

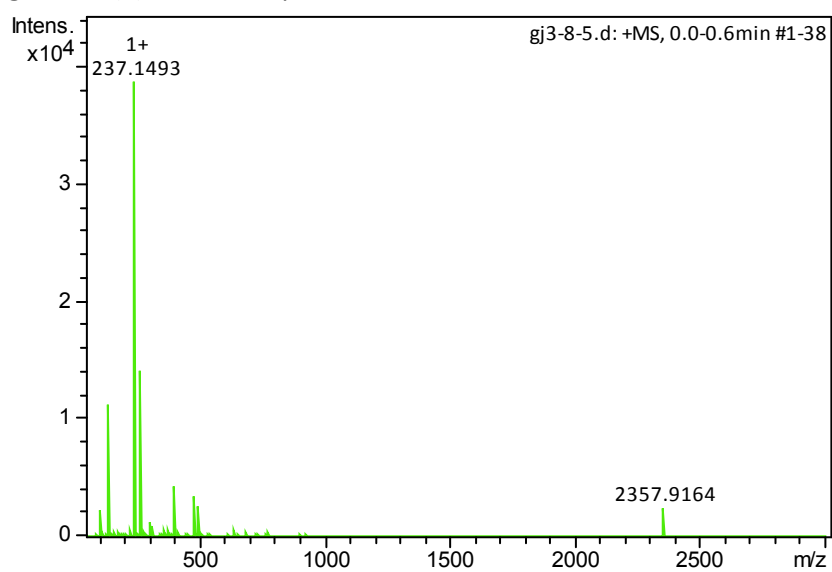
Fusaresters A–E, new  $\gamma$ -pyrone-containing polyketides  
from fungus *Fusarium* sp. Hungcl and structure revision  
of fusariumin D

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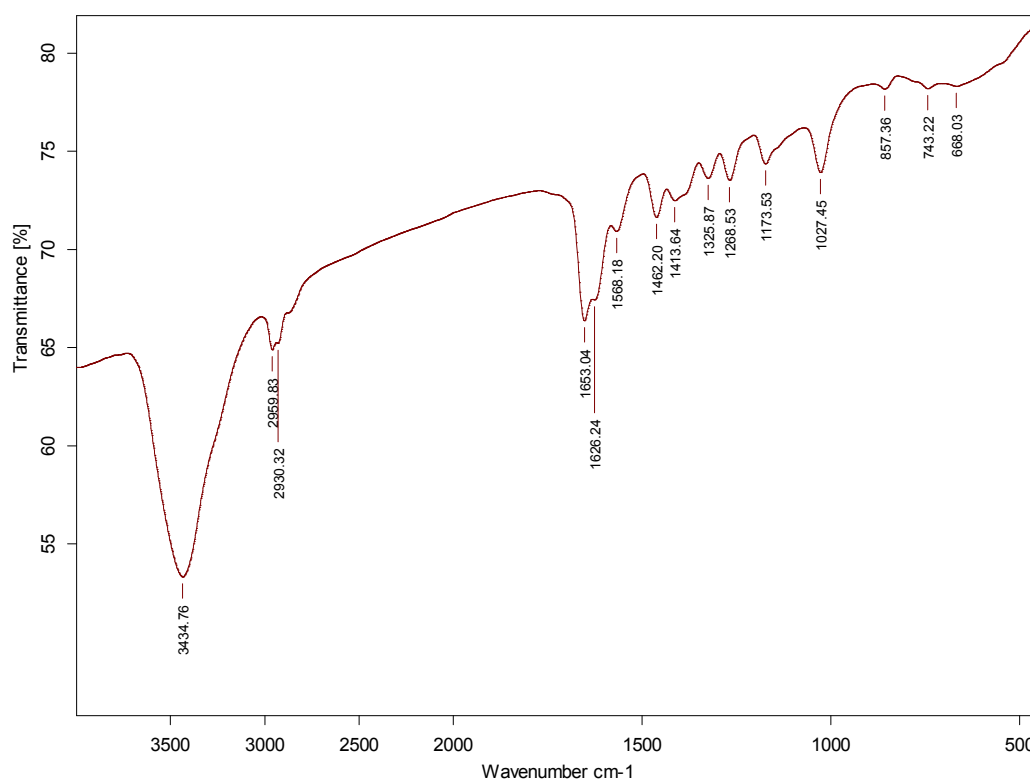
**Figure S1. (+)-HRESIMS Spectrum of 1**



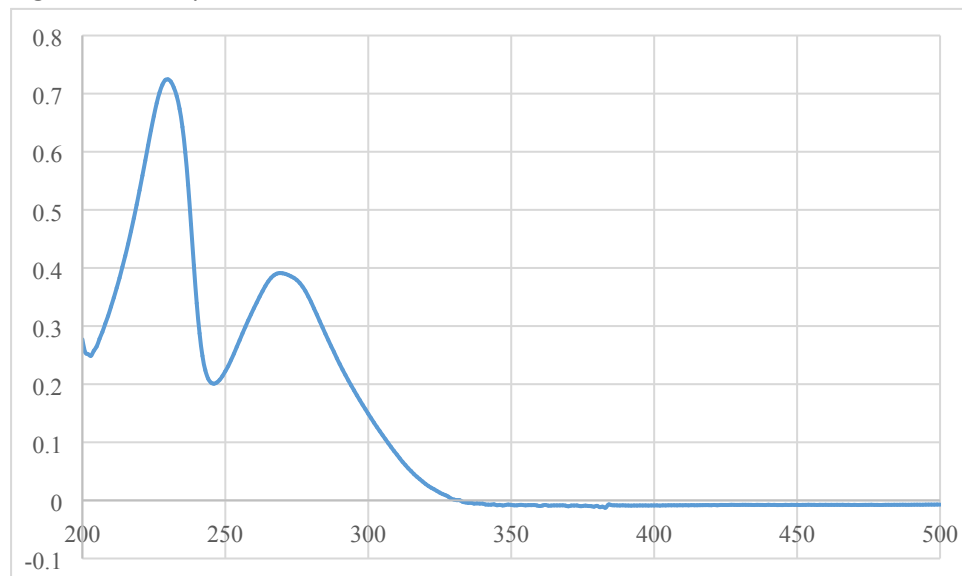
**Figure S2. IR Spectrum of 1**

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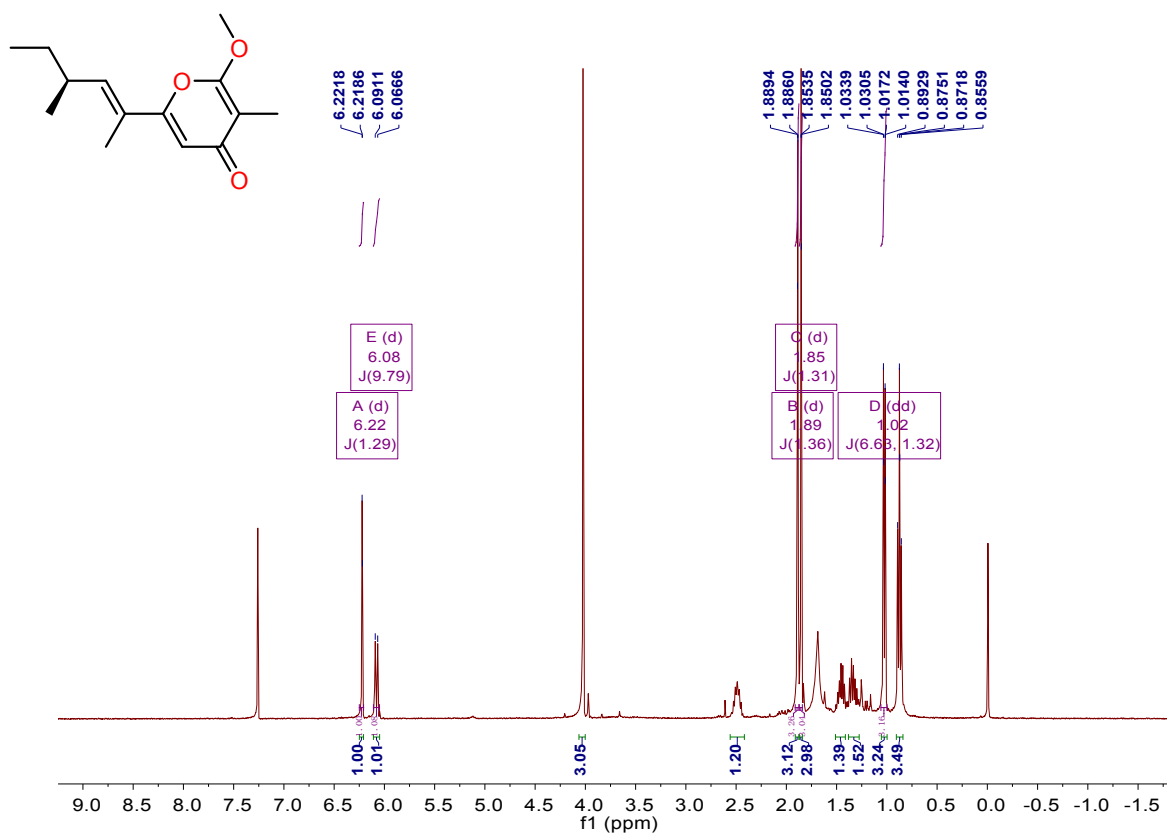
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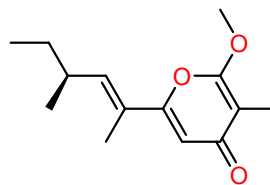


**Figure S3. UV Spectrum of 1**

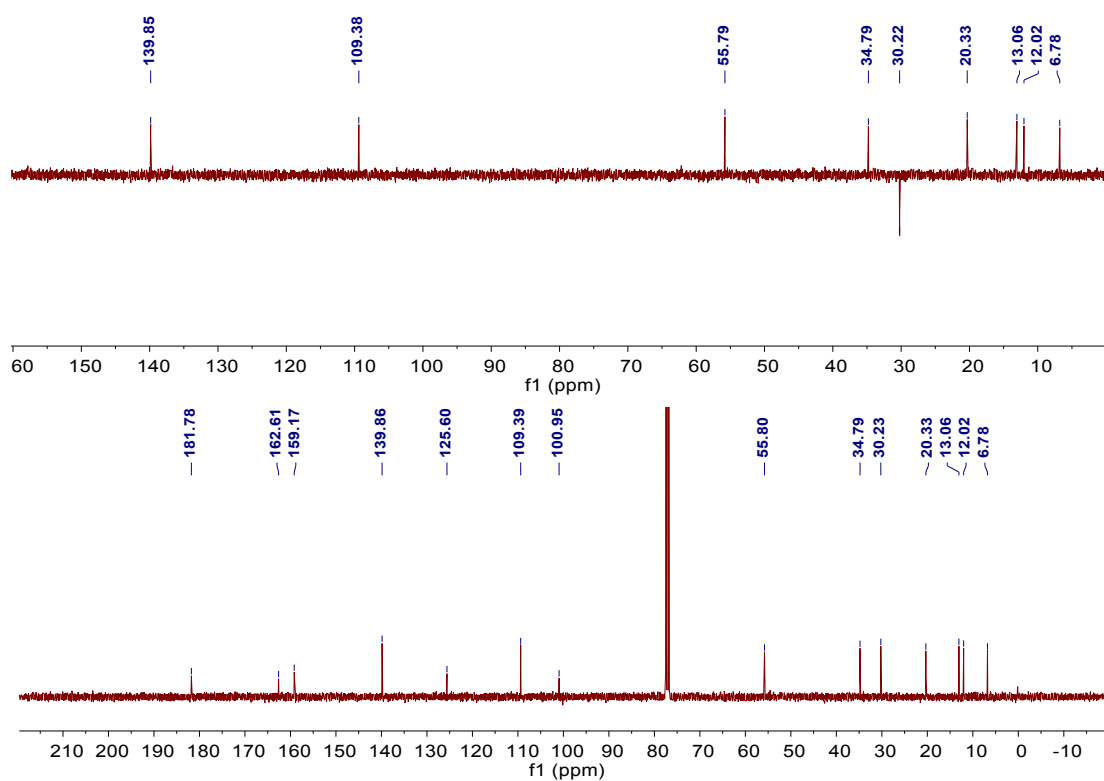


**Figure S4.  $^1\text{H}$  NMR Spectrum of 1 in  $\text{CDCl}_3$**





**Figure S5.**  $^{13}\text{C}$  NMR and DEPT Spectrum of **1** in  $\text{CDCl}_3$



**Figure S6.** HSQC Spectrum of **1** in  $\text{CDCl}_3$

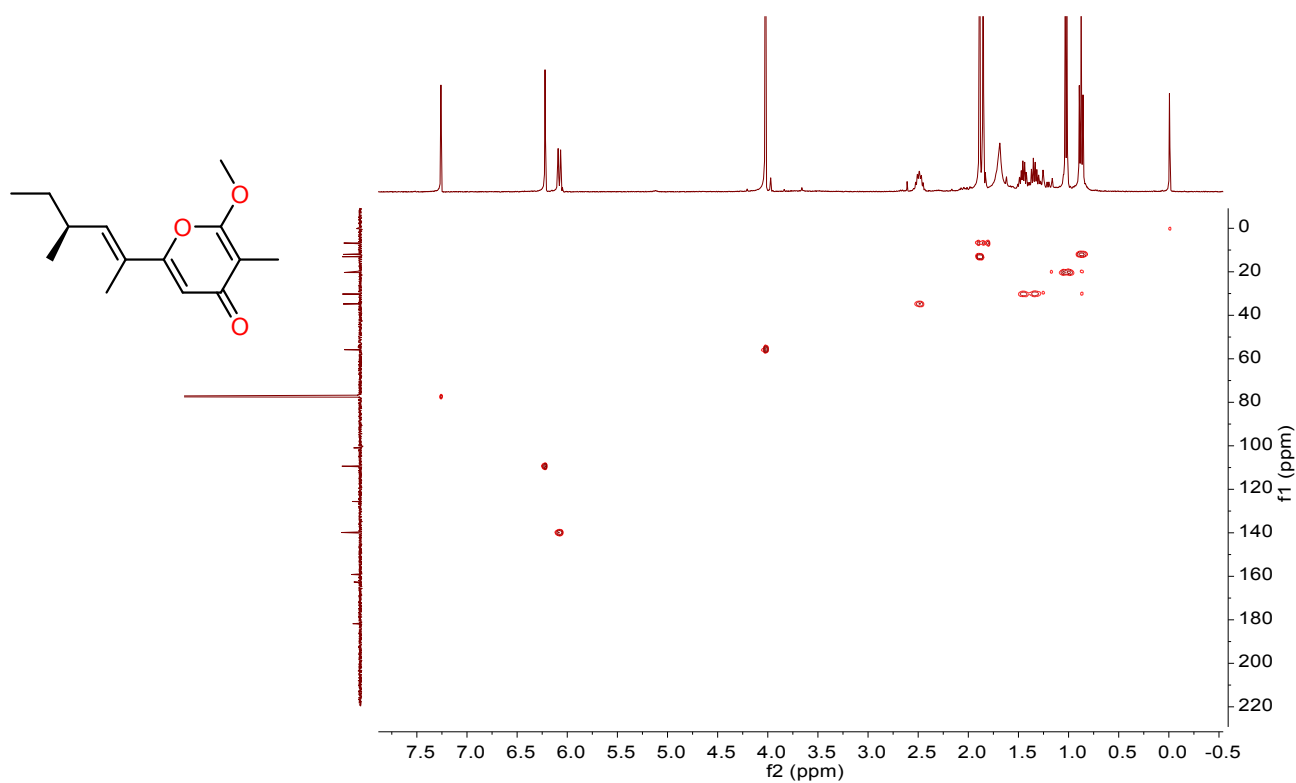


Figure S7. HMBC Spectrum of **1** in CDCl<sub>3</sub>

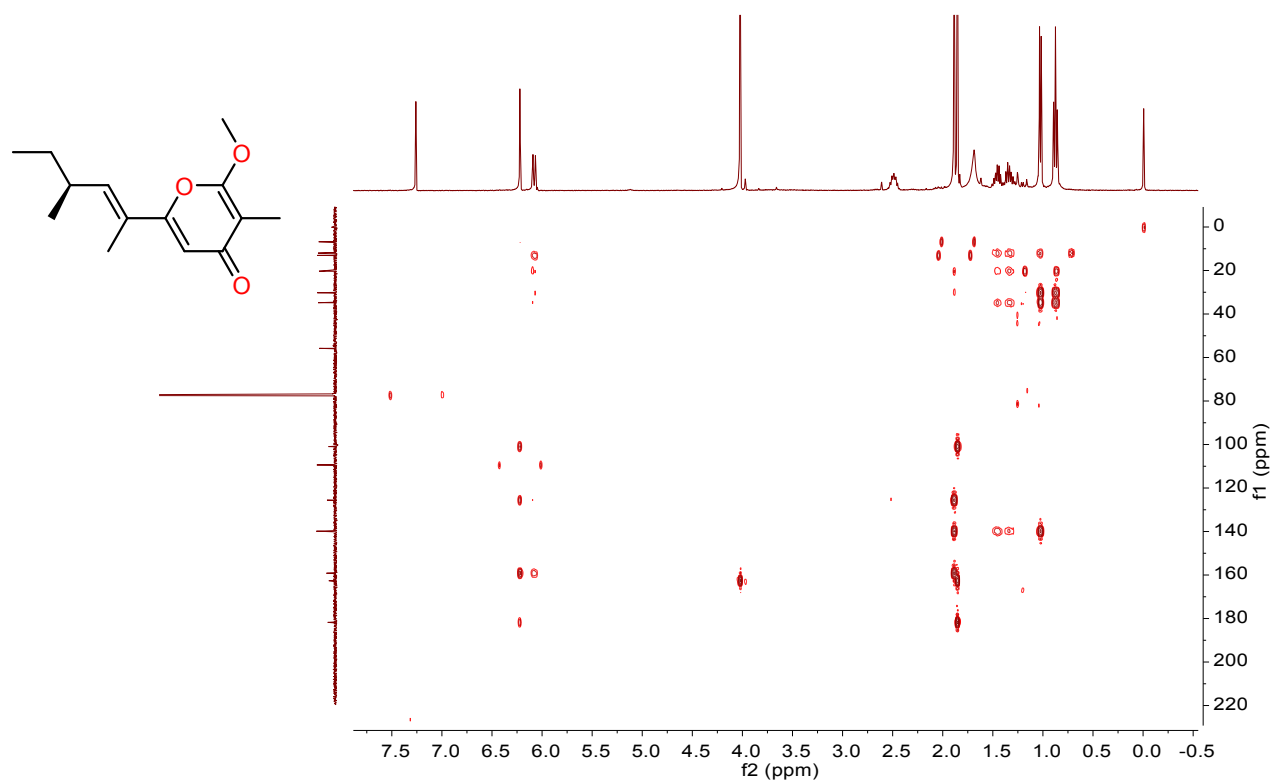
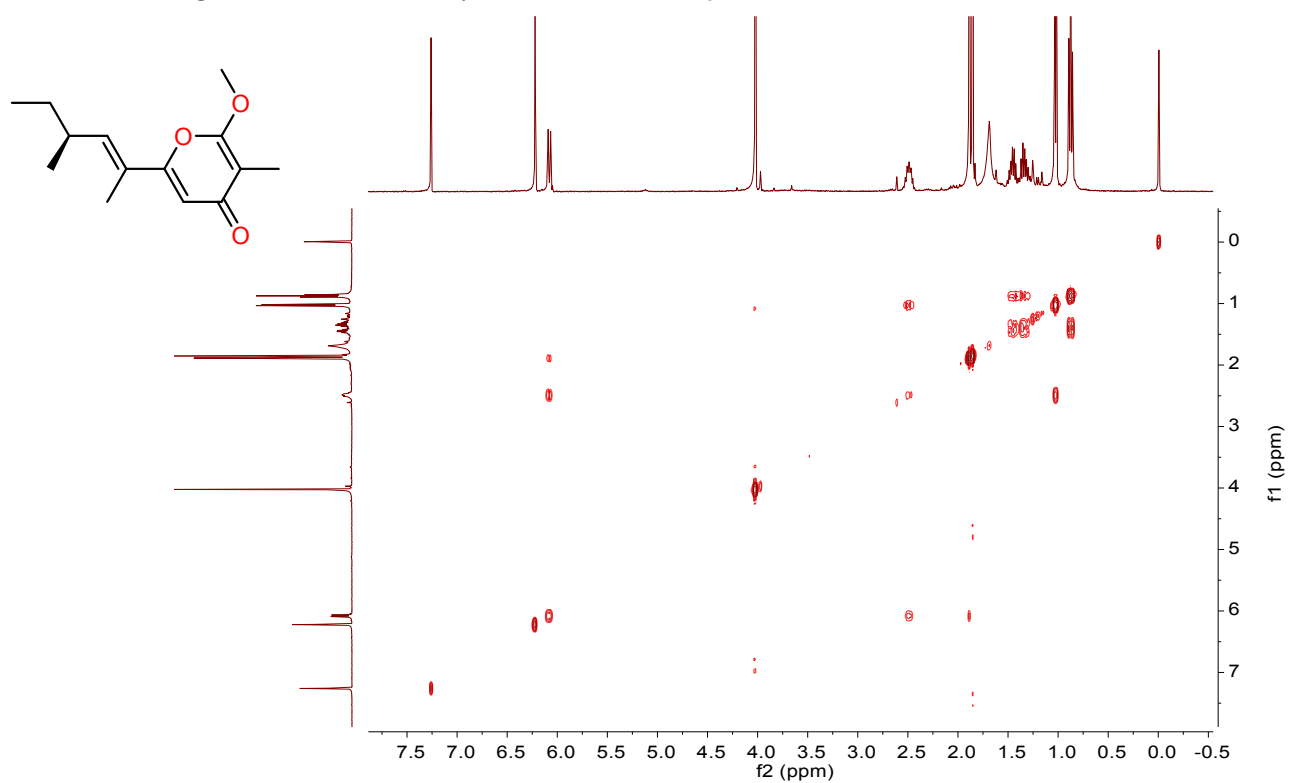
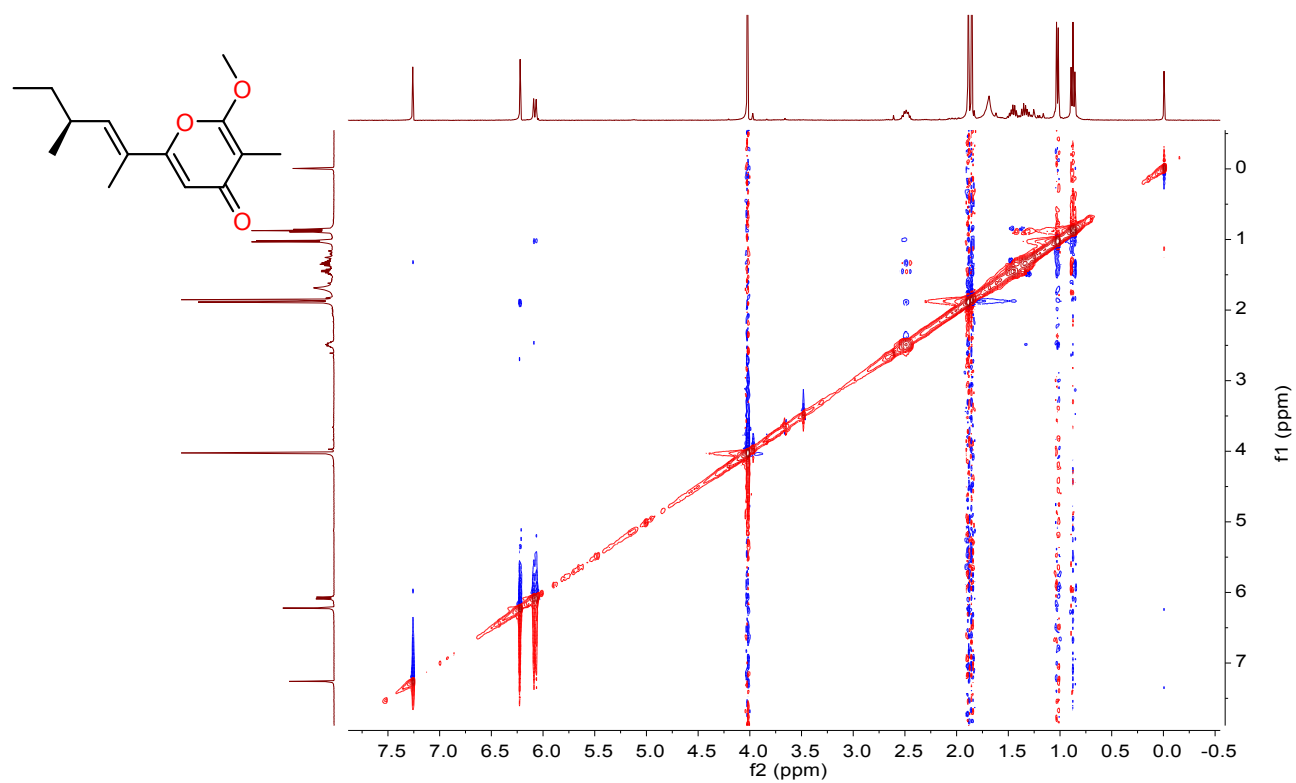


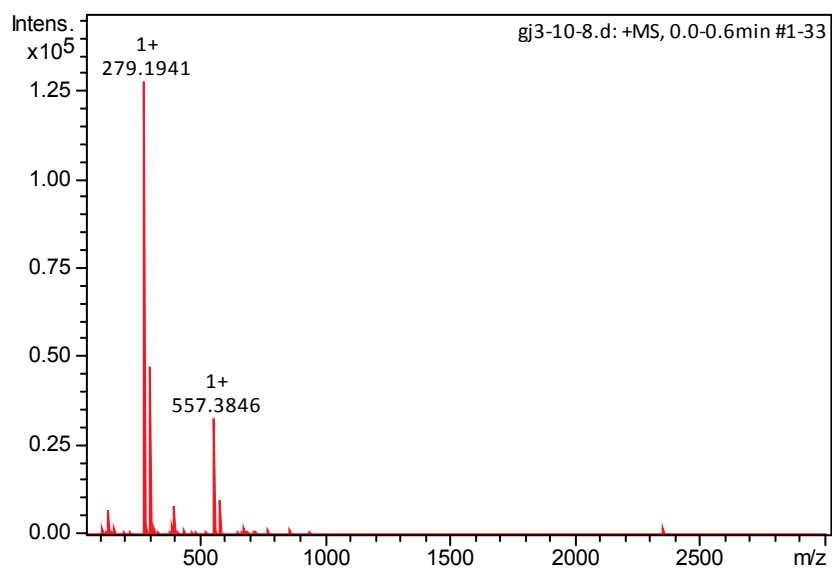
Figure S8. <sup>1</sup>H–<sup>1</sup>H COSY Spectrum of **1** in CDCl<sub>3</sub>



**Figure S9.** NOESY Spectrum of **1** in CDCl<sub>3</sub>



**Figure S10.** (+)-HRESIMS Spectrum of **2**

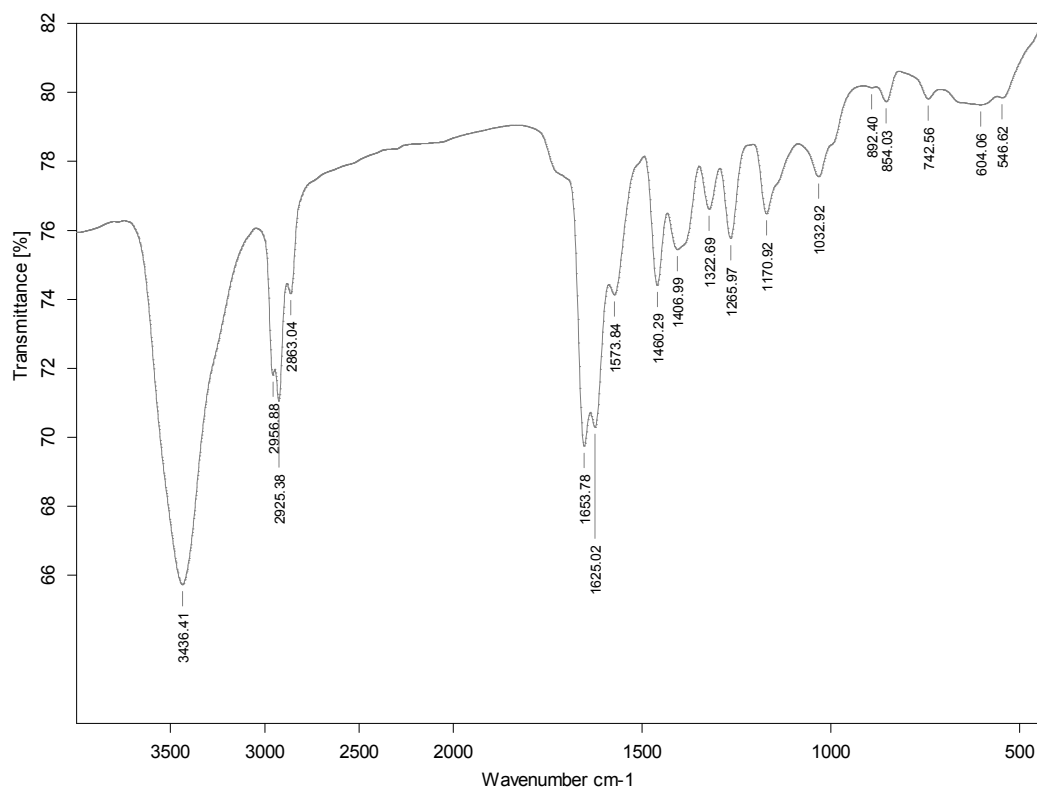




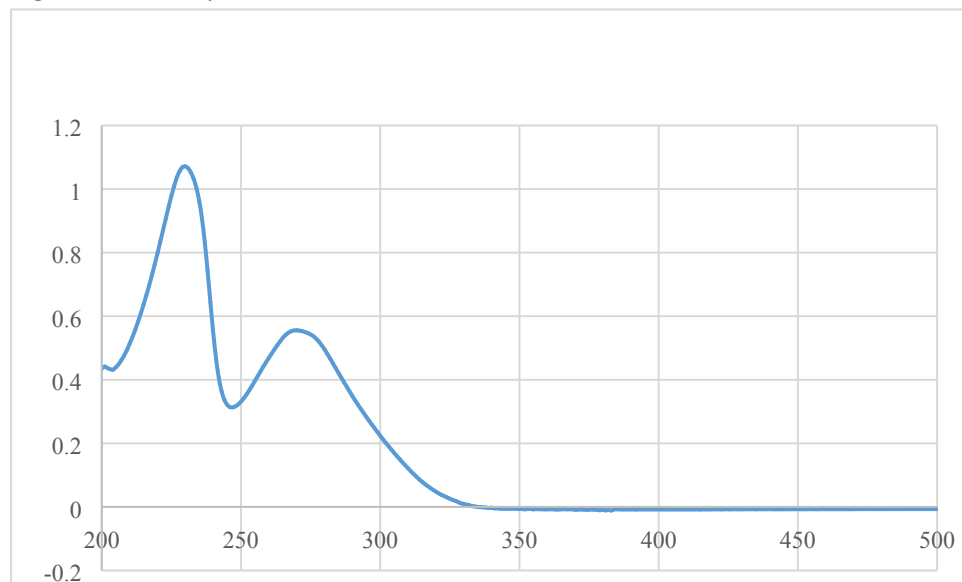
**Figure S11.** IR Spectrum of **2**

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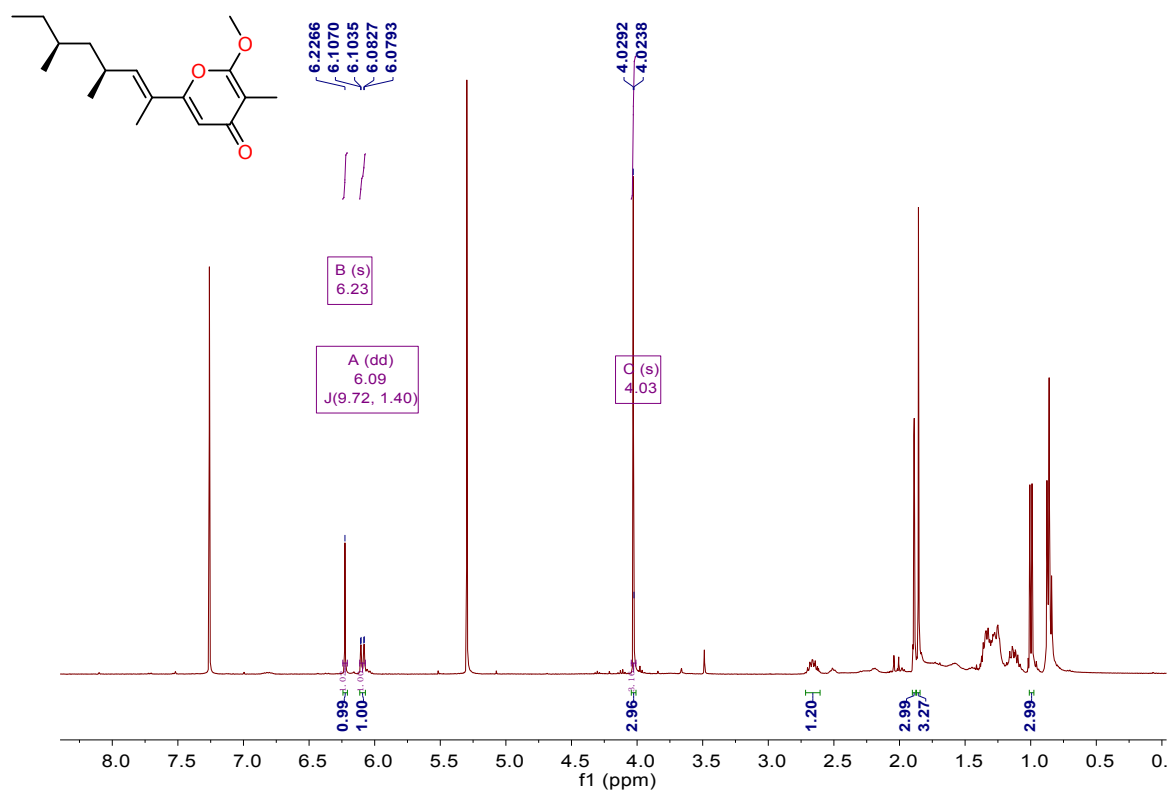
11:39:04 2018-9-17



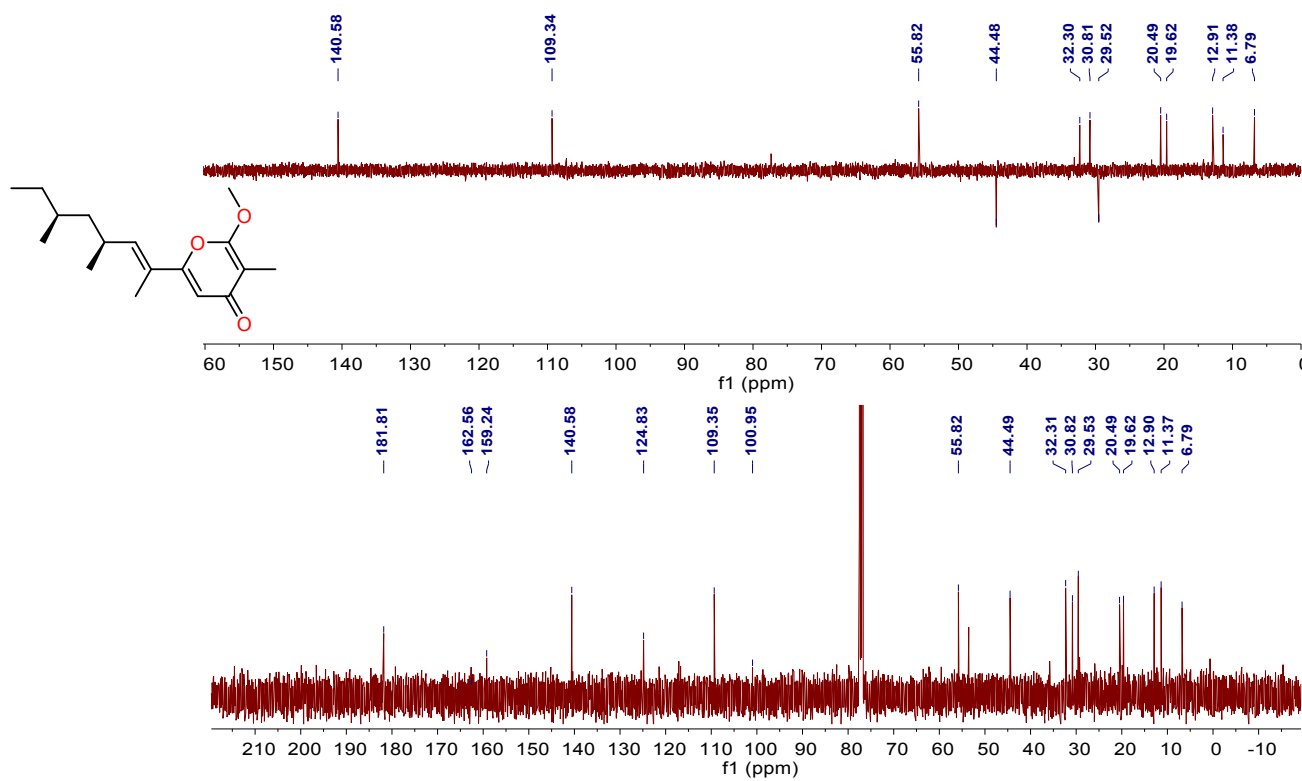
**Figure S12.** UV Spectrum of **2**



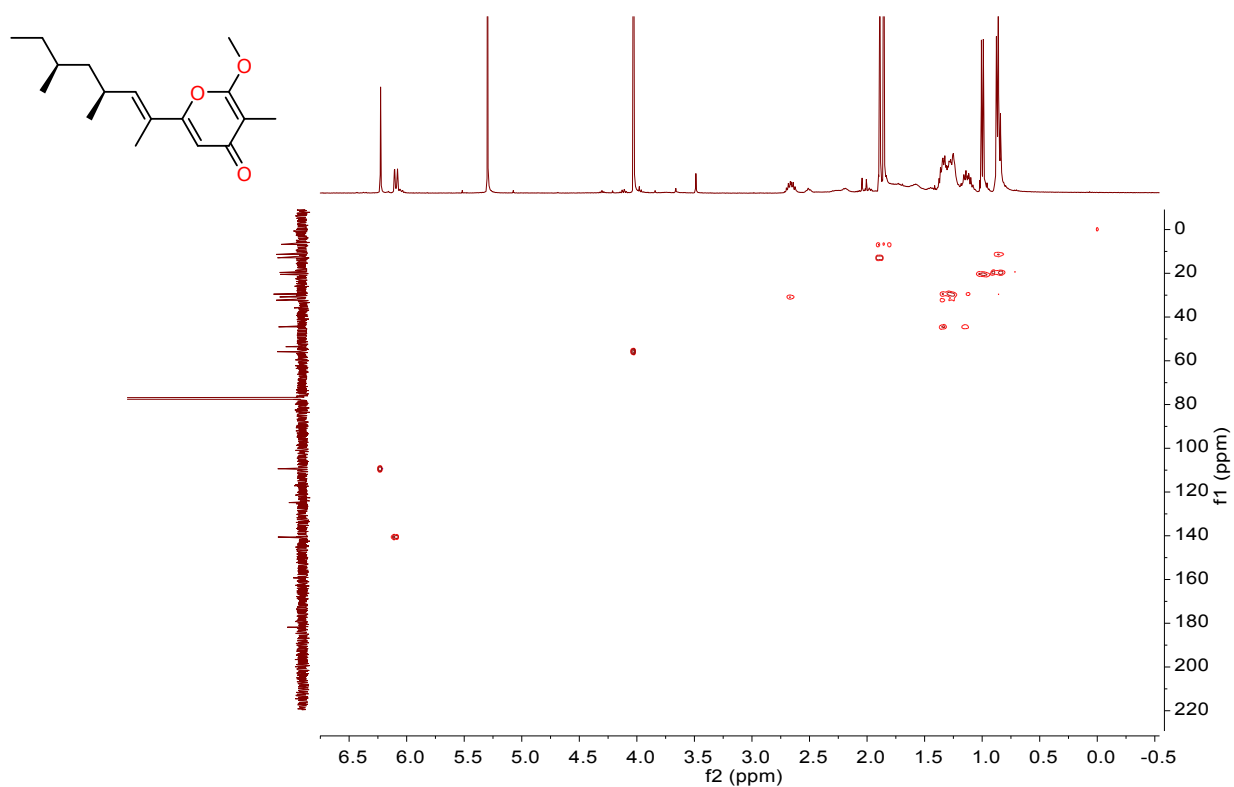
**Figure S13.**  $^1\text{H}$  NMR Spectrum of **2** in  $\text{CDCl}_3$



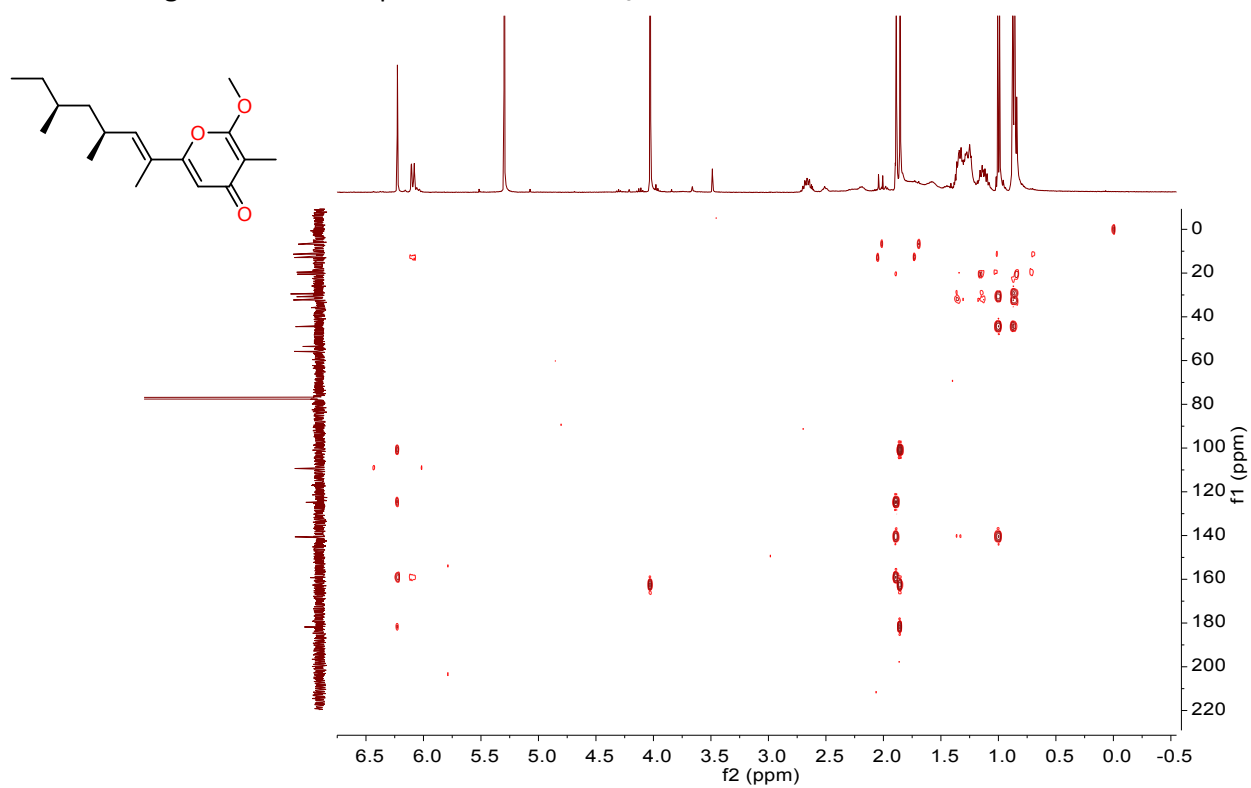
**Figure S14.**  $^{13}\text{C}$  NMR and DEPT Spectrum of **2** in  $\text{CDCl}_3$



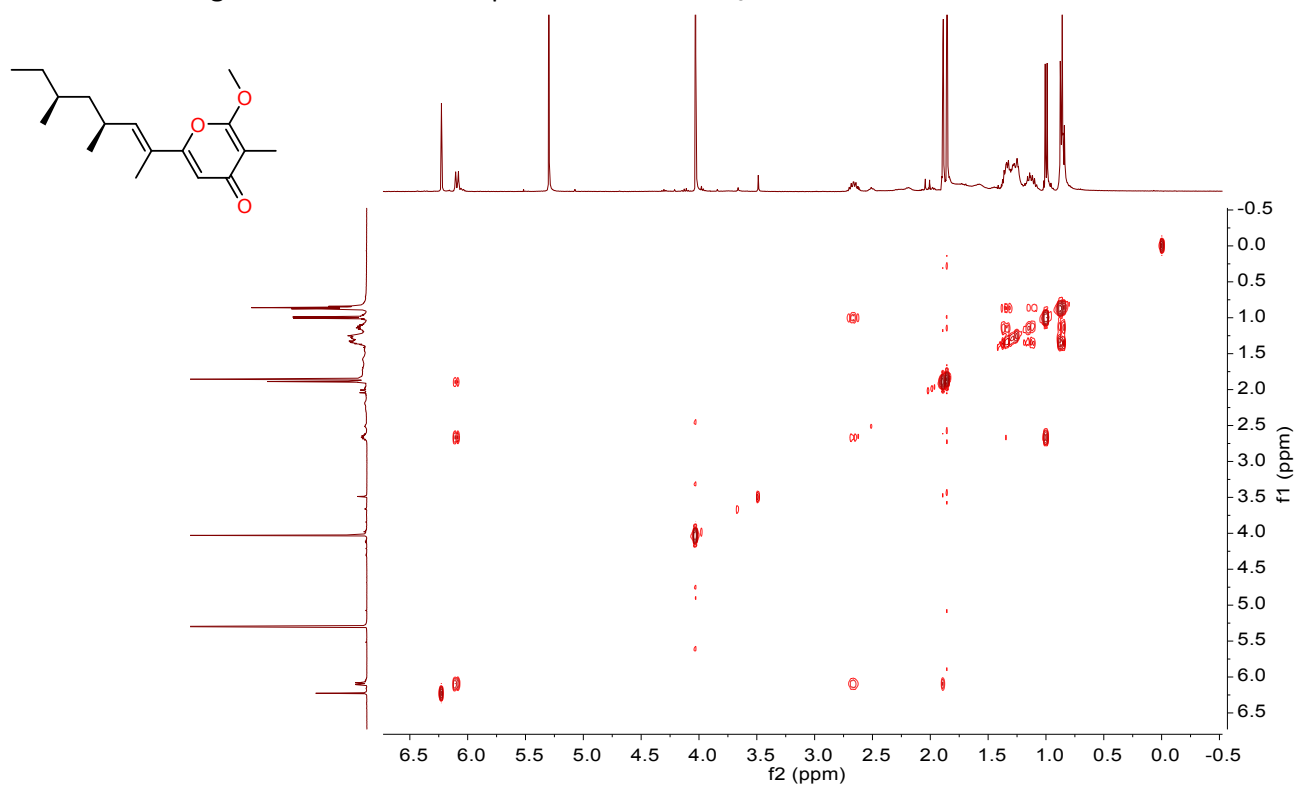
**Figure S15.** HSQC Spectrum of **2** in CDCl<sub>3</sub>



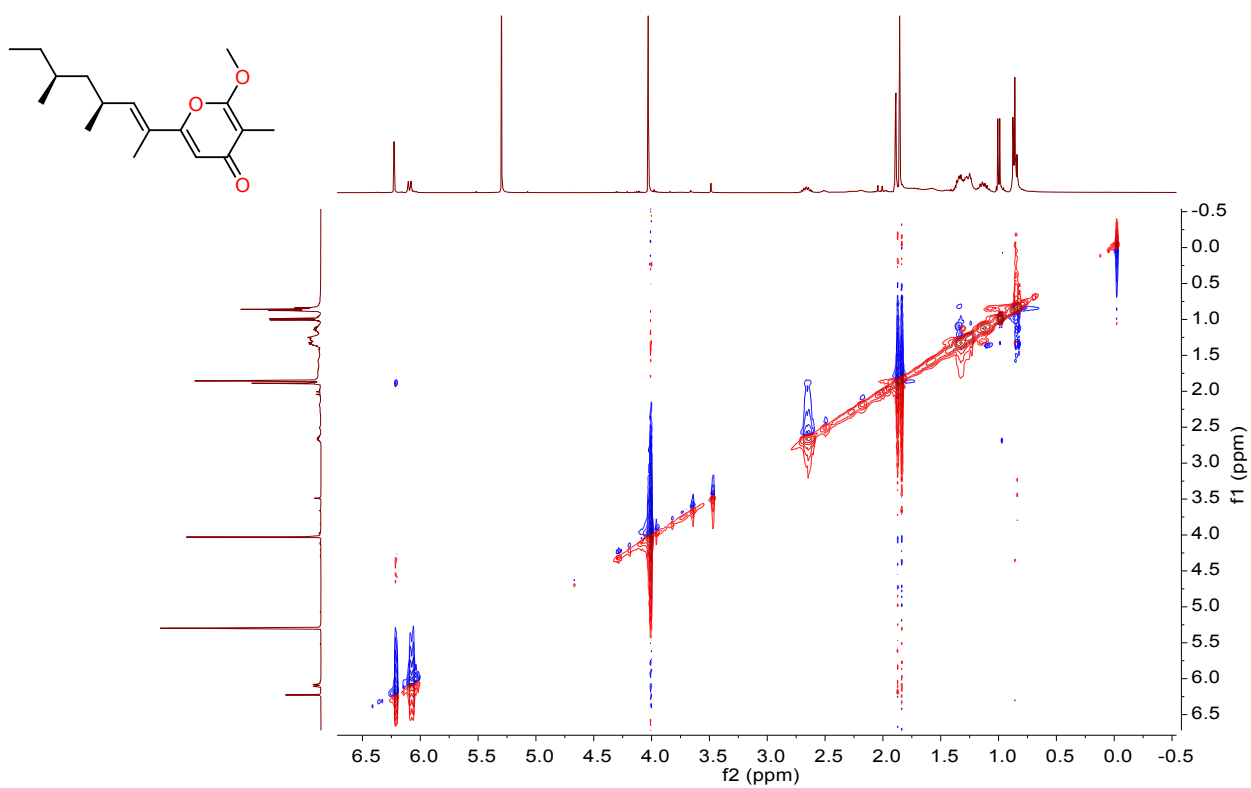
**Figure S16.** HMBC Spectrum of **2** in CDCl<sub>3</sub>



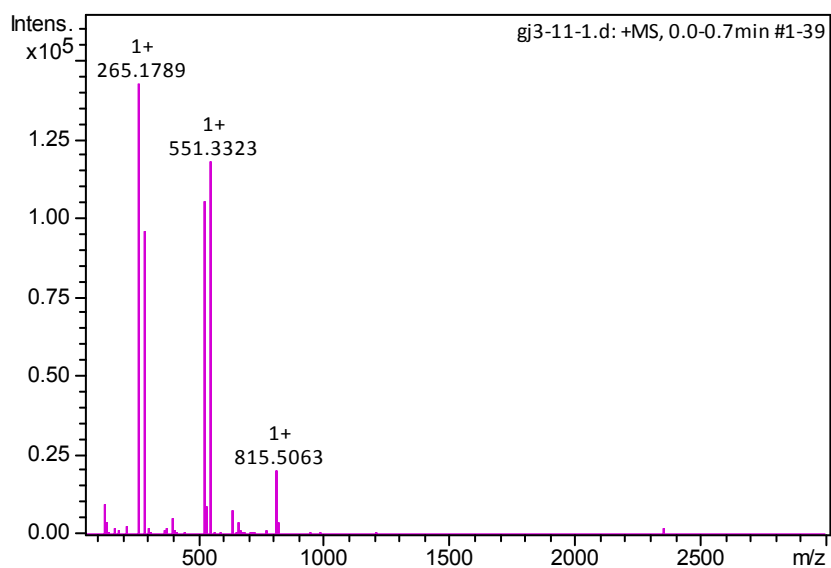
**Figure S17.**  $^1\text{H}$ - $^1\text{H}$  COSY Spectrum of **2** in  $\text{CDCl}_3$



**Figure S18.** NOESY Spectrum of **2** in  $\text{CDCl}_3$



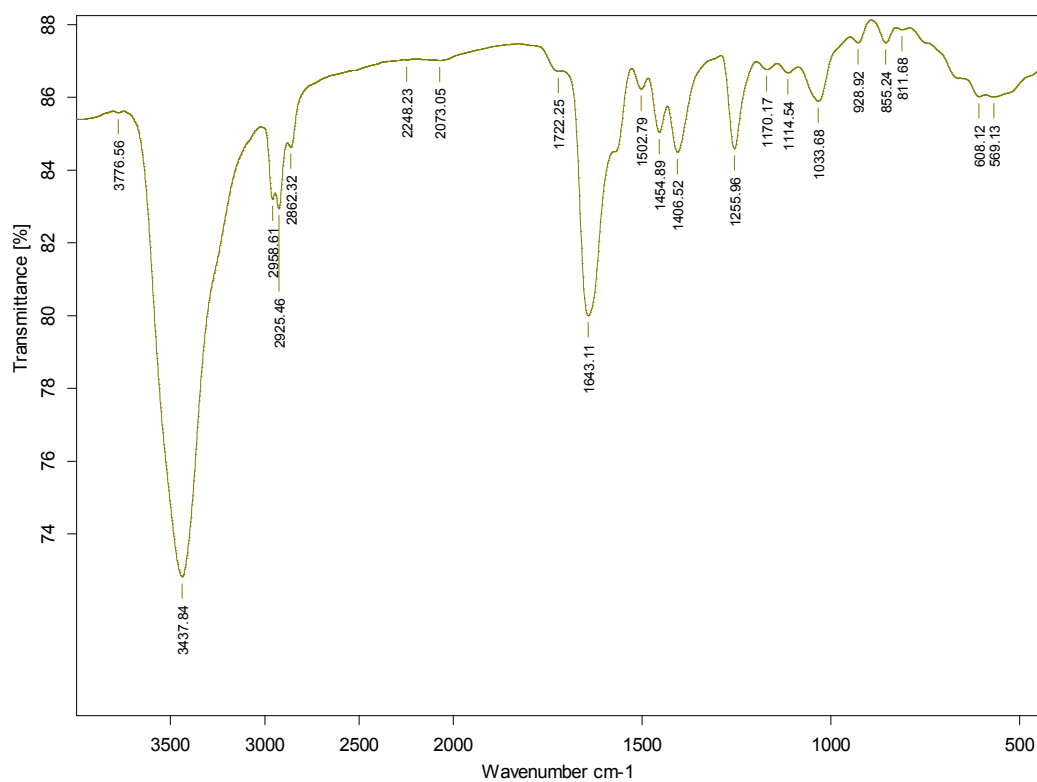
**Figure S19. (+)-HRESIMS Spectrum of 3**



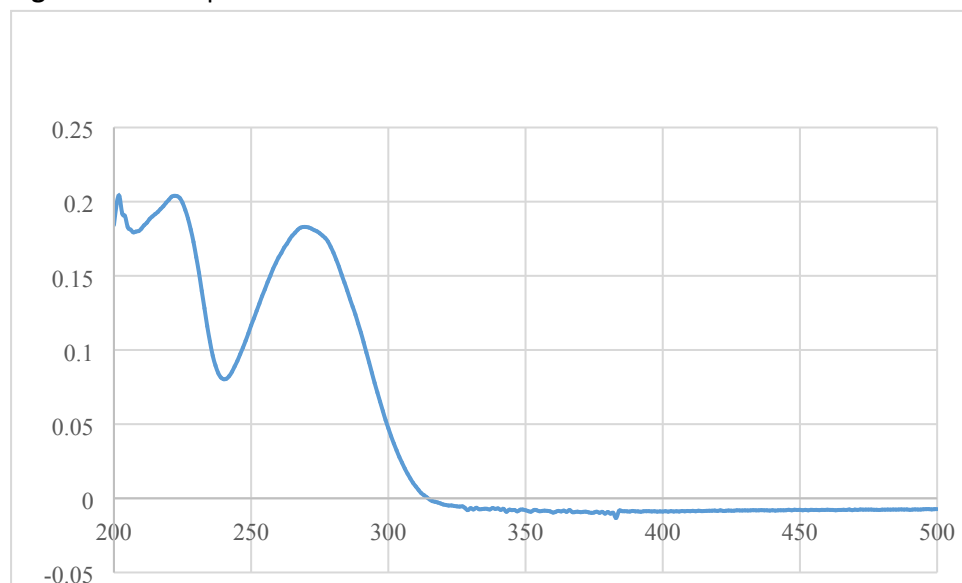
**Figure S20. IR Spectrum of 3**

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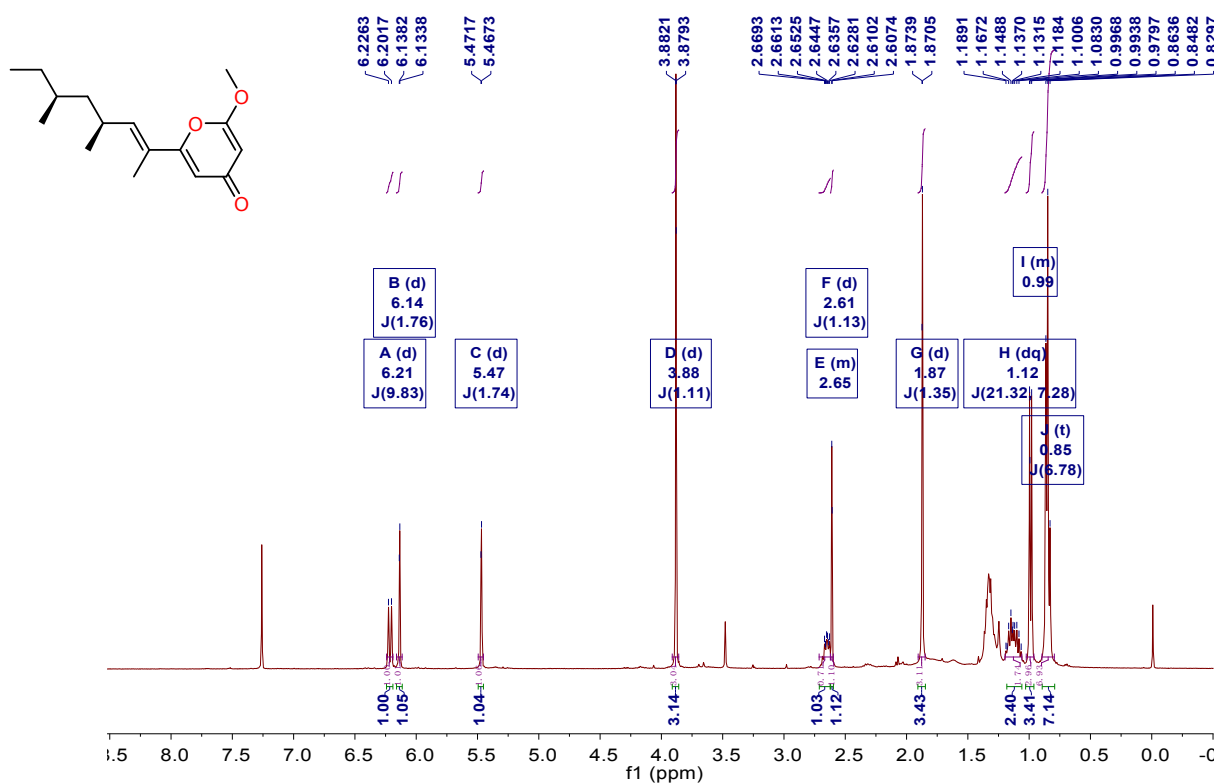
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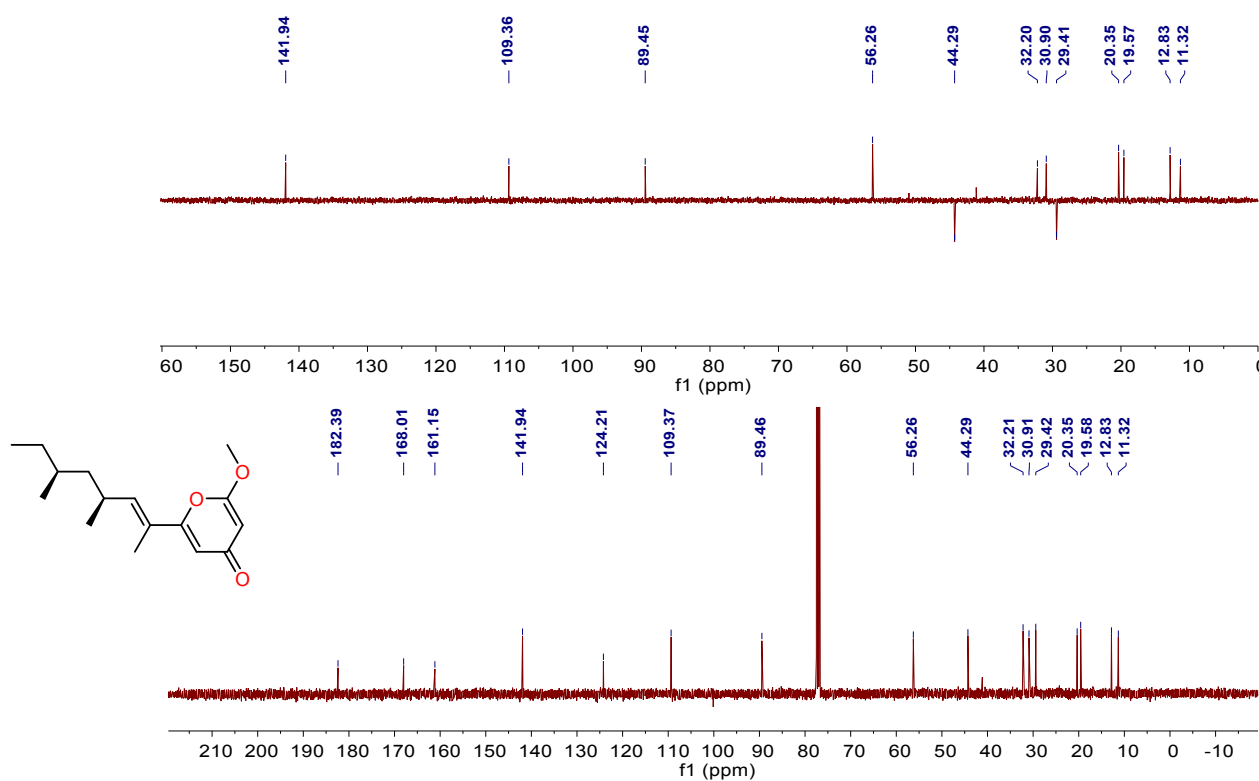
**Figure S21.** UV Spectrum of **3**



**Figure S22.**  $^1\text{H}$  NMR Spectrum of **3** in  $\text{CDCl}_3$



**Figure S23.**  $^{13}\text{C}$  NMR and DEPT Spectrum of **3** in  $\text{CDCl}_3$



**Figure S24.** HSQC Spectrum of **3** in  $\text{CDCl}_3$

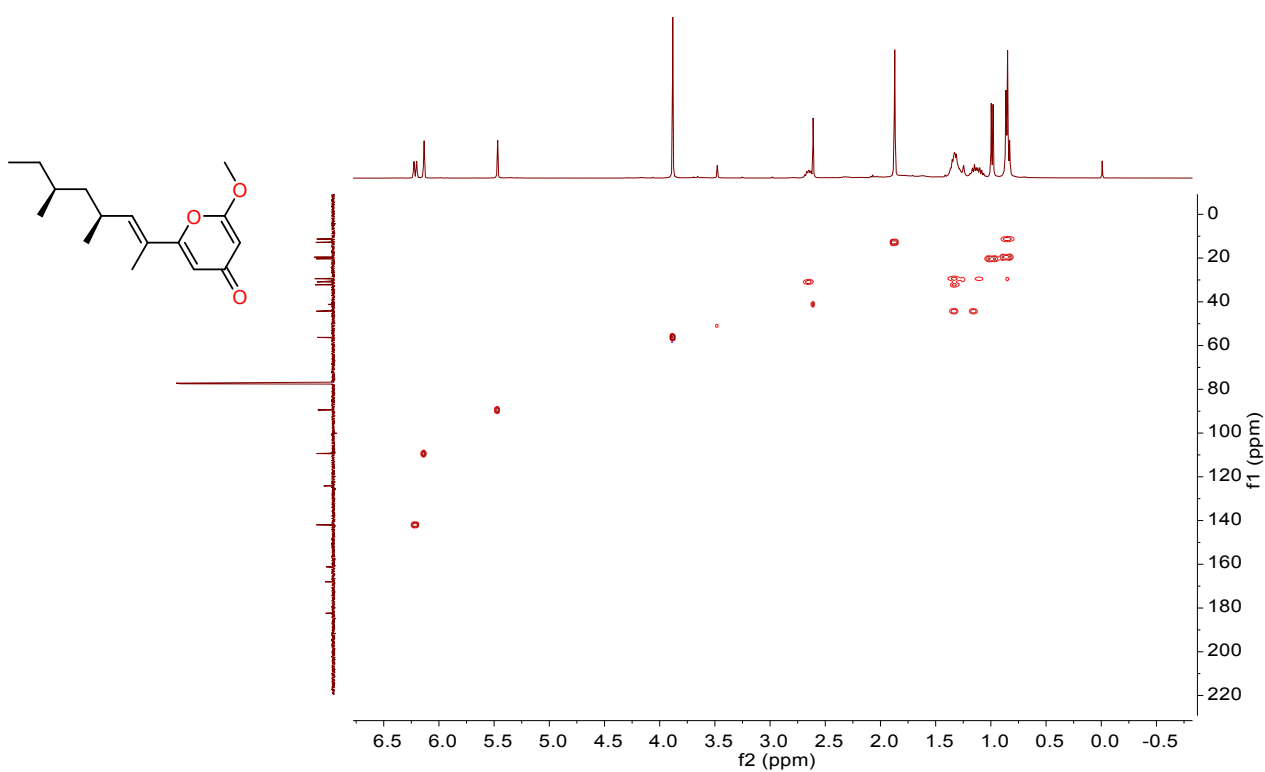


Figure S25. HMBC Spectrum of **3** in CDCl<sub>3</sub>

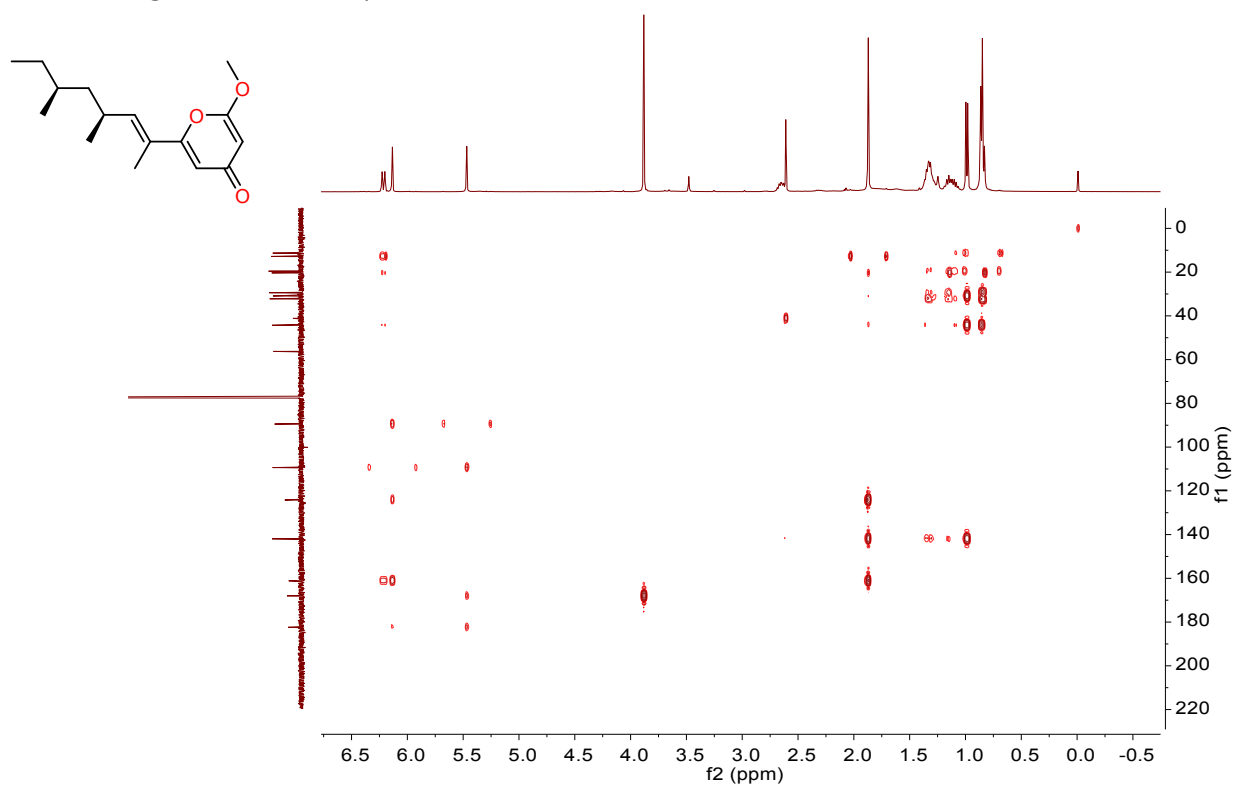
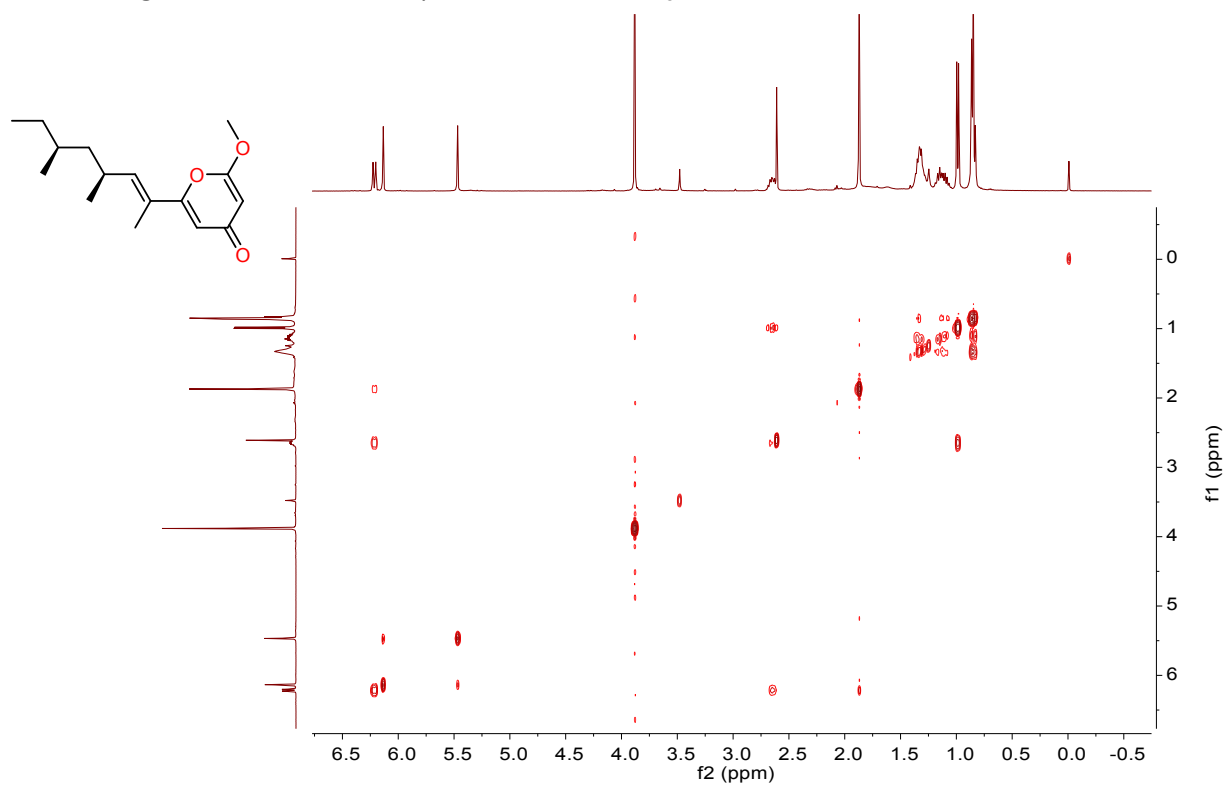
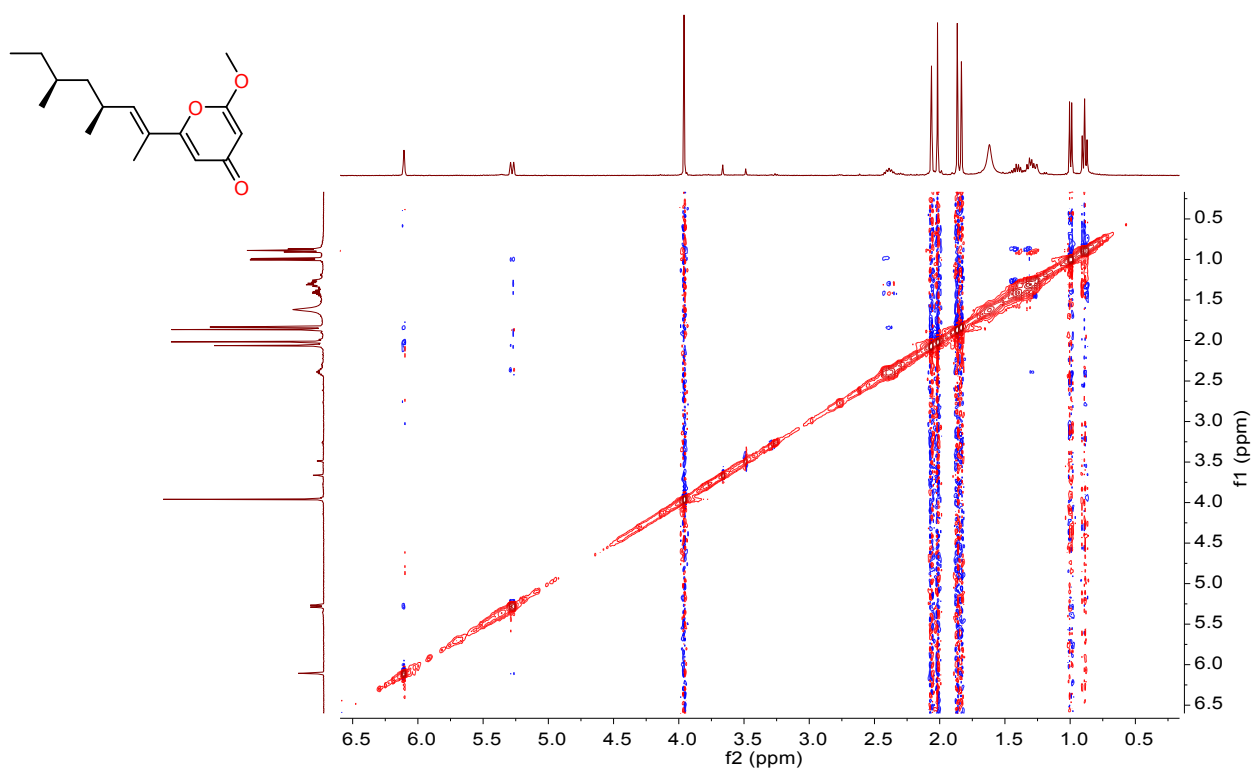


Figure S26. <sup>1</sup>H–<sup>1</sup>H COSY Spectrum of **3** in CDCl<sub>3</sub>

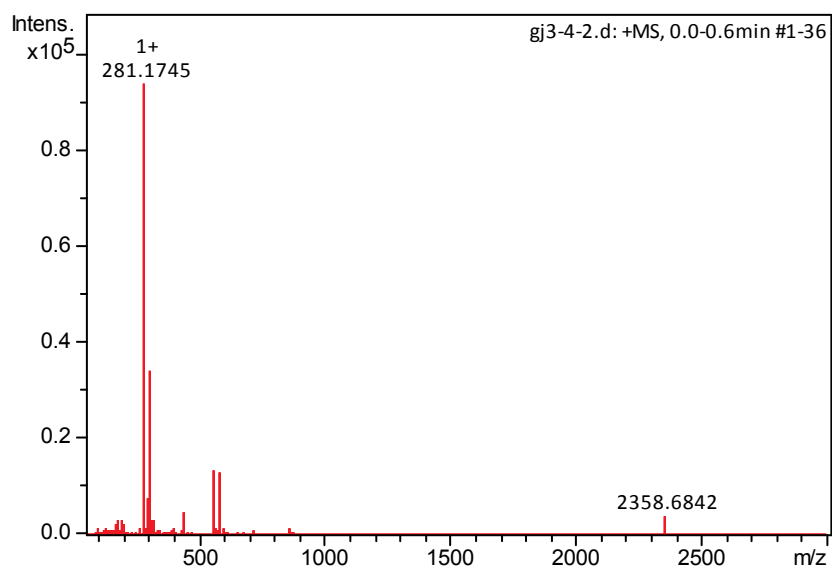




**Figure S27.** NOESY Spectrum of **3** in CDCl<sub>3</sub>



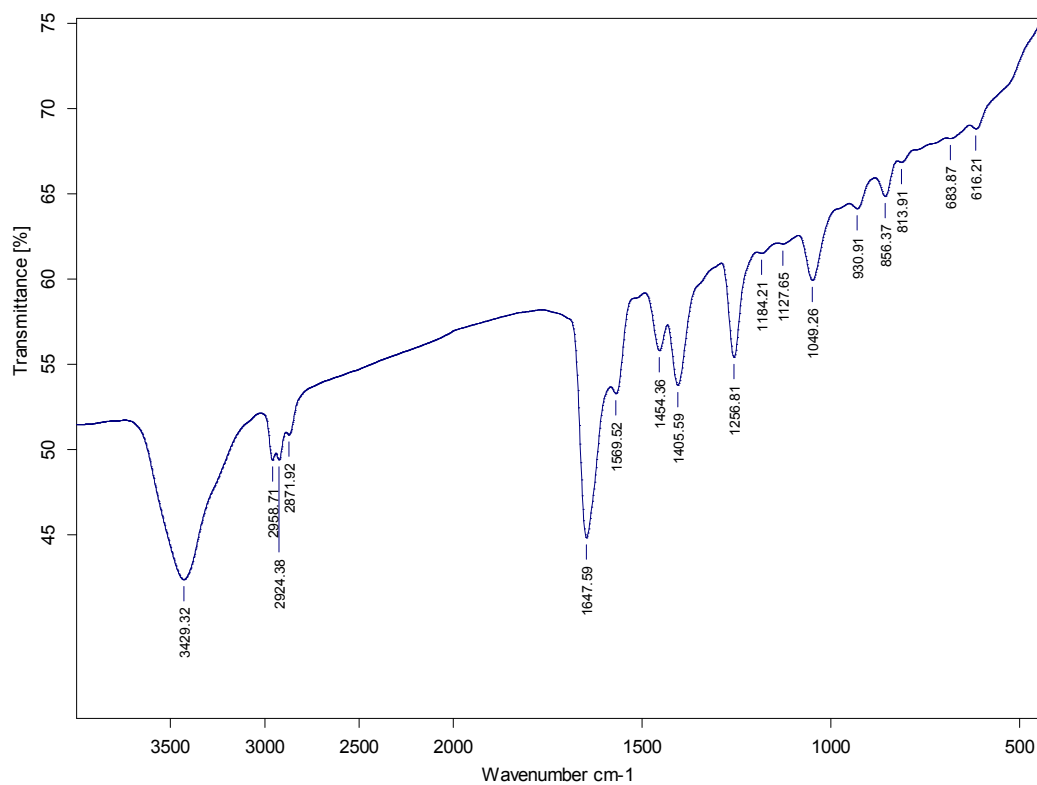
**Figure S28.** (+)-HRESIMS Spectrum of **4**



**Figure S29.** IR Spectrum of **4**

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**Figure S30.** UV Spectrum of **4**

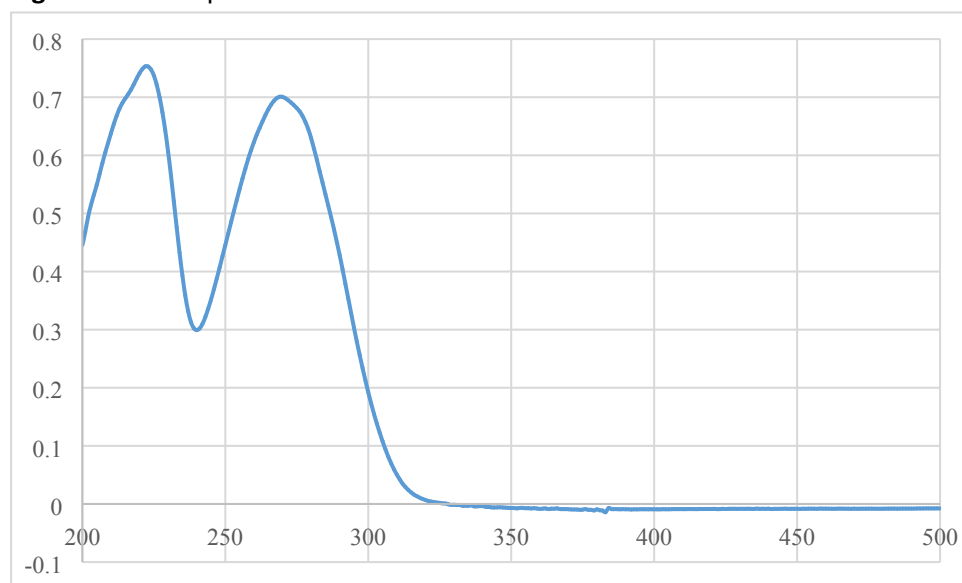


Figure S31.  $^1\text{H}$  NMR Spectrum of **4** in  $\text{CDCl}_3$

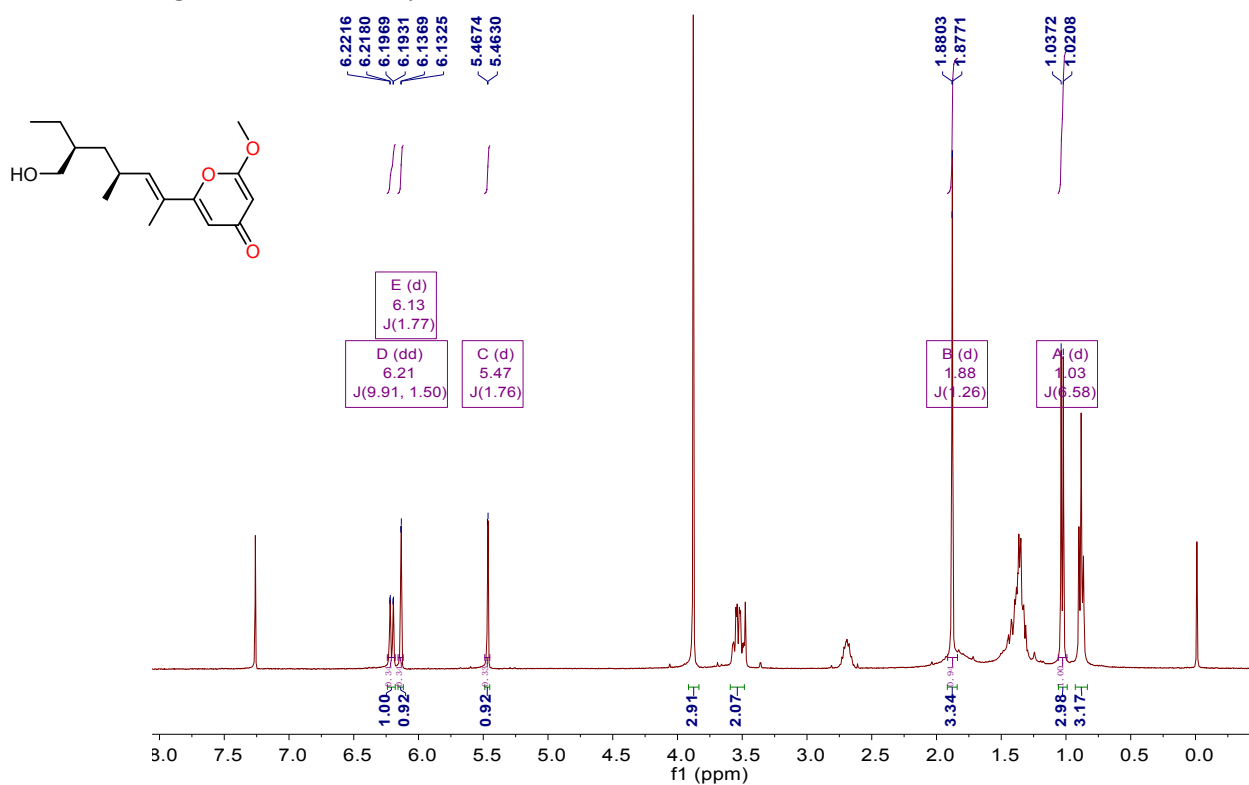
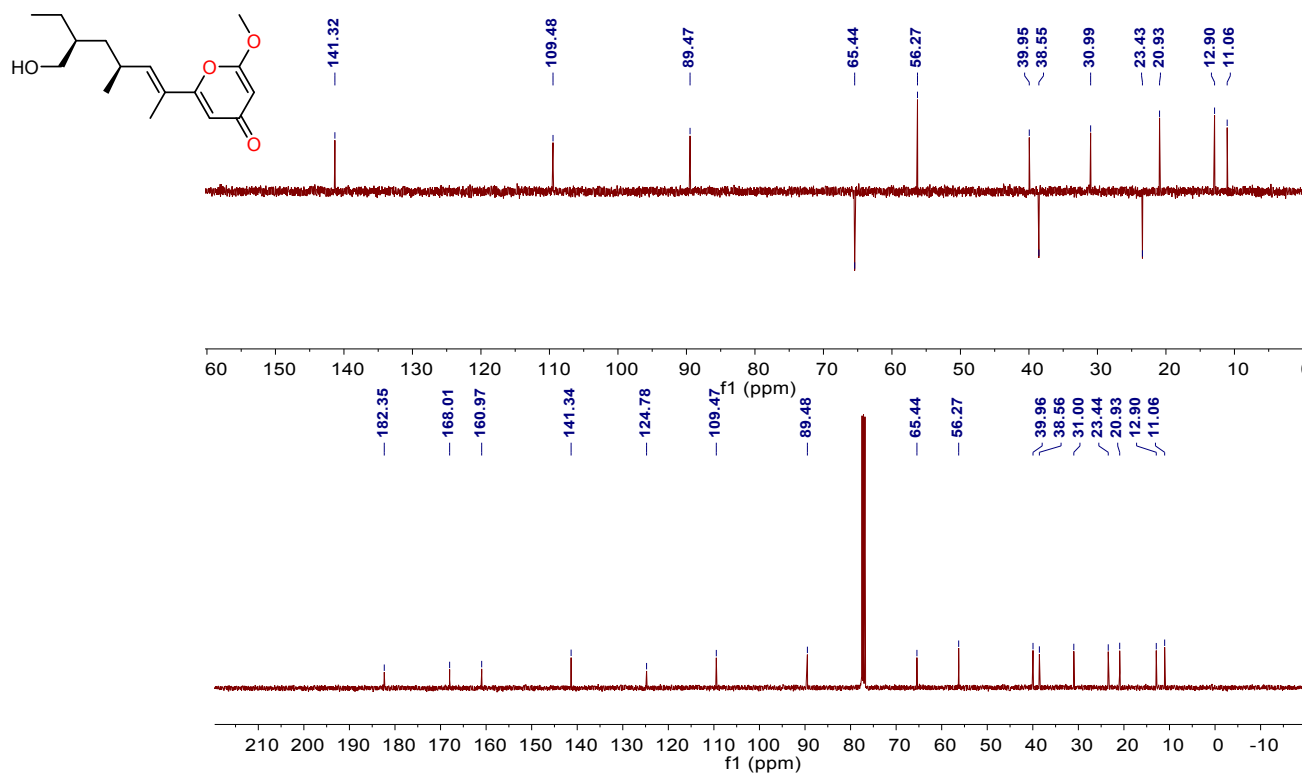
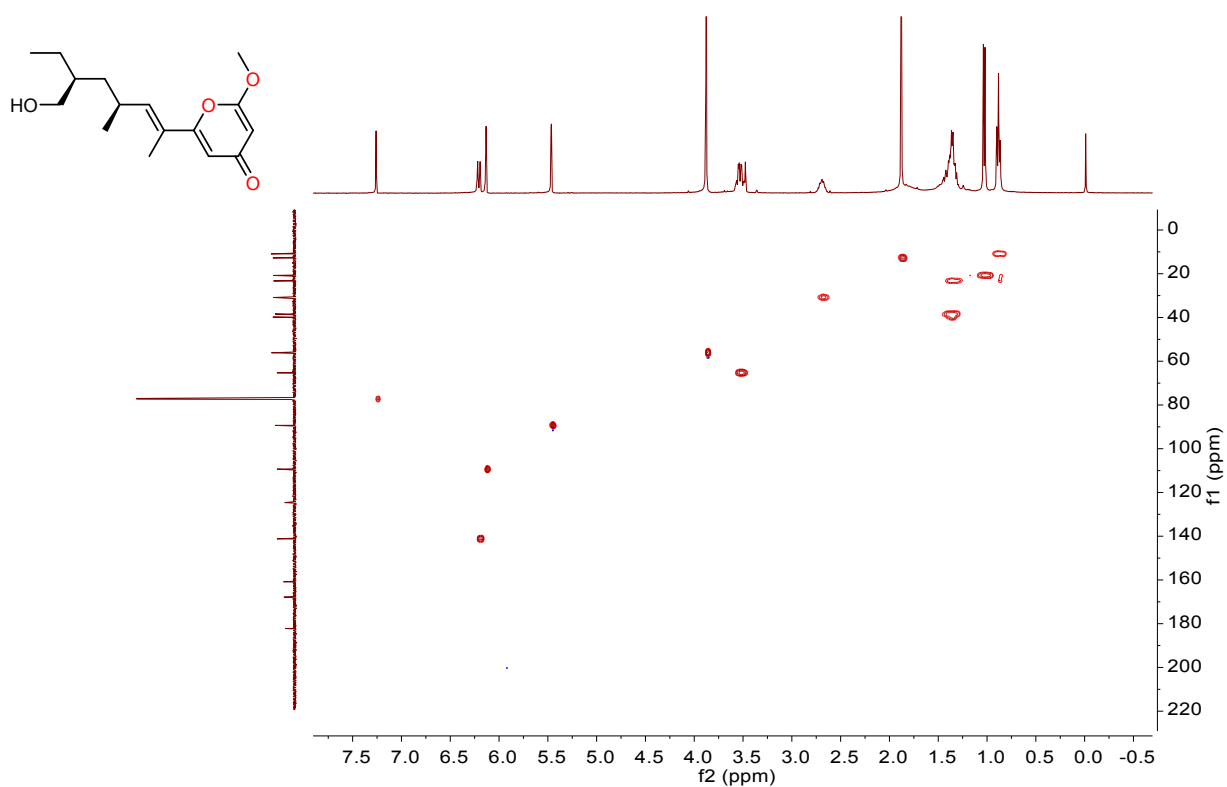


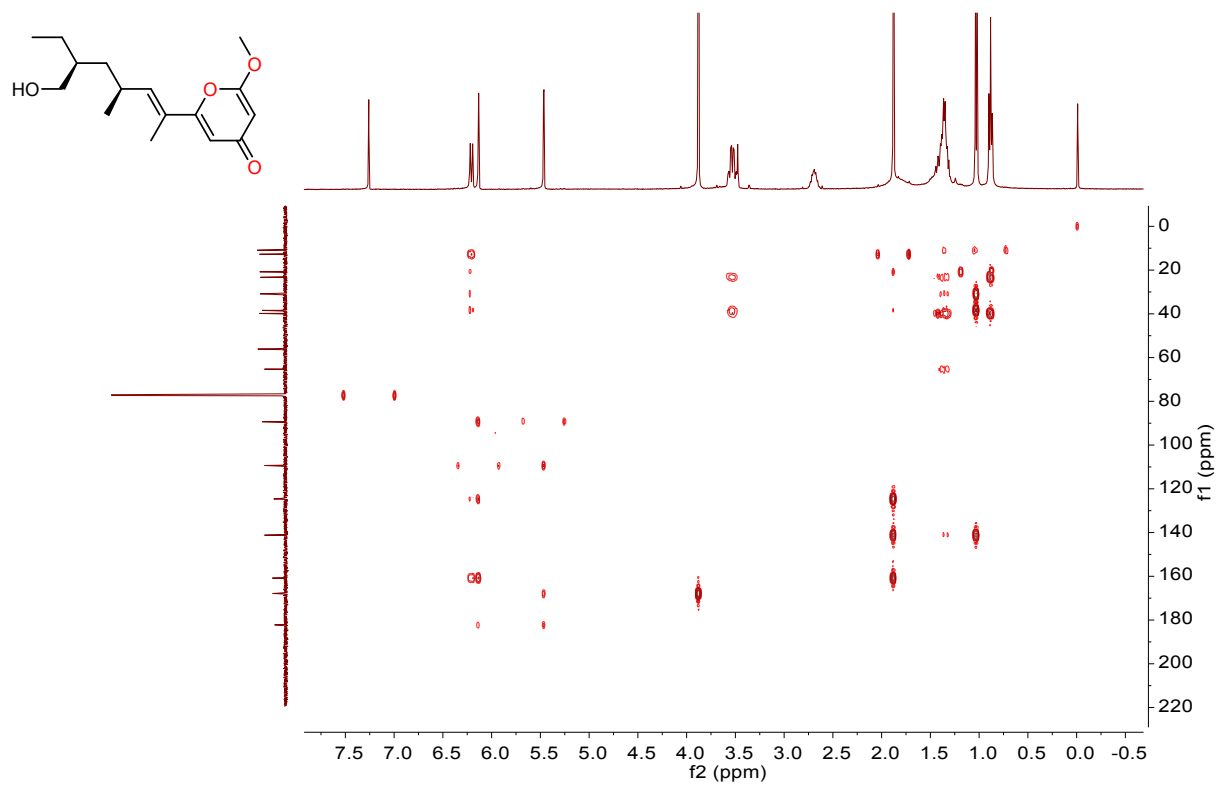
Figure S32.  $^{13}\text{C}$  NMR and DEPT Spectrum of **4** in  $\text{CDCl}_3$



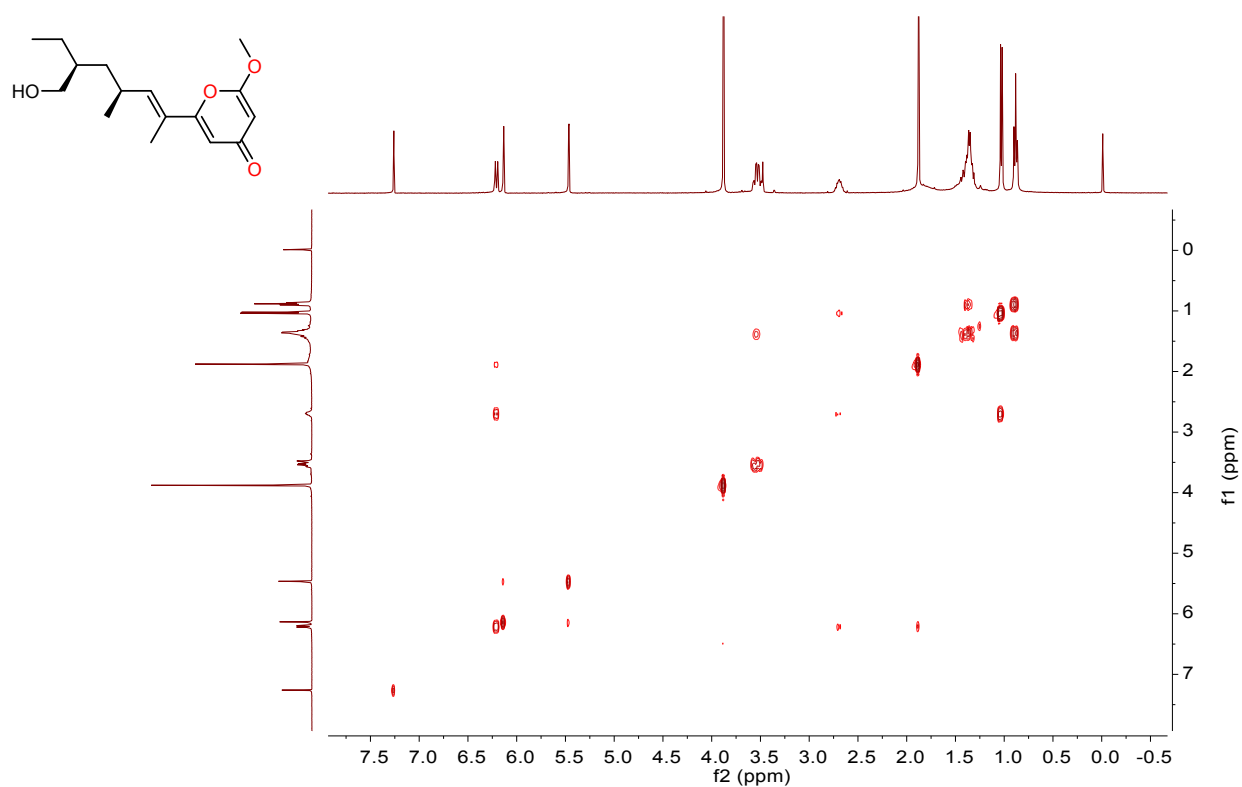
**Figure S33.** HSQC Spectrum of **4** in CDCl<sub>3</sub>



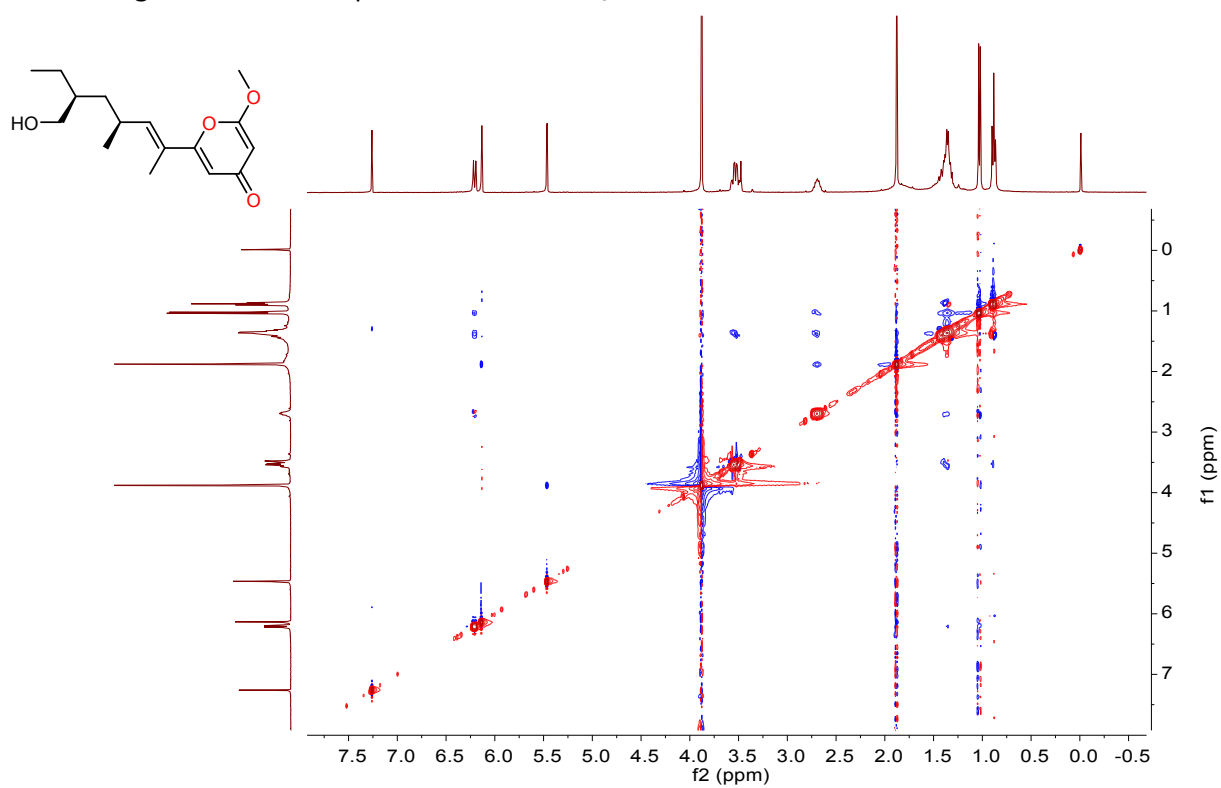
**Figure S34.** HMBC Spectrum of **4** in CDCl<sub>3</sub>



**Figure S35.**  $^1\text{H}$ - $^1\text{H}$  COSY Spectrum of **4** in  $\text{CDCl}_3$

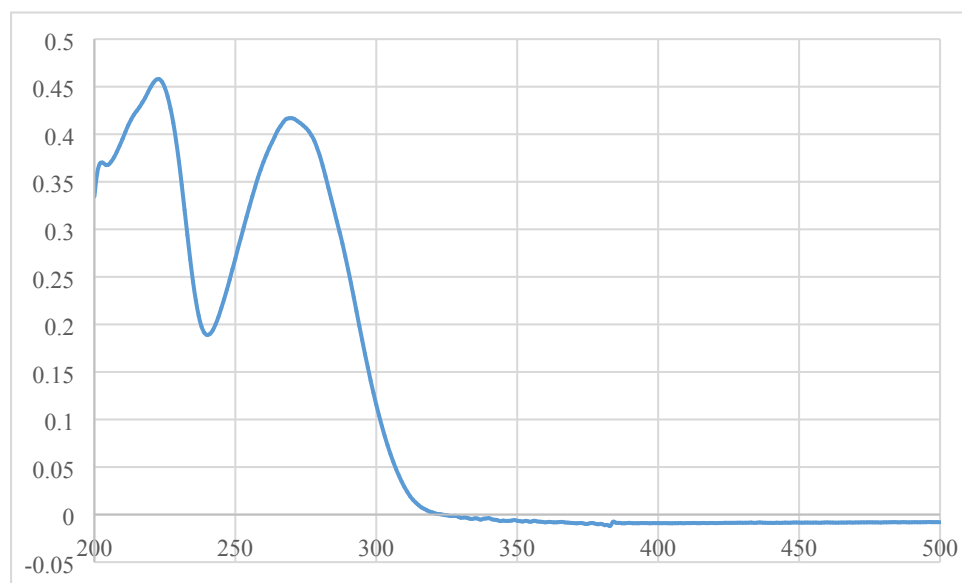


**Figure S36.** NOESY Spectrum of **4** in  $\text{CDCl}_3$

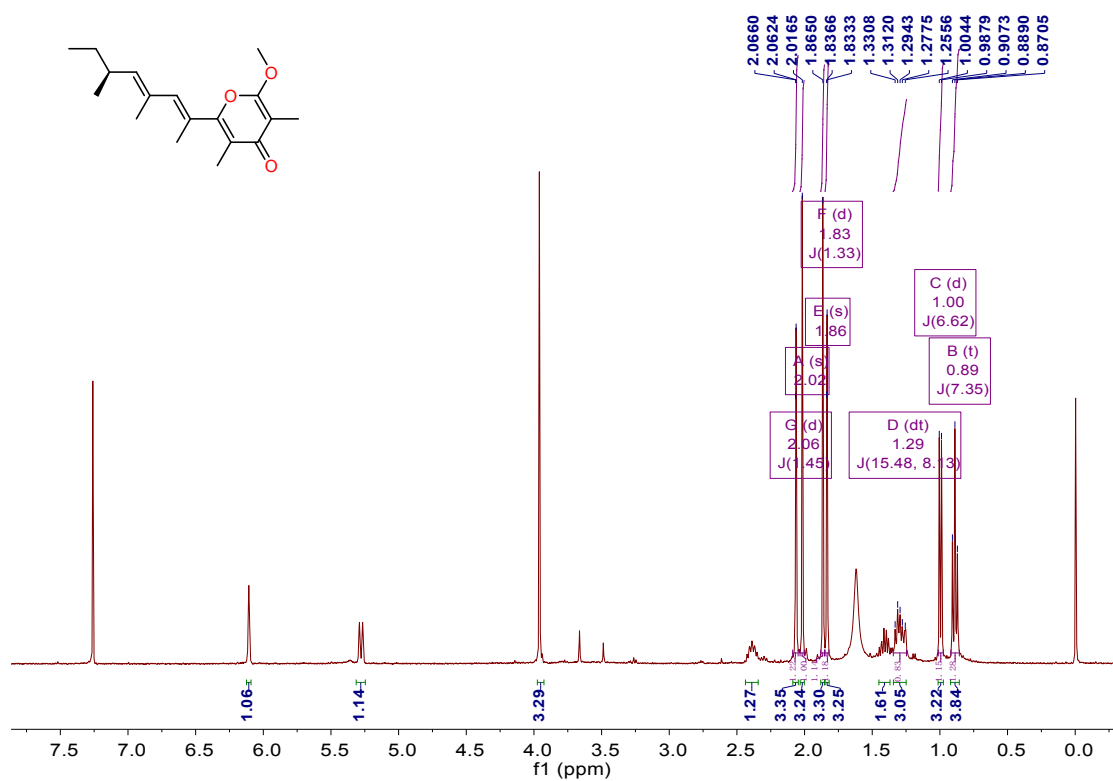




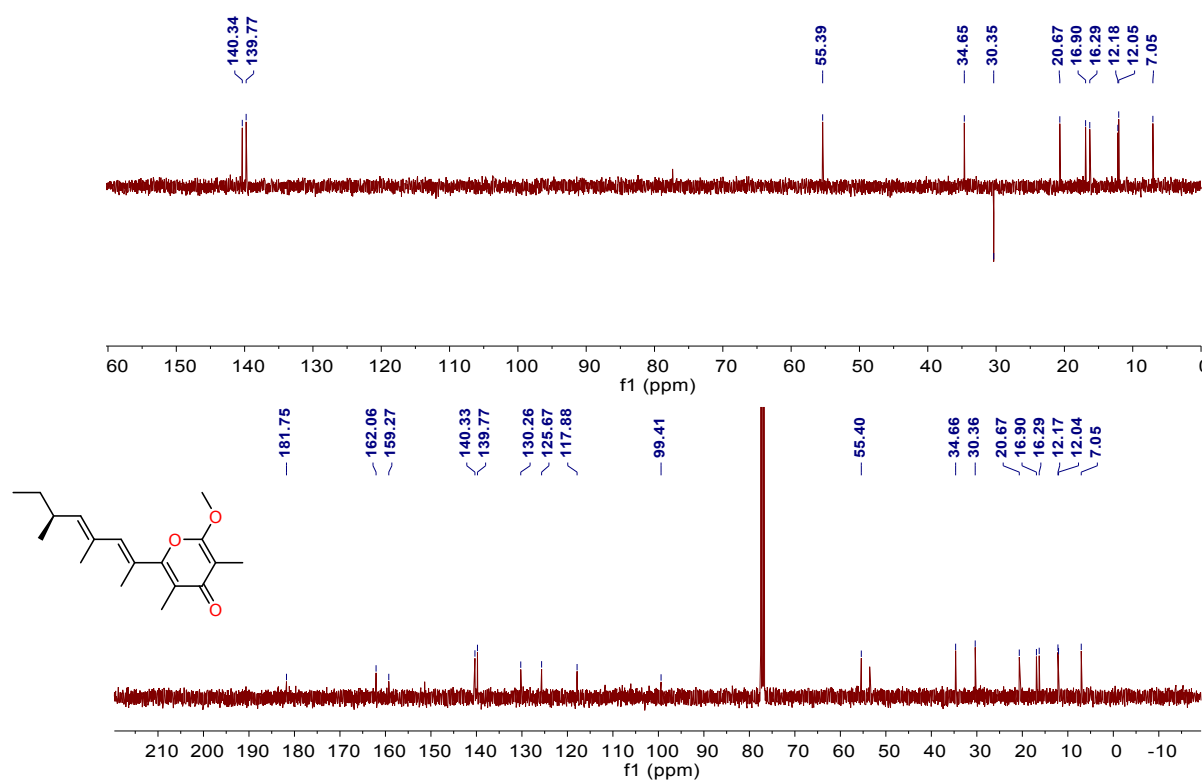
**Figure S39.** UV Spectrum of **5**



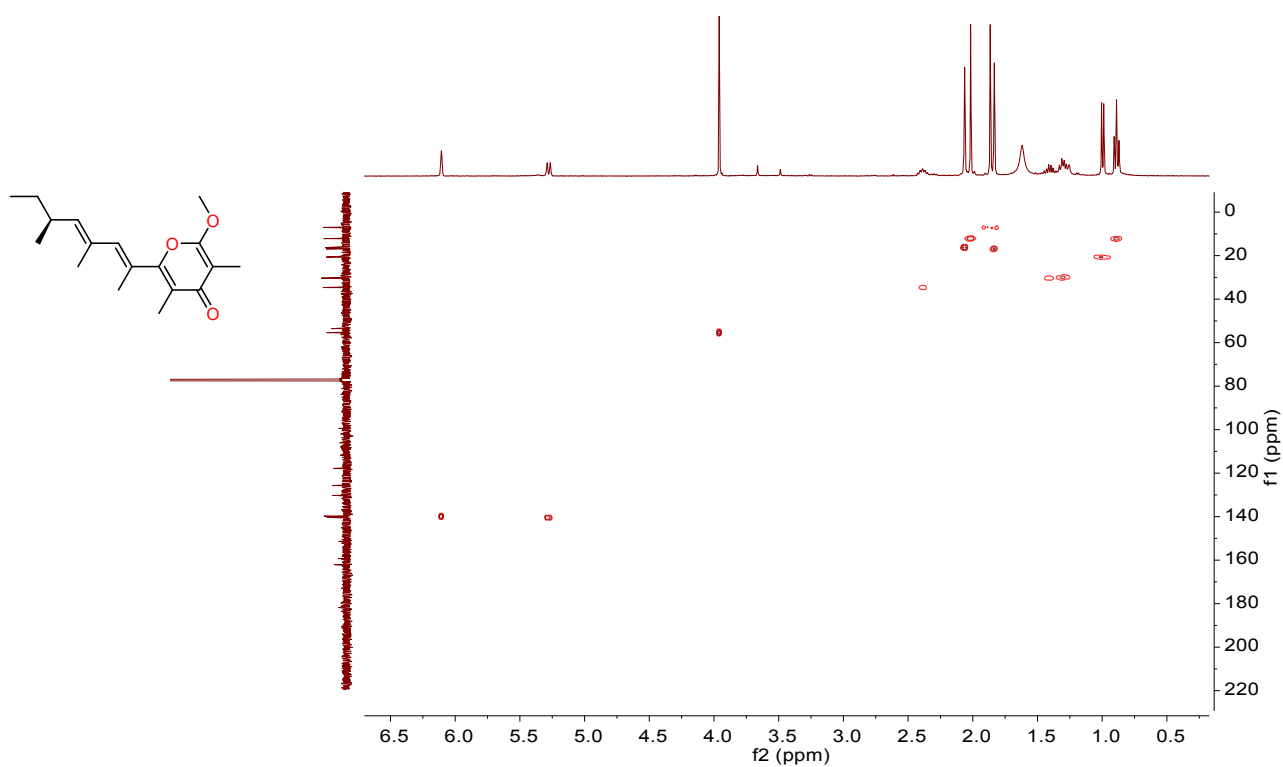
**Figure S40.**  $^1\text{H}$  NMR Spectrum of **5** in  $\text{CDCl}_3$



**Figure S41.**  $^{13}\text{C}$  NMR and DEPT Spectrum of **5** in  $\text{CDCl}_3$

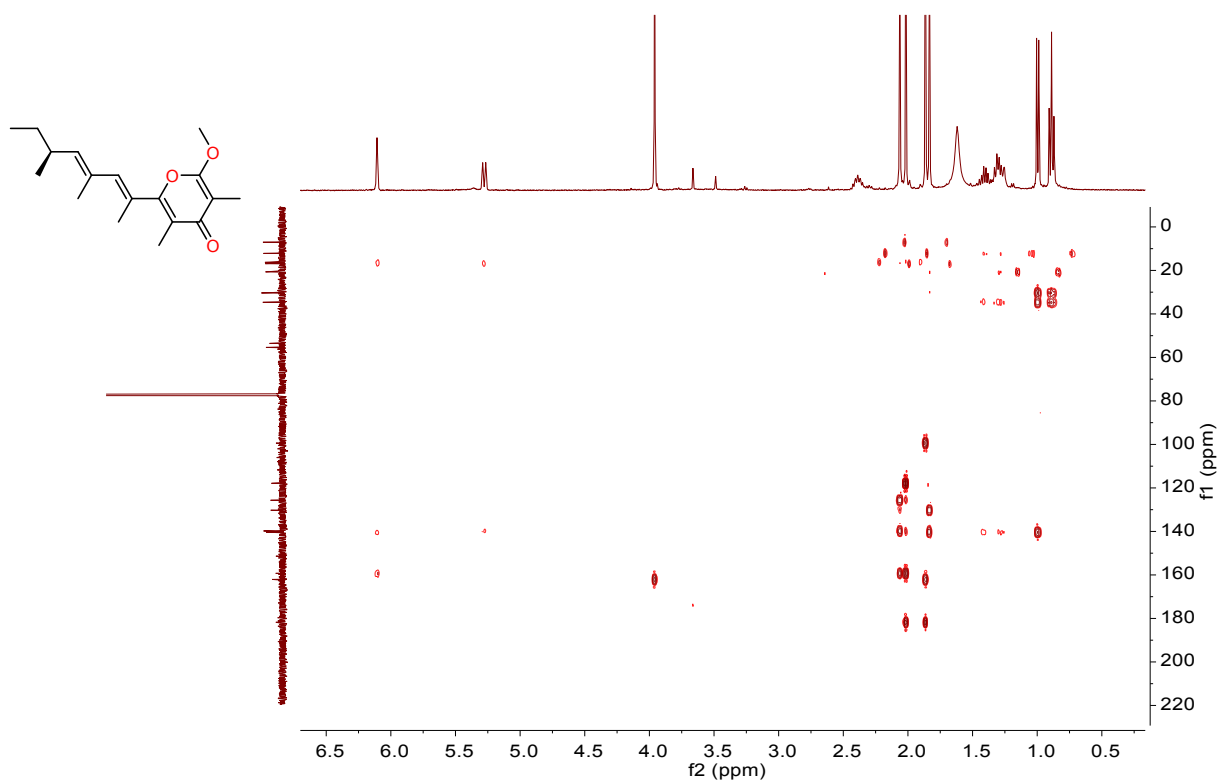


**Figure S42.** HSQC Spectrum of **5** in  $\text{CDCl}_3$

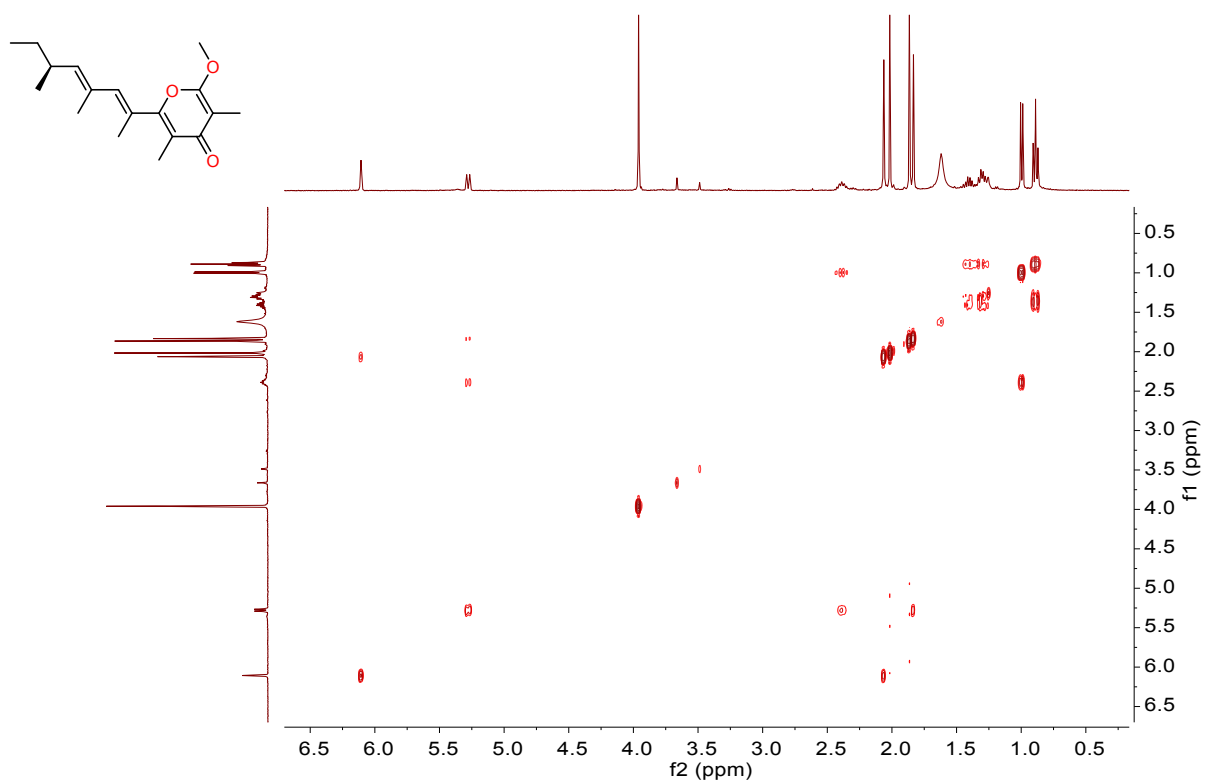




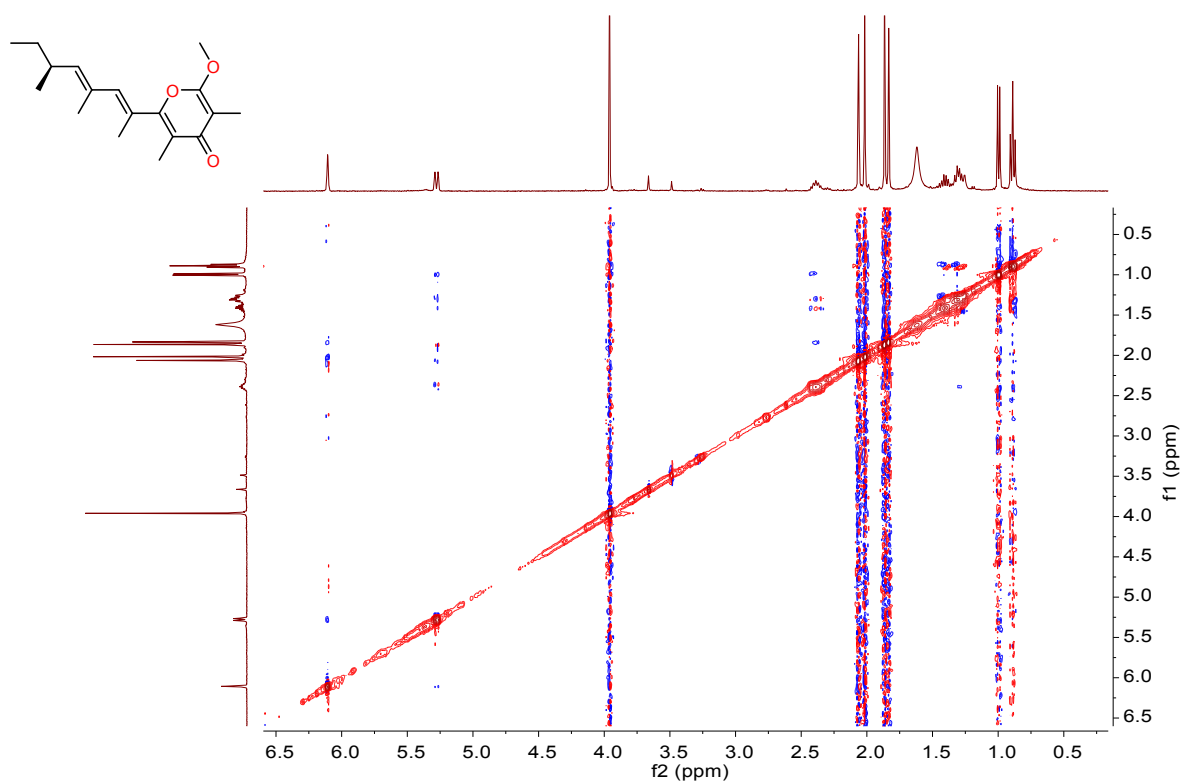
**Figure S43.** HMBC Spectrum of **5** in CDCl<sub>3</sub>



**Figure S44.** <sup>1</sup>H–<sup>1</sup>H COSY Spectrum of **5** in CDCl<sub>3</sub>



**Figure S45.** NOESY Spectrum of **5** in CDCl<sub>3</sub>

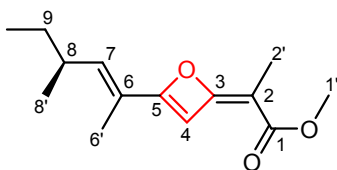


**Table S1.  $^1\text{H}$  (400 MHz) and  $^{13}\text{C}$  NMR (100 MHz) data and calculated  $^{13}\text{C}$  NMR data of two possible structures 1A and 1B in  $\text{CDCl}_3$  ( $\delta$  in ppm,  $J$  in Hz).**

| No.               | <b>1A</b>                   |                             |                                 | No.               | <b>1B</b>                   |                             |                                 |
|-------------------|-----------------------------|-----------------------------|---------------------------------|-------------------|-----------------------------|-----------------------------|---------------------------------|
|                   | $\delta_{\text{H}}$ (exptl) | $\delta_{\text{C}}$ (exptl) | $\delta_{\text{C}}$ (adj_calcd) |                   | $\delta_{\text{H}}$ (exptl) | $\delta_{\text{C}}$ (exptl) | $\delta_{\text{C}}$ (adj_calcd) |
| 1                 |                             | 162.6                       | 168.1                           | 2                 |                             | 162.6                       | 161.3                           |
| 2                 |                             | 101.0                       | 103.9                           | 3                 |                             | 101.0                       | 102.6                           |
| 2'                | 1.85, s                     | 6.8                         | 10.1                            | 3'                | 1.85, s                     | 6.8                         | 5.8                             |
| 3                 |                             | 181.8                       | 166.3                           | 4                 |                             | 181.8                       | 178.3                           |
| 4                 | 6.22, d (1.3)               | 109.4                       | 95.1                            | 5                 | 6.22, d (1.3)               | 109.4                       | 109.1                           |
| 5                 |                             | 159.2                       | 169.5                           | 6                 |                             | 159.2                       | 158.9                           |
| 6                 |                             | 125.6                       | 124.6                           | 7                 |                             | 125.6                       | 128.4                           |
| 6'                | 1.89, s                     | 13.1                        | 10.7                            | 7'                | 1.89, s                     | 13.1                        | 11.3                            |
| 7                 | 6.08, d (9.8)               | 139.9                       | 147.0                           | 8                 | 6.08, d (9.8)               | 139.9                       | 142.9                           |
| 8                 | 2.49, m                     | 34.8                        | 39.1                            | 9                 | 2.49, m                     | 34.8                        | 38.0                            |
| 8'                | 1.02, dd (6.6, 1.3)         | 20.3                        | 21.4                            | 9'                | 1.02, dd (6.6, 1.3)         | 20.3                        | 20.2                            |
| 9                 | 1.34, m; 1.45, m            | 30.2                        | 33.3                            | 10                | 1.34, m; 1.45, m            | 30.2                        | 32.0                            |
| 10                | 0.87, dd (8.1, 6.8)         | 12.0                        | 13.0                            | 11                | 0.87, dd (8.1, 6.8)         | 12.0                        | 11.2                            |
| -OCH <sub>3</sub> | 4.02, s                     | 55.8                        | 50.5                            | -OCH <sub>3</sub> | 4.02, s                     | 55.8                        | 52.4                            |

"m" means overlapped or multiplet with other signals

# <sup>13</sup>C NMR Calculation Data



**1A**

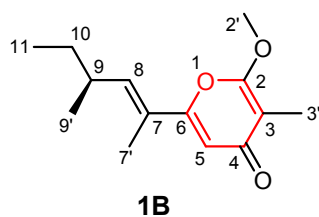
**Table S2.** Important thermodynamic parameters (a.u.) and boltzmann distribution of the optimized compound **1A** at B3LYP/6-31G(d) level in chloroform.

| Conformation | Internal Energy | %      |
|--------------|-----------------|--------|
| 1            | -771.031782     | 58.74% |
| 2            | -771.031435     | 40.67% |

**Table S3.** Optimized coordinates of compound **1A** at B3LYP/6-31G(d) level in chloroform.

| Conformation 1 |        |        |        |      |        |        |        |
|----------------|--------|--------|--------|------|--------|--------|--------|
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | -0.943 | -1.075 | -0.082 | H    | 1.441  | -2.86  | -1.067 |
| C              | 0.294  | -0.514 | -0.167 | H    | 3.023  | -2.587 | -0.324 |
| C              | -1.47  | 0.278  | -0.076 | H    | 1.592  | -2.824 | 0.69   |
| C              | 2.605  | 0.111  | -0.319 | H    | -3.142 | 2.894  | -0.914 |
| C              | 1.684  | -0.879 | -0.245 | H    | -3.048 | 2.93   | 0.843  |
| C              | -2.598 | 1.01   | -0.022 | H    | -1.552 | 2.888  | -0.117 |
| C              | -3.923 | 0.367  | 0.071  | H    | 5.033  | 0.719  | 2.905  |
| C              | 1.959  | -2.366 | -0.237 | H    | 3.434  | 0.191  | 2.358  |
| C              | -2.576 | 2.515  | -0.054 | H    | 4.829  | -0.885 | 2.184  |
| C              | 4.504  | 0.161  | 2.124  | H    | 4.29   | 1.617  | -1.889 |
| C              | 4.567  | 0.561  | -1.784 | H    | 5.657  | 0.488  | -1.873 |
| C              | -5.145 | -1.652 | 0.184  | H    | 4.117  | 0.011  | -2.617 |
| C              | 4.792  | 0.75   | 0.74   | H    | -5.773 | -1.4   | -0.675 |
| C              | 4.1    | -0.001 | -0.424 | H    | -4.917 | -2.717 | 0.19   |
| O              | -4.971 | 0.991  | 0.122  | H    | -5.665 | -1.368 | 1.102  |
| O              | -0.159 | 0.84   | -0.165 | H    | 5.874  | 0.738  | 0.554  |
| O              | -3.874 | -0.987 | 0.094  | H    | 4.486  | 1.805  | 0.714  |
| H              | -1.364 | -2.065 | -0.038 | H    | 4.402  | -1.054 | -0.37  |
| H              | 2.227  | 1.134  | -0.316 |      |        |        |        |
| Conformation 2 |        |        |        |      |        |        |        |
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | -0.782 | -1.276 | -0.036 | H    | 3.282  | -2.526 | -0.174 |
| C              | 0.417  | -0.64  | -0.143 | H    | 1.828  | -2.83  | 0.789  |
| C              | -1.392 | 0.04   | -0.083 | H    | 1.754  | -2.931 | -0.971 |
| C              | 2.681  | 0.132  | -0.322 | H    | -1.678 | 2.627  | -0.223 |
| C              | 1.828  | -0.913 | -0.206 | H    | -3.261 | 2.489  | -1.016 |

|   |        |        |        |   |        |        |        |
|---|--------|--------|--------|---|--------|--------|--------|
| C | -2.575 | 0.682  | -0.056 | H | -3.17  | 2.598  | 0.74   |
| C | -3.786 | -0.156 | 0.065  | H | 5.051  | 1.024  | 2.877  |
| C | 2.201  | -2.377 | -0.137 | H | 3.497  | 0.358  | 2.348  |
| C | -2.672 | 2.182  | -0.144 | H | 4.969  | -0.617 | 2.218  |
| C | 4.568  | 0.399  | 2.117  | H | 5.707  | 0.652  | -1.888 |
| C | 4.614  | 0.655  | -1.803 | H | 4.205  | 0.044  | -2.615 |
| C | -6.145 | -0.119 | 0.197  | H | 4.267  | 1.685  | -1.949 |
| C | 4.817  | 0.954  | 0.712  | H | -6.272 | -0.799 | -0.649 |
| C | 4.18   | 0.116  | -0.423 | H | -6.17  | -0.695 | 1.126  |
| O | -3.814 | -1.375 | 0.139  | H | -6.927 | 0.64   | 0.198  |
| O | -0.126 | 0.684  | -0.194 | H | 5.898  | 1.01   | 0.526  |
| O | -4.908 | 0.603  | 0.084  | H | 4.44   | 1.984  | 0.647  |
| H | -1.142 | -2.286 | 0.047  | H | 4.551  | -0.912 | -0.329 |
| H | 2.235  | 1.127  | -0.363 |   |        |        |        |



**Table S4.** Important thermodynamic parameters (a.u.) and boltzmann distribution of the optimized compound **1B** at B3LYP/6-31G(d) level in chloroform.

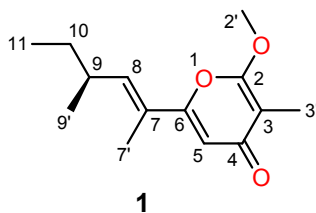
| Conformation | Internal Energy | %      |
|--------------|-----------------|--------|
| 1            | -771.069838     | 86.32% |
| 2            | -771.067475     | 7.07%  |
| 3            | -771.067412     | 6.61%  |

**Table S5.** Optimized coordinates of compound **1B** at B3LYP/6-31G(d) level in chloroform.

| Conformation 1 |        |        |        |      |        |        |        |
|----------------|--------|--------|--------|------|--------|--------|--------|
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | -1.382 | -1.716 | -0.038 | H    | -5.104 | 0.04   | -0.527 |
| C              | -3.053 | 0.097  | 0.078  | H    | -4.551 | 1.652  | -0.009 |
| C              | -0.388 | -0.799 | -0.119 | H    | -4.88  | 0.379  | 1.183  |
| C              | -1.99  | 0.944  | -0.002 | H    | 0.973  | -3.055 | -1.091 |
| C              | -2.791 | -1.336 | 0.07   | H    | 2.516  | -2.668 | -0.324 |
| C              | 1.934  | -0.049 | -0.312 | H    | 1.103  | -3.04  | 0.669  |
| C              | 1.055  | -1.071 | -0.229 | H    | 4.257  | -0.931 | 2.153  |
| C              | -4.472 | 0.58   | 0.185  | H    | 2.812  | 0.072  | 2.345  |
| C              | 1.437  | -2.534 | -0.245 | H    | 4.392  | 0.686  | 2.862  |
| C              | 3.878  | 0.097  | 2.094  | H    | 3.522  | 1.516  | -1.925 |
| C              | 3.851  | 0.475  | -1.816 | H    | 3.413  | -0.103 | -2.637 |
| C              | -0.976 | 3.115  | -0.127 | H    | 4.941  | 0.453  | -1.926 |
| C              | 4.112  | 0.691  | 0.701  | H    | -1.364 | 4.133  | -0.098 |
| C              | 3.433  | -0.097 | -0.445 | H    | -0.474 | 2.932  | -1.08  |
| O              | -3.697 | -2.182 | 0.146  | H    | -0.276 | 2.959  | 0.698  |
| O              | -0.703 | 0.543  | -0.1   | H    | 3.757  | 1.731  | 0.676  |
| O              | -2.134 | 2.275  | 0.015  | H    | 5.19   | 0.73   | 0.495  |
| H              | -1.153 | -2.773 | -0.05  | H    | 3.787  | -1.133 | -0.39  |
| H              | 1.53   | 0.962  | -0.297 |      |        |        |        |
| Conformation 2 |        |        |        |      |        |        |        |
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | 0.668  | 1.49   | 0.173  | H    | 4.522  | 1.702  | -1.255 |
| C              | 2.963  | 0.672  | -0.225 | H    | 4.909  | 0.001  | -0.882 |
| C              | 0.24   | 0.215  | 0.314  | H    | 4.955  | 1.238  | 0.387  |
| C              | 2.447  | -0.573 | -0.029 | H    | -0.675 | -1.423 | 2.361  |
| C              | 2.063  | 1.816  | -0.124 | H    | -2.275 | -1.749 | 1.678  |
| C              | -2.171 | 0.442  | 0.104  | H    | -0.824 | -2.382 | 0.891  |
| C              | -1.13  | -0.261 | 0.594  | H    | -4.134 | -2.111 | -1.258 |

|                |          |          |          |             |          |          |          |
|----------------|----------|----------|----------|-------------|----------|----------|----------|
| C              | 4.419    | 0.905    | -0.512   | H           | -2.879   | -1.17    | -2.08    |
| C              | -1.239   | -1.52    | 1.426    | H           | -4.505   | -1.276   | -2.775   |
| C              | -3.947   | -1.196   | -1.835   | H           | -4.107   | 2.346    | 0.55     |
| C              | -4.244   | 1.404    | 1.095    | H           | -3.768   | 1.51     | 2.075    |
| C              | 2.584    | -2.967   | 0.038    | H           | -5.32    | 1.259    | 1.25     |
| C              | -4.372   | 0.048    | -1.049   | H           | 3.403    | -3.68    | -0.055   |
| C              | -3.647   | 0.219    | 0.307    | H           | 1.859    | -3.121   | -0.766   |
| O              | 2.45     | 2.987    | -0.271   | H           | 2.093    | -3.085   | 1.008    |
| O              | 1.142    | -0.824   | 0.223    | H           | -4.203   | 0.947    | -1.658   |
| O              | 3.206    | -1.675   | -0.07    | H           | -5.452   | 0.007    | -0.855   |
| H              | -0.028   | 2.311    | 0.297    | H           | -3.814   | -0.694   | 0.892    |
| H              | -1.941   | 1.306    | -0.521   |             |          |          |          |
| Conformation 3 |          |          |          |             |          |          |          |
| <b>Atom</b>    | <b>X</b> | <b>Y</b> | <b>Z</b> | <b>Atom</b> | <b>X</b> | <b>Y</b> | <b>Z</b> |
| C              | 0.525    | 1.374    | -0.026   | H           | 4.617    | 1.944    | -0.582   |
| C              | 2.926    | 0.816    | 0.101    | H           | 5.04     | 0.365    | 0.121    |
| C              | 0.225    | 0.057    | -0.088   | H           | 4.561    | 1.725    | 1.16     |
| C              | 2.53     | -0.483   | 0.005    | H           | -0.608   | -2.659   | -0.456   |
| C              | 1.901    | 1.854    | 0.099    | H           | -2.203   | -2.218   | -1.078   |
| C              | -2.155   | 0.033    | 0.41     | H           | -0.741   | -1.755   | -1.963   |
| C              | -1.109   | -0.571   | -0.189   | H           | -4.473   | 0.238    | -2.214   |
| C              | 4.369    | 1.222    | 0.204    | H           | -3.257   | 1.439    | -1.757   |
| C              | -1.176   | -1.87    | -0.962   | H           | -4.959   | 1.909    | -1.892   |
| C              | -4.285   | 1.107    | -1.572   | H           | -3.876   | 0.069    | 2.558    |
| C              | -4.011   | -0.773   | 1.867    | H           | -3.408   | -1.61    | 2.235    |
| C              | 2.914    | -2.848   | -0.119   | H           | -5.066   | -1.069   | 1.9      |
| C              | -4.506   | 0.761    | -0.096   | H           | 3.808    | -3.471   | -0.105   |
| C              | -3.603   | -0.379   | 0.431    | H           | 2.373    | -2.99    | -1.059   |
| O              | 2.176    | 3.062    | 0.182    | H           | 2.266    | -3.104   | 0.723    |
| O              | 1.239    | -0.877   | -0.084   | H           | -4.348   | 1.656    | 0.523    |
| O              | 3.401    | -1.5     | -0.004   | H           | -5.553   | 0.465    | 0.057    |
| H              | -0.266   | 2.112    | -0.08    | H           | -3.758   | -1.252   | -0.215   |
| H              | -1.949   | 0.937    | 0.985    |             |          |          |          |

# ECD Calculation Data



**Table S6.** Important thermodynamic parameters (a.u.) and Boltzmann distributions of the optimized **1** at B3LYP/6-31G(d) level in methanol.

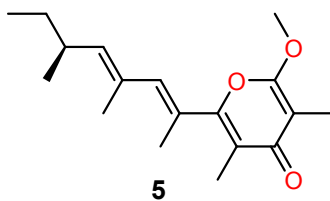
| Conformation | Internal Energy | %      |
|--------------|-----------------|--------|
| 1            | -771.074        | 86.09% |
| 2            | -771.072        | 7.40%  |
| 3            | -771.071        | 6.52%  |

**Table S7.** Optimized coordinates of compound **1** at B3LYP/6-31G(d) level in methanol.

| Conformation 1 |        |        |        |      |        |        |        |
|----------------|--------|--------|--------|------|--------|--------|--------|
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | -1.383 | -1.715 | -0.037 | H    | -5.08  | 0.166  | -0.623 |
| C              | -3.052 | 0.097  | 0.081  | H    | -4.533 | 1.669  | 0.153  |
| C              | -0.388 | -0.798 | -0.122 | H    | -4.925 | 0.236  | 1.128  |
| C              | -1.989 | 0.946  | -0.008 | H    | 2.515  | -2.667 | -0.337 |
| C              | -2.789 | -1.334 | 0.071  | H    | 1.104  | -3.044 | 0.656  |
| C              | 1.932  | -0.047 | -0.311 | H    | 0.971  | -3.051 | -1.103 |
| C              | 1.054  | -1.071 | -0.233 | H    | 4.254  | -0.949 | 2.143  |
| C              | -4.471 | 0.58   | 0.19   | H    | 2.814  | 0.058  | 2.348  |
| C              | 1.436  | -2.534 | -0.256 | H    | 4.397  | 0.662  | 2.865  |
| C              | 3.879  | 0.081  | 2.093  | H    | 3.516  | 1.53   | -1.914 |
| C              | 3.846  | 0.488  | -1.813 | H    | 3.408  | -0.084 | -2.638 |
| C              | -0.969 | 3.116  | -0.105 | H    | 4.937  | 0.469  | -1.923 |
| C              | 4.111  | 0.685  | 0.705  | H    | -1.358 | 4.133  | -0.083 |
| C              | 3.431  | -0.095 | -0.446 | H    | -0.44  | 2.937  | -1.045 |
| O              | -3.698 | -2.181 | 0.15   | H    | -0.295 | 2.953  | 0.739  |
| O              | -0.704 | 0.542  | -0.106 | H    | 3.755  | 1.726  | 0.689  |
| O              | -2.133 | 2.274  | -0.003 | H    | 5.188  | 0.725  | 0.498  |
| H              | -1.152 | -2.773 | -0.048 | H    | 3.785  | -1.131 | -0.4   |
| H              | 1.529  | 0.964  | -0.29  |      |        |        |        |
| Conformation 2 |        |        |        |      |        |        |        |
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | 0.666  | 1.487  | 0.175  | H    | 4.533  | 1.541  | -1.395 |
| C              | 2.962  | 0.676  | -0.218 | H    | 4.966  | -0.011 | -0.643 |



| C              | 0.239  | 0.209  | 0.307  | H    | 4.886  | 1.473  | 0.326  |
|----------------|--------|--------|--------|------|--------|--------|--------|
| C              | 2.449  | -0.574 | -0.038 | H    | -0.662 | -1.476 | 2.32   |
| C              | 2.059  | 1.814  | -0.118 | H    | -2.268 | -1.783 | 1.642  |
| C              | -2.172 | 0.44   | 0.113  | H    | -0.824 | -2.401 | 0.83   |
| C              | -1.129 | -0.272 | 0.584  | H    | -4.131 | -2.082 | -1.305 |
| C              | 4.419  | 0.921  | -0.498 | H    | -2.883 | -1.117 | -2.107 |
| C              | -1.234 | -1.55  | 1.387  | H    | -4.511 | -1.211 | -2.799 |
| C              | -3.95  | -1.153 | -1.86  | H    | -4.109 | 2.33   | 0.612  |
| C              | -4.243 | 1.374  | 1.133  | H    | -3.765 | 1.456  | 2.115  |
| C              | 2.589  | -2.968 | 0.056  | H    | -5.318 | 1.224  | 1.287  |
| C              | -4.376 | 0.07   | -1.042 | H    | 3.408  | -3.679 | -0.044 |
| C              | -3.647 | 0.209  | 0.316  | H    | 1.845  | -3.137 | -0.727 |
| O              | 2.448  | 2.989  | -0.26  | H    | 2.123  | -3.066 | 1.039  |
| O              | 1.144  | -0.825 | 0.21   | H    | -4.212 | 0.985  | -1.629 |
| O              | 3.205  | -1.674 | -0.093 | H    | -5.455 | 0.02   | -0.844 |
| H              | -0.032 | 2.306  | 0.302  | H    | -3.81  | -0.717 | 0.879  |
| H              | -1.947 | 1.318  | -0.494 |      |        |        |        |
| Conformation 3 |        |        |        |      |        |        |        |
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | 0.525  | 1.374  | -0.019 | H    | 4.623  | 1.925  | -0.608 |
| C              | 2.925  | 0.818  | 0.1    | H    | 5.037  | 0.362  | 0.131  |
| C              | 0.224  | 0.056  | -0.079 | H    | 4.563  | 1.745  | 1.14   |
| C              | 2.53   | -0.483 | 0.005  | H    | -0.61  | -2.668 | -0.399 |
| C              | 1.9    | 1.852  | 0.101  | H    | -2.198 | -2.234 | -1.044 |
| C              | -2.157 | 0.039  | 0.407  | H    | -0.725 | -1.793 | -1.924 |
| C              | -1.108 | -0.575 | -0.177 | H    | -4.461 | 0.218  | -2.225 |
| C              | 4.369  | 1.223  | 0.195  | H    | -3.253 | 1.43   | -1.772 |
| C              | -1.171 | -1.887 | -0.926 | H    | -4.956 | 1.891  | -1.92  |
| C              | -4.28  | 1.094  | -1.589 | H    | -3.884 | 0.092  | 2.55   |
| C              | -4.016 | -0.755 | 1.866  | H    | -3.414 | -1.589 | 2.243  |
| C              | 2.915  | -2.848 | -0.129 | H    | -5.071 | -1.052 | 1.898  |
| C              | -4.508 | 0.76   | -0.112 | H    | 3.811  | -3.468 | -0.12  |
| C              | -3.605 | -0.375 | 0.428  | H    | 2.372  | -2.984 | -1.067 |
| O              | 2.175  | 3.064  | 0.182  | H    | 2.27   | -3.106 | 0.715  |
| O              | 1.24   | -0.876 | -0.078 | H    | -4.354 | 1.66   | 0.501  |
| O              | 3.401  | -1.497 | -0.009 | H    | -5.554 | 0.462  | 0.038  |
| H              | -0.267 | 2.111  | -0.07  | H    | -3.757 | -1.253 | -0.21  |
| H              | -1.956 | 0.954  | 0.967  |      |        |        |        |



**Table S8.** Important thermodynamic parameters (a.u.) and Boltzmann distributions of the optimized **5** at B3LYP/6-31G(d) level in methanol.

| Conformation | Internal Energy | %      |
|--------------|-----------------|--------|
| 1            | -927.046        | 26.24% |
| 2            | -927.046        | 25.80% |
| 3            | -927.046        | 17.27% |
| 4            | -927.046        | 15.29% |
| 5            | -927.046        | 14.11% |
| 6            | -927.043        | 1.25%  |

**Table S9.** Optimized coordinates of compound **5** at B3LYP/6-31G(d) level in methanol.

| Conformation 1 |        |        |        |      |        |        |        |
|----------------|--------|--------|--------|------|--------|--------|--------|
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | 1.694  | -1.371 | -0.17  | H    | -0.198 | -2.301 | -0.673 |
| C              | 4.031  | -0.491 | -0.071 | H    | 0.699  | -3.124 | 0.612  |
| C              | 1.243  | -0.092 | -0.071 | H    | 5.823  | -1.292 | 0.81   |
| C              | 3.467  | 0.749  | -0.01  | H    | 6.065  | 0.236  | -0.061 |
| C              | 3.148  | -1.638 | -0.152 | H    | 5.823  | -1.285 | -0.948 |
| C              | -1.036 | -0.209 | 0.779  | H    | -0.535 | 1.329  | -1.963 |
| C              | -3.293 | 0.273  | -0.089 | H    | 0.343  | 2.353  | -0.83  |
| C              | -0.149 | 0.407  | -0.039 | H    | -1.398 | 2.074  | -0.608 |
| C              | -2.475 | 0.062  | 0.964  | H    | -2.473 | 0.827  | 2.989  |
| C              | 0.803  | -2.573 | -0.331 | H    | -4.01  | 0.083  | 2.52   |
| C              | 5.518  | -0.709 | -0.067 | H    | -2.6   | -0.924 | 2.88   |
| C              | -0.456 | 1.609  | -0.904 | H    | -5.91  | -1.939 | 0.687  |
| C              | -2.926 | 0.012  | 2.409  | H    | -4.445 | -2.281 | -0.246 |
| C              | -5.478 | -1.922 | -0.321 | H    | -6.038 | -2.636 | -0.936 |
| C              | -5.033 | 1.961  | -0.683 | H    | -4.653 | 2.039  | -1.71  |
| C              | 3.535  | 3.144  | 0.104  | H    | -6.107 | 2.179  | -0.706 |
| C              | -5.537 | -0.514 | -0.922 | H    | -4.54  | 2.734  | -0.083 |
| C              | -4.775 | 0.555  | -0.103 | H    | 4.34   | 3.874  | 0.176  |
| O              | 3.588  | -2.802 | -0.216 | H    | 2.881  | 3.217  | 0.976  |
| O              | 2.141  | 0.962  | -0.009 | H    | 2.958  | 3.311  | -0.809 |
| O              | 4.198  | 1.866  | 0.064  | H    | -5.135 | -0.531 | -1.945 |
| H              | -0.64  | -0.983 | 1.436  | H    | -6.585 | -0.198 | -1.009 |
| H              | -2.847 | 0.229  | -1.084 | H    | -5.17  | 0.538  | 0.919  |

|                |          |          |          |             |          |          |          |
|----------------|----------|----------|----------|-------------|----------|----------|----------|
| H              | 1.261    | -3.264   | -1.045   |             |          |          |          |
| Conformation 2 |          |          |          |             |          |          |          |
| <b>Atom</b>    | <b>X</b> | <b>Y</b> | <b>Z</b> | <b>Atom</b> | <b>X</b> | <b>Y</b> | <b>Z</b> |
| C              | -1.852   | 1.397    | 0.199    | H           | -1.664   | 3.318    | 1.102    |
| C              | -4.056   | 0.229    | 0.051    | H           | -0.095   | 2.552    | 0.723    |
| C              | -1.24    | 0.187    | 0.098    | H           | -5.952   | 0.771    | 0.903    |
| C              | -3.338   | -0.929   | -0.008   | H           | -5.916   | 0.817    | -0.855   |
| C              | -3.327   | 1.478    | 0.159    | H           | -5.98    | -0.749   | -0.02    |
| C              | 1.01     | 0.585    | -0.739   | H           | -0.058   | -2.097   | 0.927    |
| C              | 3.311    | 0.393    | 0.135    | H           | 0.721    | -0.955   | 2.019    |
| C              | 0.205    | -0.13    | 0.082    | H           | 1.638    | -1.636   | 0.667    |
| C              | 2.473    | 0.507    | -0.917   | H           | 2.496    | 1.559    | -2.803   |
| C              | -1.121   | 2.7      | 0.381    | H           | 4.002    | 0.691    | -2.47    |
| C              | -5.558   | 0.257    | 0.018    | H           | 2.55     | -0.192   | -2.964   |
| C              | 0.655    | -1.269   | 0.968    | H           | 5.465    | -3.092   | 0.468    |
| C              | 2.917    | 0.647    | -2.359   | H           | 3.979    | -2.357   | -0.152   |
| C              | 5.056    | -2.203   | -0.024   | H           | 5.503    | -2.14    | -1.024   |
| C              | 5.35     | 1.594    | 0.925    | H           | 6.447    | 1.594    | 0.945    |
| C              | -3.098   | -3.31    | -0.164   | H           | 5.017    | 2.528    | 0.461    |
| C              | 5.351    | -0.94    | 0.791    | H           | 4.995    | 1.589    | 1.963    |
| C              | 4.819    | 0.367    | 0.154    | H           | -2.504   | -3.419   | 0.747    |
| O              | -3.912   | 2.576    | 0.228    | H           | -3.803   | -4.136   | -0.251   |
| O              | -1.995   | -0.972   | 0.014    | H           | -2.441   | -3.282   | -1.036   |
| O              | -3.92    | -2.129   | -0.101   | H           | 6.437    | -0.839   | 0.92     |
| H              | 0.52     | 1.296    | -1.405   | H           | 4.93     | -1.042   | 1.801    |
| H              | 2.862    | 0.358    | 1.129    | H           | 5.208    | 0.417    | -0.869   |
| H              | -1.085   | 3.273    | -0.555   |             |          |          |          |
| Conformation 3 |          |          |          |             |          |          |          |
| <b>Atom</b>    | <b>X</b> | <b>Y</b> | <b>Z</b> | <b>Atom</b> | <b>X</b> | <b>Y</b> | <b>Z</b> |
| C              | 2.048    | -1.418   | 0.165    | H           | 0.628    | -2.825   | 0.999    |
| C              | 4.016    | 0.044    | -0.32    | H           | 2.313    | -3.404   | 0.881    |
| C              | 1.286    | -0.298   | 0.278    | H           | 6.094    | -0.319   | 0.078    |
| C              | 3.167    | 1.096    | -0.146   | H           | 5.763    | 1.272    | -0.643   |
| C              | 3.482    | -1.296   | -0.174   | H           | 5.705    | -0.201   | -1.633   |
| C              | -1.043   | -0.956   | -0.042   | H           | -0.52    | 1.914    | 1.15     |
| C              | -3.26    | 0.12     | 0.12     | H           | 0.235    | 0.938    | 2.407    |
| C              | -0.153   | -0.154   | 0.585    | H           | -1.491   | 0.728    | 2.029    |
| C              | -2.513   | -1.004   | 0.092    | H           | -2.731   | -2.95    | 1.014    |
| C              | 1.534    | -2.814   | 0.391    | H           | -4.165   | -2.437   | 0.11     |
| C              | 5.473    | 0.22     | -0.646   | H           | -2.715   | -2.984   | -0.746   |
| C              | -0.504   | 0.914    | 1.599    | H           | -5.673   | -0.654   | -2.304   |
| C              | -3.074   | -2.412   | 0.12     | H           | -4.113   | 0.146    | -2.547   |
| C              | -5.17    | 0.321    | -2.315   | H           | -5.601   | 0.909    | -3.133   |

| C              | -5.109 | 0.99   | 1.553  | H    | -4.655 | 1.988  | 1.587  |
|----------------|--------|--------|--------|------|--------|--------|--------|
| C              | 2.614  | 3.427  | -0.045 | H    | -6.195 | 1.112  | 1.649  |
| C              | -5.334 | 1.041  | -0.973 | H    | -4.75  | 0.428  | 2.422  |
| C              | -4.756 | 0.268  | 0.236  | H    | 3.182  | 4.345  | -0.191 |
| O              | 4.199  | -2.307 | -0.311 | H    | 2.208  | 3.393  | 0.969  |
| O              | 1.861  | 0.956  | 0.139  | H    | 1.8    | 3.368  | -0.772 |
| O              | 3.567  | 2.367  | -0.253 | H    | -4.857 | 2.03   | -1.023 |
| H              | -0.637 | -1.7   | -0.727 | H    | -6.401 | 1.224  | -0.786 |
| H              | -2.734 | 1.071  | 0.036  | H    | -5.232 | -0.72  | 0.258  |
| H              | 1.309  | -3.32  | -0.557 |      |        |        |        |
| Conformation 4 |        |        |        |      |        |        |        |
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | -2.034 | -1.411 | 0.186  | H    | -1.397 | -3.346 | -0.543 |
| C              | -4.046 | 0.038  | -0.127 | H    | -0.516 | -2.787 | 0.888  |
| C              | -1.266 | -0.289 | 0.172  | H    | -5.885 | -0.336 | -1.175 |
| C              | -3.185 | 1.093  | -0.086 | H    | -6.064 | -0.22  | 0.57   |
| C              | -3.497 | -1.298 | 0.008  | H    | -5.812 | 1.255  | -0.388 |
| C              | 1.014  | -0.954 | -0.393 | H    | 1.674  | 0.762  | 1.603  |
| C              | 3.241  | 0.112  | -0.488 | H    | -0.006 | 1.013  | 2.128  |
| C              | 0.198  | -0.138 | 0.313  | H    | 0.646  | 1.94   | 0.779  |
| C              | 2.489  | -1.007 | -0.432 | H    | 2.802  | -2.965 | 0.436  |
| C              | -1.494 | -2.798 | 0.404  | H    | 2.582  | -2.977 | -1.31  |
| C              | -5.531 | 0.205  | -0.29  | H    | 4.124  | -2.447 | -0.622 |
| C              | 0.656  | 0.952  | 1.257  | H    | 5.716  | -0.614 | 1.939  |
| C              | 3.041  | -2.417 | -0.485 | H    | 5.634  | 0.962  | 2.743  |
| C              | 5.196  | 0.352  | 1.945  | H    | 4.148  | 0.163  | 2.204  |
| C              | 5.101  | 0.929  | -1.936 | H    | 6.188  | 1.033  | -2.037 |
| C              | -2.625 | 3.424  | -0.158 | H    | 4.732  | 0.351  | -2.79  |
| C              | 5.322  | 1.052  | 0.588  | H    | 4.661  | 1.933  | -1.996 |
| C              | 4.74   | 0.248  | -0.6   | H    | -1.915 | 3.327  | -0.983 |
| O              | -4.222 | -2.311 | -0.01  | H    | -3.207 | 4.338  | -0.269 |
| O              | -1.855 | 0.961  | 0.053  | H    | -2.088 | 3.433  | 0.794  |
| O              | -3.597 | 2.361  | -0.189 | H    | 6.382  | 1.249  | 0.38   |
| H              | 0.531  | -1.711 | -1.011 | H    | 4.83   | 2.034  | 0.629  |
| H              | 2.717  | 1.068  | -0.504 | H    | 5.21   | -0.743 | -0.589 |
| H              | -2.202 | -3.363 | 1.018  |      |        |        |        |
| Conformation 5 |        |        |        |      |        |        |        |
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | 1.553  | -1.307 | 0.373  | H    | -0.254 | -1.932 | 1.391  |
| C              | 3.896  | -0.808 | -0.339 | H    | 0.095  | -2.84  | -0.088 |
| C              | 1.299  | 0.029  | 0.36   | H    | 5.798  | -1.712 | 0.128  |
| C              | 3.544  | 0.506  | -0.268 | H    | 5.219  | -2.029 | -1.502 |
| C              | 2.894  | -1.802 | -0.003 | H    | 5.884  | -0.43  | -1.095 |

| C              | -1.097 | 0.299  | 0.112  | H    | 0.615  | 2.835  | 0.958  |
|----------------|--------|--------|--------|------|--------|--------|--------|
| C              | -3.377 | 0.015  | -0.562 | H    | 0.99   | 1.785  | 2.32   |
| C              | 0.051  | 0.76   | 0.671  | H    | -0.675 | 2.294  | 2.037  |
| C              | -2.495 | 0.748  | 0.163  | H    | -2.747 | 1.806  | 2.039  |
| C              | 0.55   | -2.352 | 0.784  | H    | -2.338 | 2.848  | 0.673  |
| C              | 5.277  | -1.259 | -0.725 | H    | -3.967 | 2.193  | 0.828  |
| C              | 0.244  | 1.984  | 1.544  | H    | -4.493 | -1.545 | 1.489  |
| C              | -2.91  | 1.961  | 0.965  | H    | -5.927 | -0.548 | 1.78   |
| C              | -5.532 | -1.379 | 1.182  | H    | -6.106 | -2.277 | 1.439  |
| C              | -5.155 | 0.518  | -2.236 | H    | -6.233 | 0.643  | -2.396 |
| C              | 3.945  | 2.859  | -0.494 | H    | -4.653 | 1.44   | -2.548 |
| C              | -5.631 | -1.074 | -0.316 | H    | -4.81  | -0.292 | -2.892 |
| C              | -4.86  | 0.194  | -0.756 | H    | 4.819  | 3.456  | -0.751 |
| O              | 3.148  | -3.022 | -0.019 | H    | 3.151  | 3.019  | -1.229 |
| O              | 2.311  | 0.928  | 0.061  | H    | 3.586  | 3.126  | 0.503  |
| O              | 4.406  | 1.495  | -0.525 | H    | -6.686 | -0.945 | -0.594 |
| H              | -0.974 | -0.572 | -0.529 | H    | -5.263 | -1.933 | -0.895 |
| H              | -2.975 | -0.839 | -1.113 | H    | -5.227 | 1.03   | -0.15  |
| H              | 1.065  | -3.137 | 1.346  |      |        |        |        |
| Conformation 6 |        |        |        |      |        |        |        |
| Atom           | X      | Y      | Z      | Atom | X      | Y      | Z      |
| C              | 2.315  | -1.514 | 0.004  | H    | 0.946  | -3.103 | 0.553  |
| C              | 4.092  | 0.23   | -0.116 | H    | 2.666  | -3.428 | 0.87   |
| C              | 1.386  | -0.529 | -0.072 | H    | 6.065  | 0.246  | 0.736  |
| C              | 3.076  | 1.138  | -0.156 | H    | 5.658  | 1.717  | -0.175 |
| C              | 3.751  | -1.178 | -0.035 | H    | 6.044  | 0.205  | -1.022 |
| C              | -0.789 | 0.016  | 0.862  | H    | -1.713 | -1.808 | -0.935 |
| C              | -3.095 | 0.298  | 0.032  | H    | -0.093 | -2.371 | -1.406 |
| C              | -0.095 | -0.651 | -0.088 | H    | -0.761 | -0.914 | -2.127 |
| C              | -2.248 | 0.104  | 1.065  | H    | -2.112 | 0.758  | 3.117  |
| C              | 1.961  | -2.967 | 0.172  | H    | -3.732 | 0.205  | 2.668  |
| C              | 5.541  | 0.632  | -0.146 | H    | -2.43  | -0.963 | 2.939  |
| C              | -0.701 | -1.487 | -1.192 | H    | -7.222 | 0.127  | -1.178 |
| C              | -2.666 | 0.023  | 2.519  | H    | -7.125 | -0.831 | 0.309  |
| C              | -6.766 | -0.761 | -0.726 | H    | -7.142 | -1.635 | -1.269 |
| C              | -5.003 | 1.826  | -0.474 | H    | -4.674 | 1.962  | -1.513 |
| C              | 2.165  | 3.351  | -0.301 | H    | -6.088 | 1.967  | -0.444 |
| C              | -5.234 | -0.712 | -0.776 | H    | -4.545 | 2.618  | 0.129  |
| C              | -4.598 | 0.433  | 0.051  | H    | 2.604  | 4.347  | -0.359 |
| O              | 4.624  | -2.066 | 0.015  | H    | 1.535  | 3.269  | 0.588  |
| O              | 1.773  | 0.798  | -0.143 | H    | 1.571  | 3.148  | -1.196 |
| O              | 3.291  | 2.456  | -0.217 | H    | -4.835 | -1.666 | -0.406 |
| H              | -0.201 | 0.531  | 1.624  | H    | -4.901 | -0.625 | -1.821 |

|   |        |        |        |   |        |       |      |
|---|--------|--------|--------|---|--------|-------|------|
| H | -2.658 | 0.398  | -0.962 | H | -4.967 | 0.338 | 1.08 |
| H | 2.052  | -3.517 | -0.774 |   |        |       |      |