

## SUPPORTING INFORMATION

### Bioactivity-Guided Investigation of Geranium Essential Oils as Natural Tick Repellents

Nurhayat Tabanca,<sup>†</sup> Mei Wang,<sup>†</sup> Cristina Avonto,<sup>†</sup> Amar G. Chittiboyina,<sup>†</sup> Jon F. Parcher,<sup>†</sup> John F. Carroll,<sup>‡</sup> Matthew Kramer,<sup>§</sup> and Ikhlas A. Khan<sup>\*,†,||</sup>

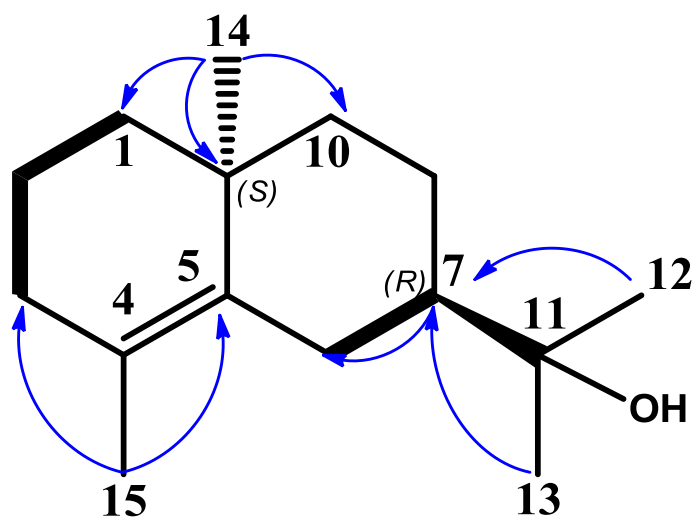
<sup>†</sup>National Center for Natural Products Research (NCNPR), and <sup>||</sup>Department of Pharmacognosy, School of Pharmacy, University of Mississippi, University, Mississippi 38677, United States

<sup>‡</sup>Invasive Insect Biocontrol and Behavior Laboratory, and <sup>§</sup>Biometrical Consulting Service, Beltsville Agricultural Research Center, Agricultural Research Service (ARS), United States Department of Agriculture (USDA), Beltsville, Maryland 20705, United States

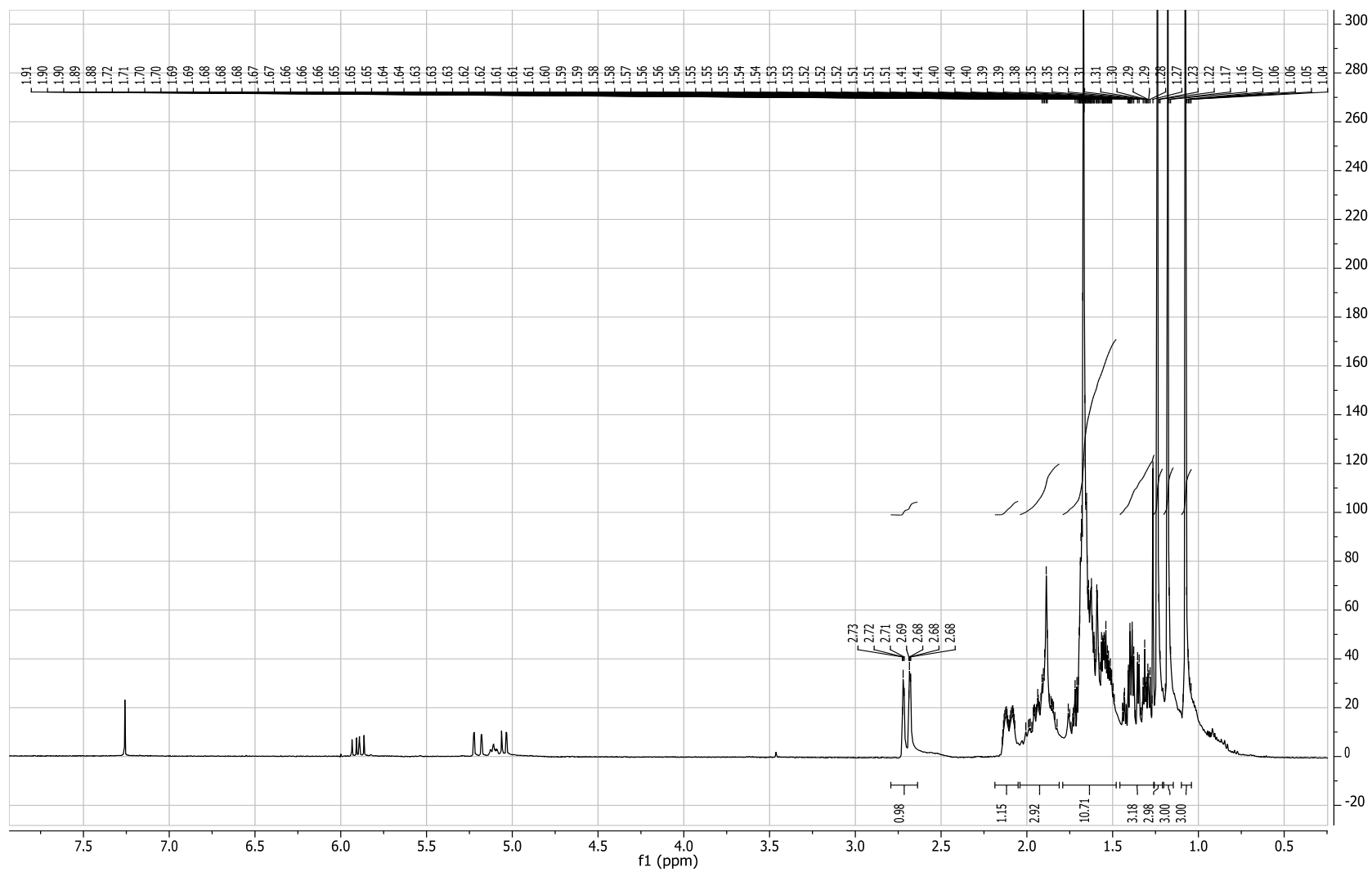
#### Corresponding Author

\*Telephone: +1-662-915-7821. Fax: +1-662-915-7062. E-mail: ikhan@olemiss.edu

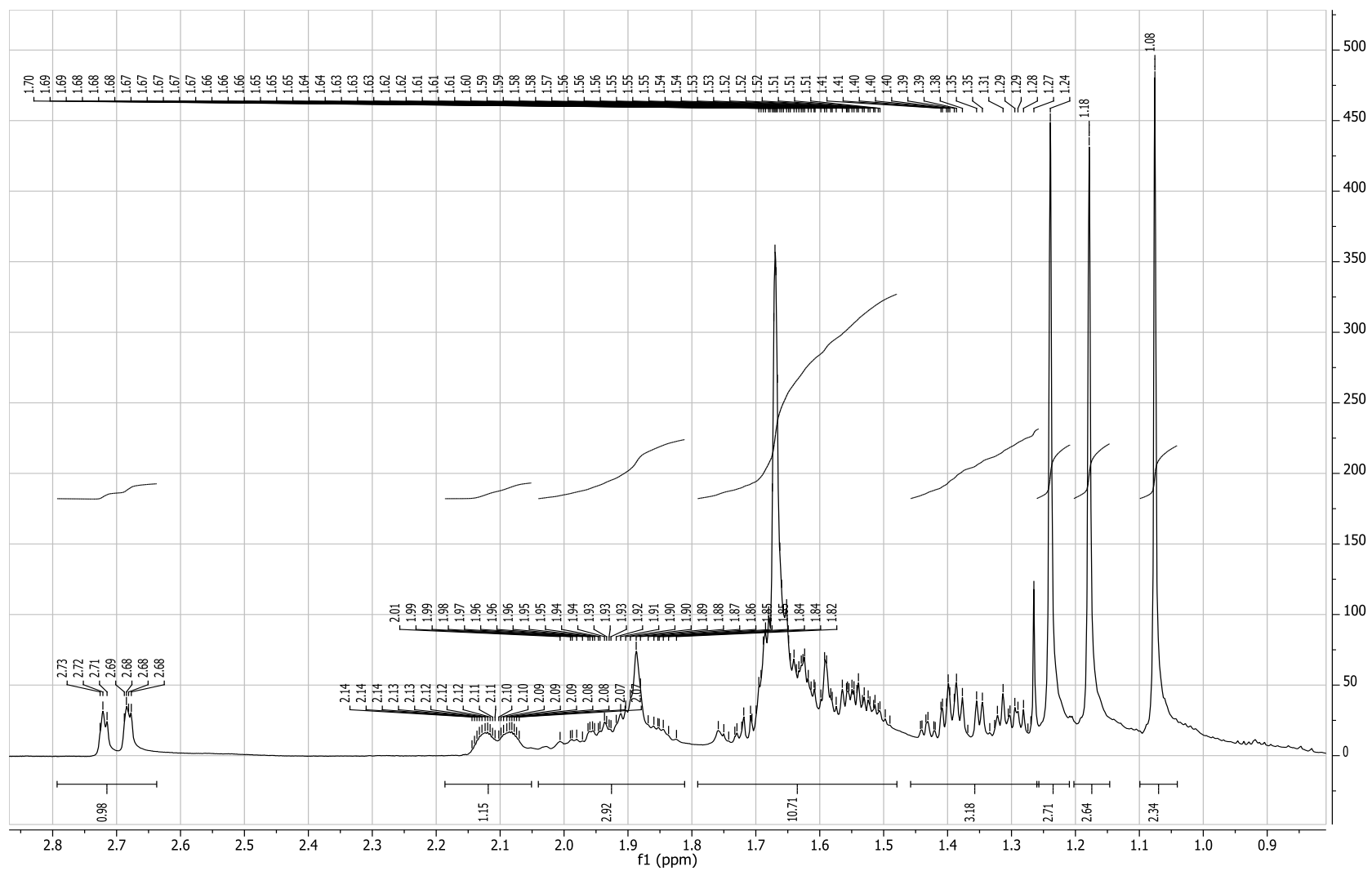
Supporting information for the marker compounds (-)-(7*R*,10*S*)-epi- $\gamma$ -eudesmol obtained from *Pelargonium graveolens* sample S1. NMR and mass spectra data along with structure elucidation are provided.



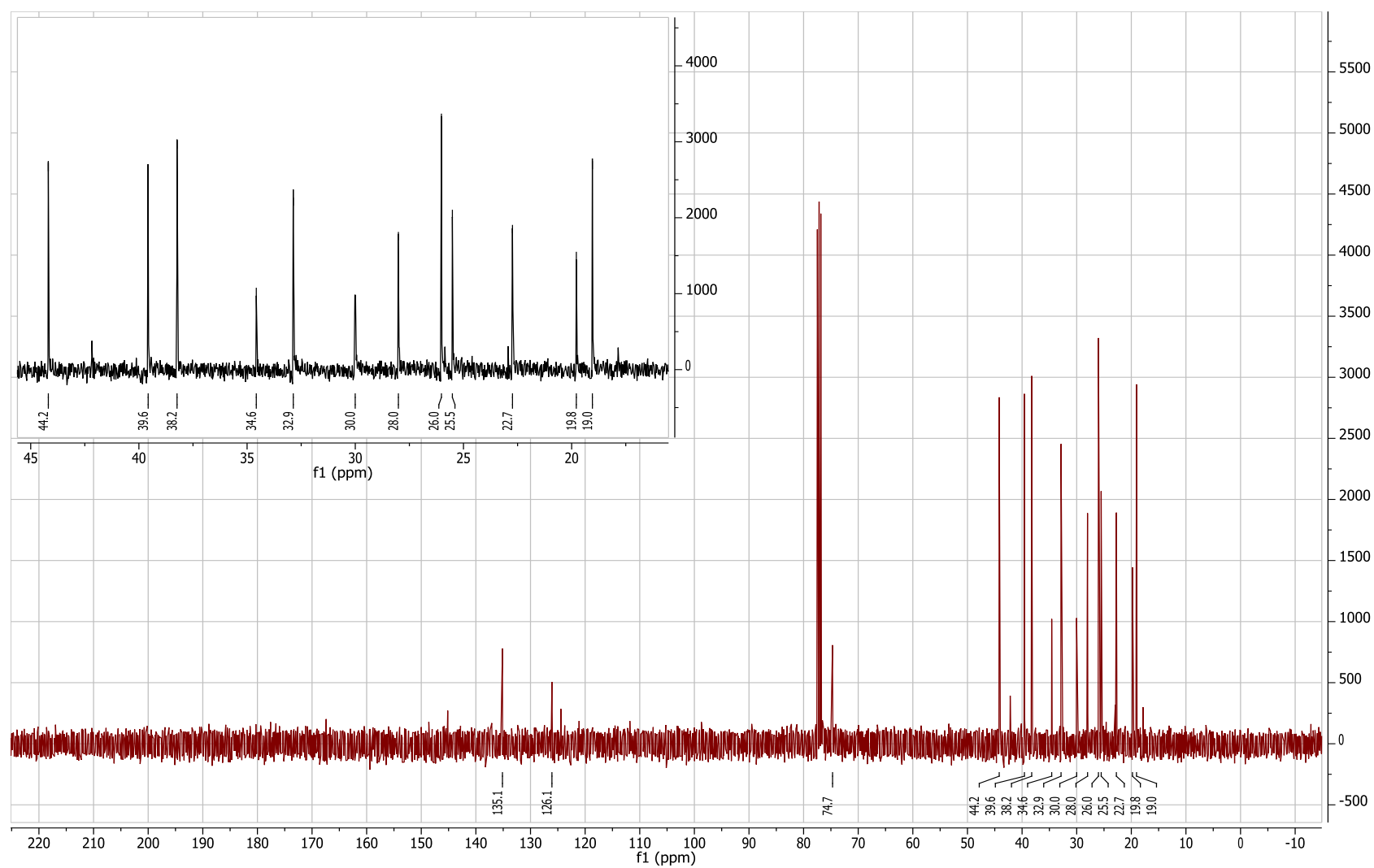
**Figure SI-1:** Selected  $^1\text{H}$ - $^{13}\text{C}$  HMBC ( $\rightarrow$ ) and COSY ( $\text{—}$ ) correlations for  
 (-)-10-epi- $\gamma$ -eudesmol (**5**).



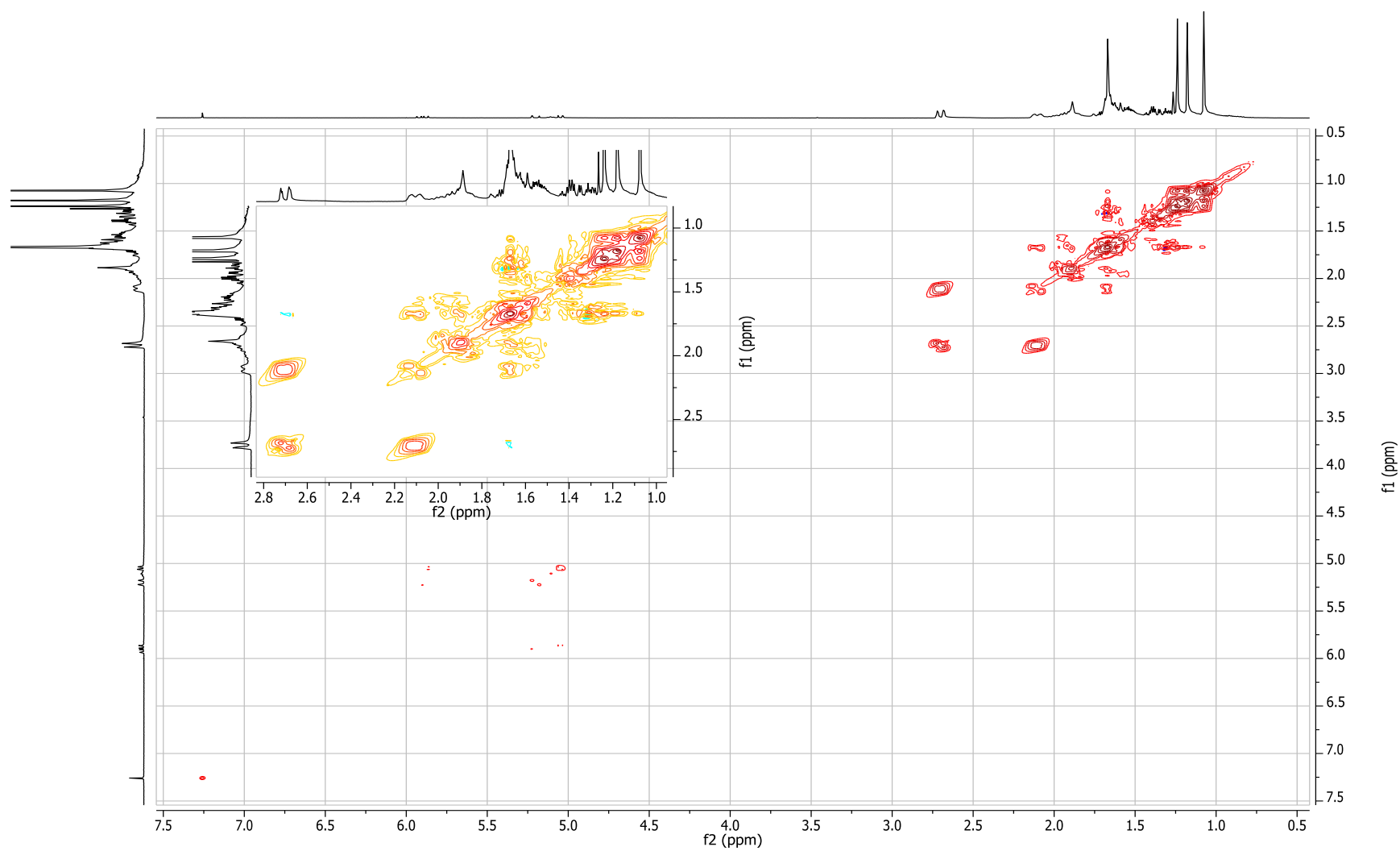
**Figure SI-2a:**  $^1\text{H}$  NMR spectrum ( $\text{CDCl}_3$ , 400MHz) of (-)-10-epi- $\gamma$ -eudesmol.



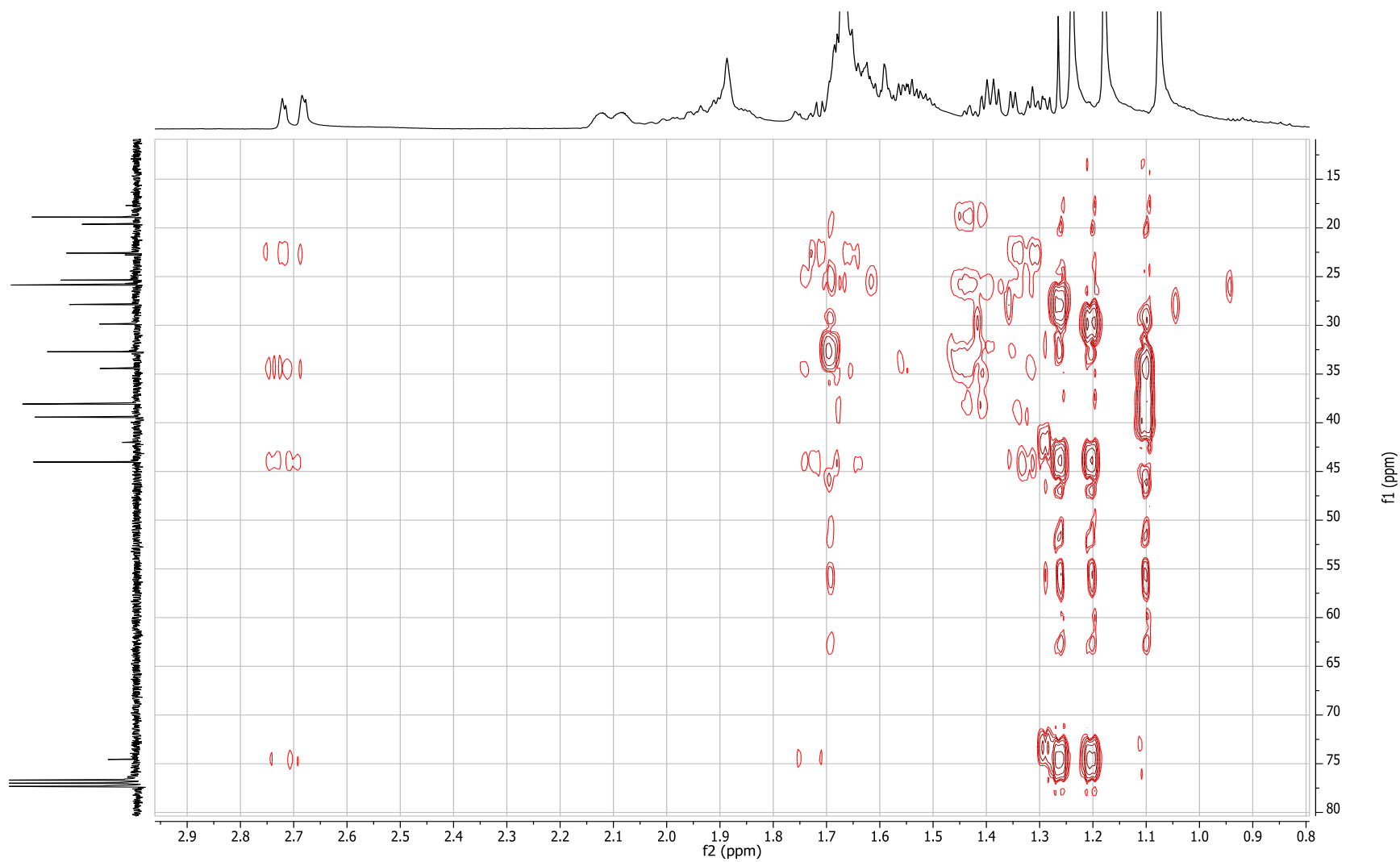
**Figure SI-2b:** Expansion of  $^1\text{H}$  NMR spectrum ( $\text{CDCl}_3$ , 400MHz) (-)-10-epi- $\gamma$ -eudesmol between  $\delta$  2.8-0.75 ppm.



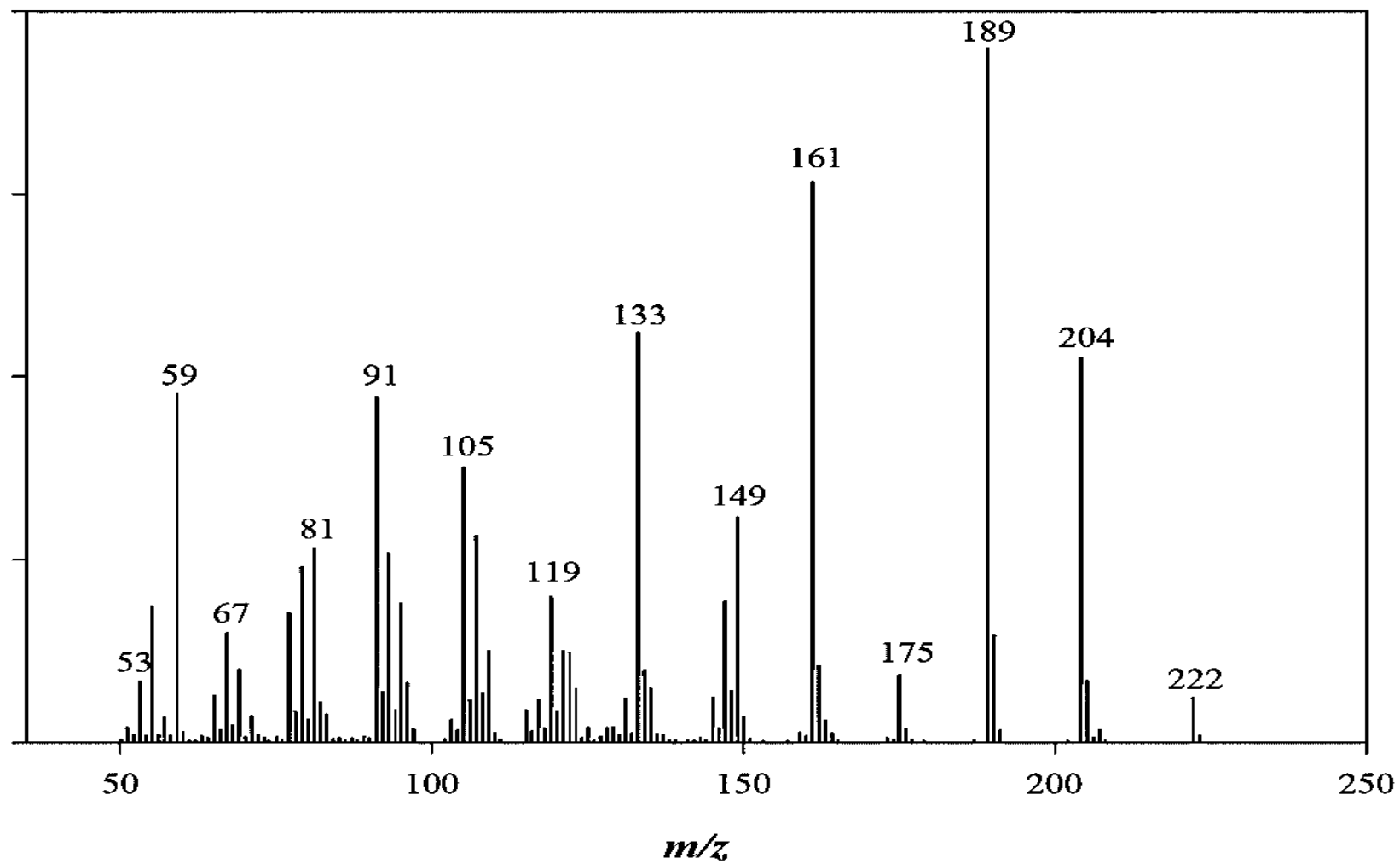
**Figure SI-3:**  $^{13}\text{C}$  NMR spectrum ( $\text{CDCl}_3$ , 100 MHz) of (-)-10-epi- $\gamma$ -eudesmol and expansion of peaks between  $\delta$  45 and 5 ppm.



**Figure SI-4:**  $^1\text{H}$ - $^1\text{H}$  DQFCOSY NMR spectrum ( $\text{CDCl}_3$ , 400MHz) of (-)-10-epi- $\gamma$ -eudesmol.



**Figure SI-5:** HMBC spectrum of (-)-10-epi- $\gamma$ -eudesmol.



**Figure SI-6:** EI mass spectrum of (-)-10-epi- $\gamma$ -eudesmol.