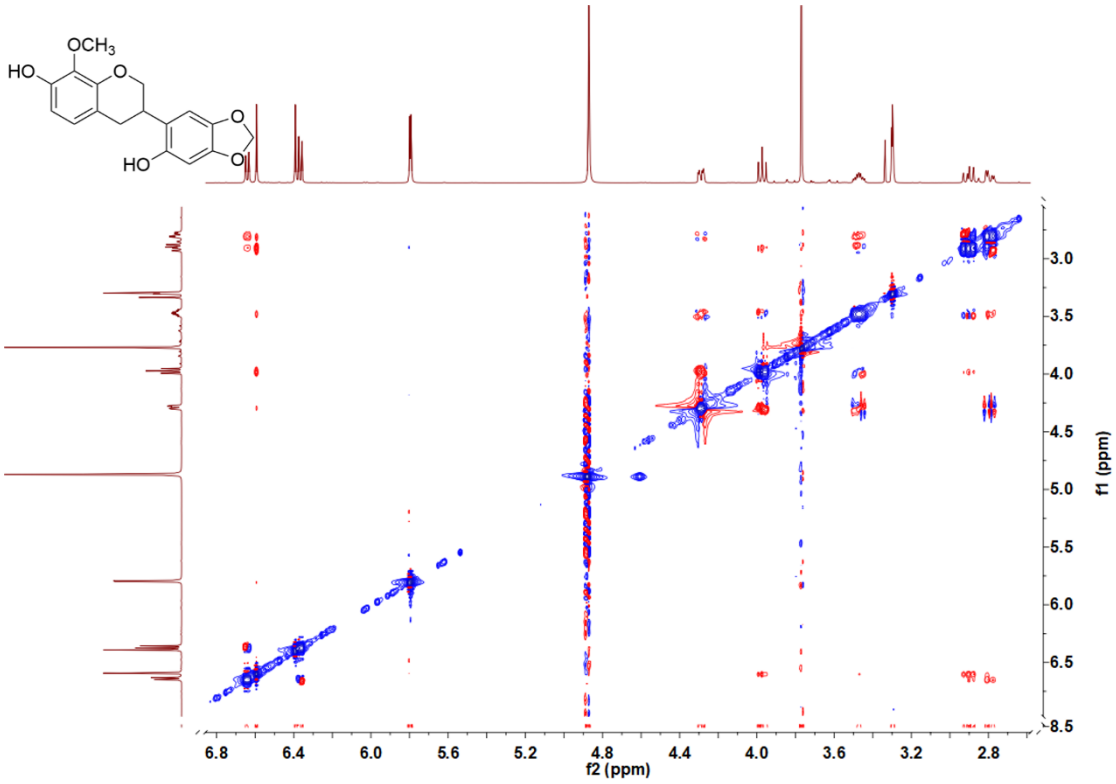



**Figure S21:** ROESY spectrum of Compound **2**

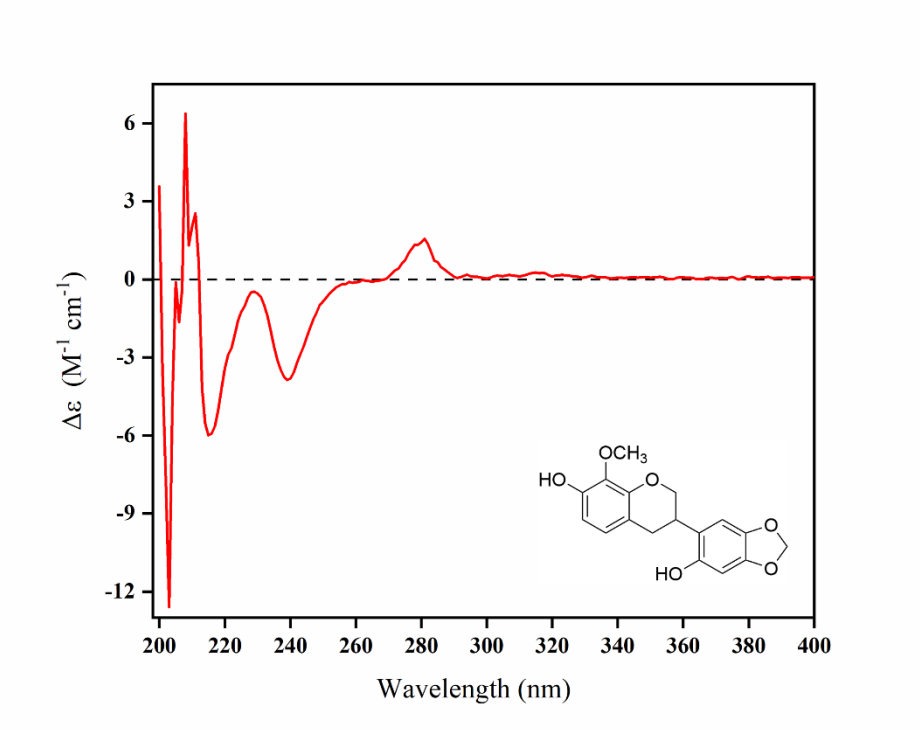
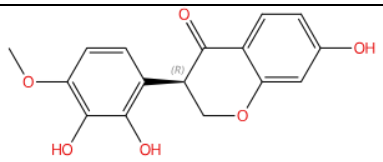
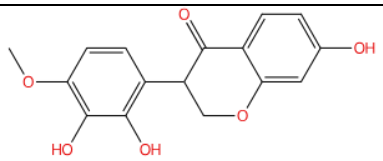
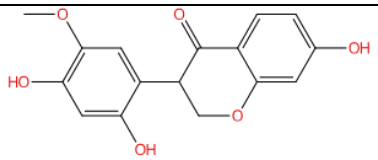
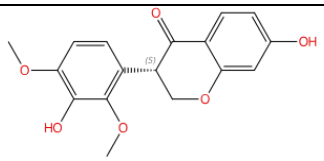
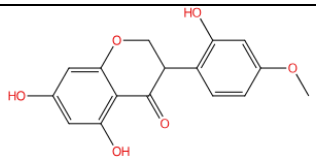
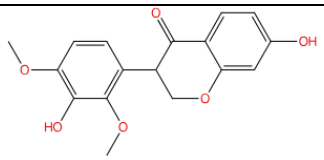
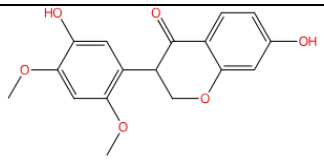
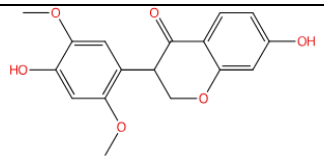



**Figure S22:** CD spectrum of Compound **2**

**Table S1:** SciFinder searches for the ten compounds most similar to Compound **1** in the report

| No. | structure | similarity |
|---|---|---|
| 1 |  | 97% |
| 2 |  | 97% |
| 3 |  | 97% |
| 4 |  | 96% |
| 5 |  | 96% |
| 6 |  | 96% |
| 7 |  | 96% |
| 8 |  | 96% |

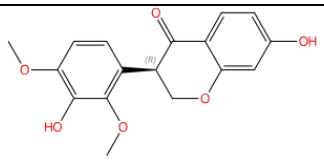
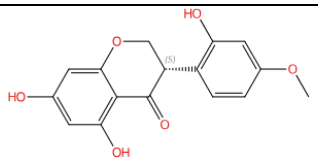
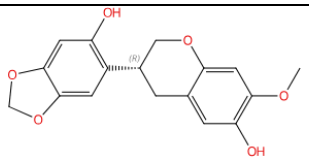
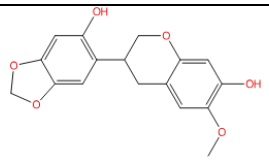
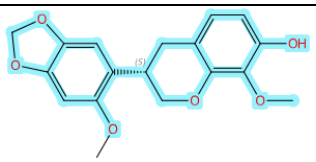
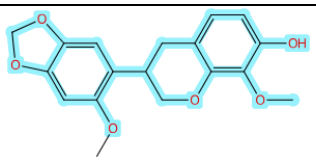
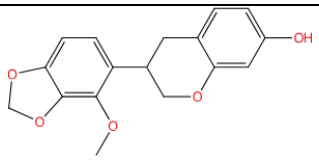
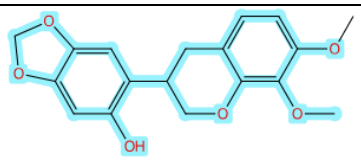
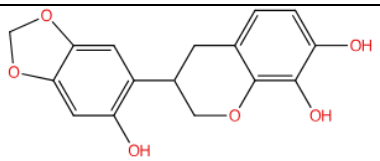
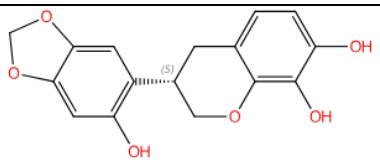
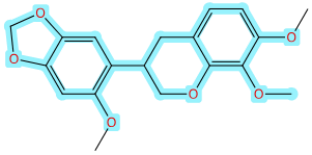
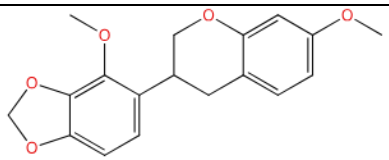
| | | |
|---|---|---|
| 9 |  | 96% |
| 10 |  | 96% |

**Table S2:** SciFinder searches for the ten compounds most similar to Compound **2** in the report

| No. | structure | similarity |
|---|---|---|
| 1 |  | 98% |
| 2 |  | 98% |
| 3 |  | 97% |
| 4 |  | 97% |
| 5 |  | 97% |
| 6 |  | 96% |

| | | |
|---|---|---|
| 7 |  | 96% |
| 8 |  | 96% |
| 9 |  | 95% |
| 10 |  | 95% |