

## SUPPLEMENTARY MATERIAL

### *Artemisia herba-alba* Sesquiterpenes: *in silico* Inhibition in ATP-Binding Pocket

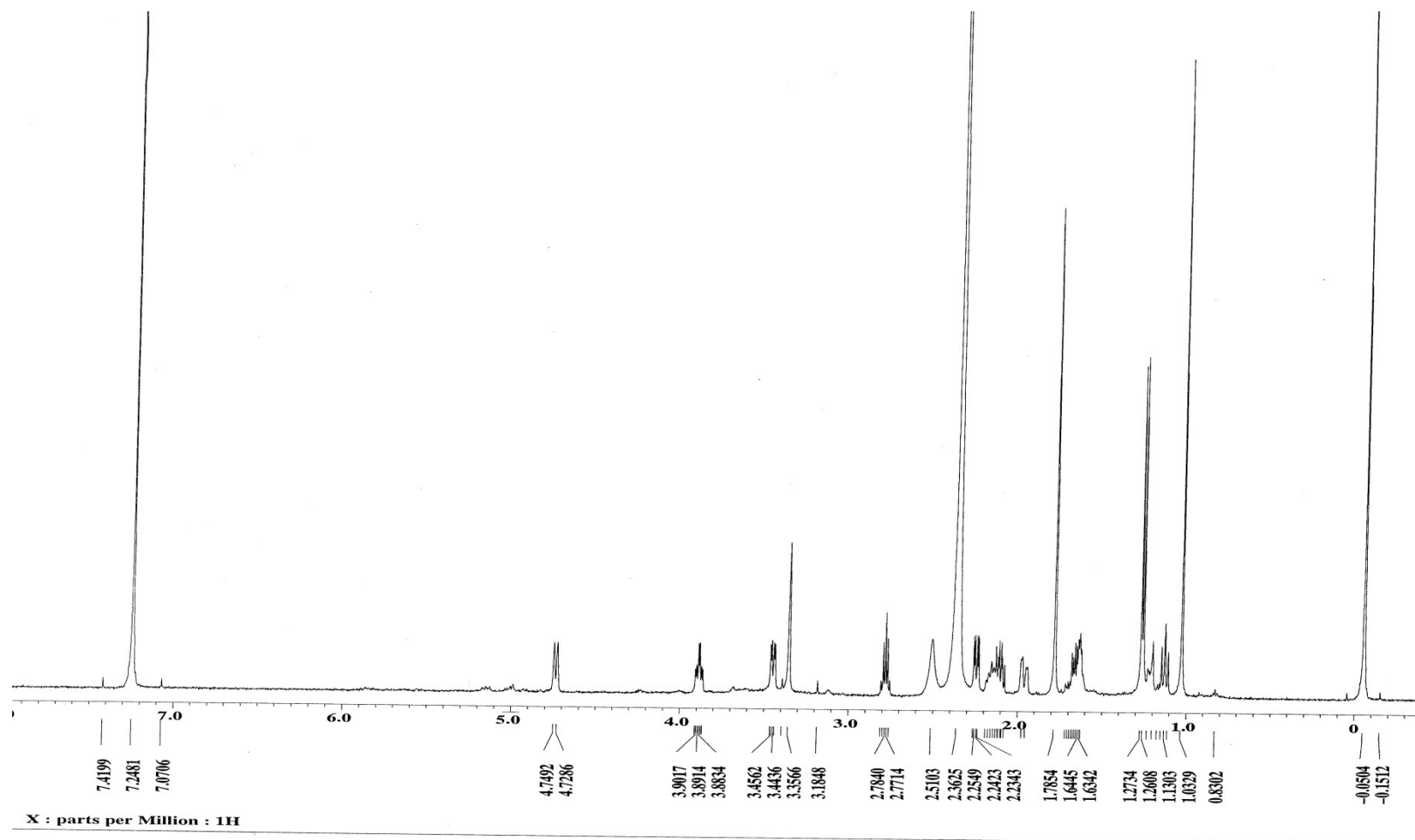
Tarik A. Mohamed<sup>a\*</sup>, Mohamed H. Abd El-Razek<sup>b</sup>, Ibrahim A. Saleh<sup>a</sup>, Sherin K. Ali<sup>a</sup>,  
Abeer A. Abd El Aty<sup>c</sup>, Paul W. Paré<sup>d</sup> and Mohamed-Elamir F. Hegazy<sup>a\*</sup>

- a. Chemistry of Medicinal Plants Department, National Research Centre, 33 El-Bohouth St., Dokki, Giza, 12622, Egypt.
- b. Department of Natural Compounds Chemistry, National Research Centre, 33 El-Bohouth St., Dokki, Giza, 12622, Egypt.
- c. Chemistry of Natural and Microbial Products Department, National Research Centre, 33 El-Bohouth St., Dokki, Giza, 12622, Egypt.
- d. Department of Chemistry & Biochemistry, Texas Tech University, Lubbock, TX 79409, USA

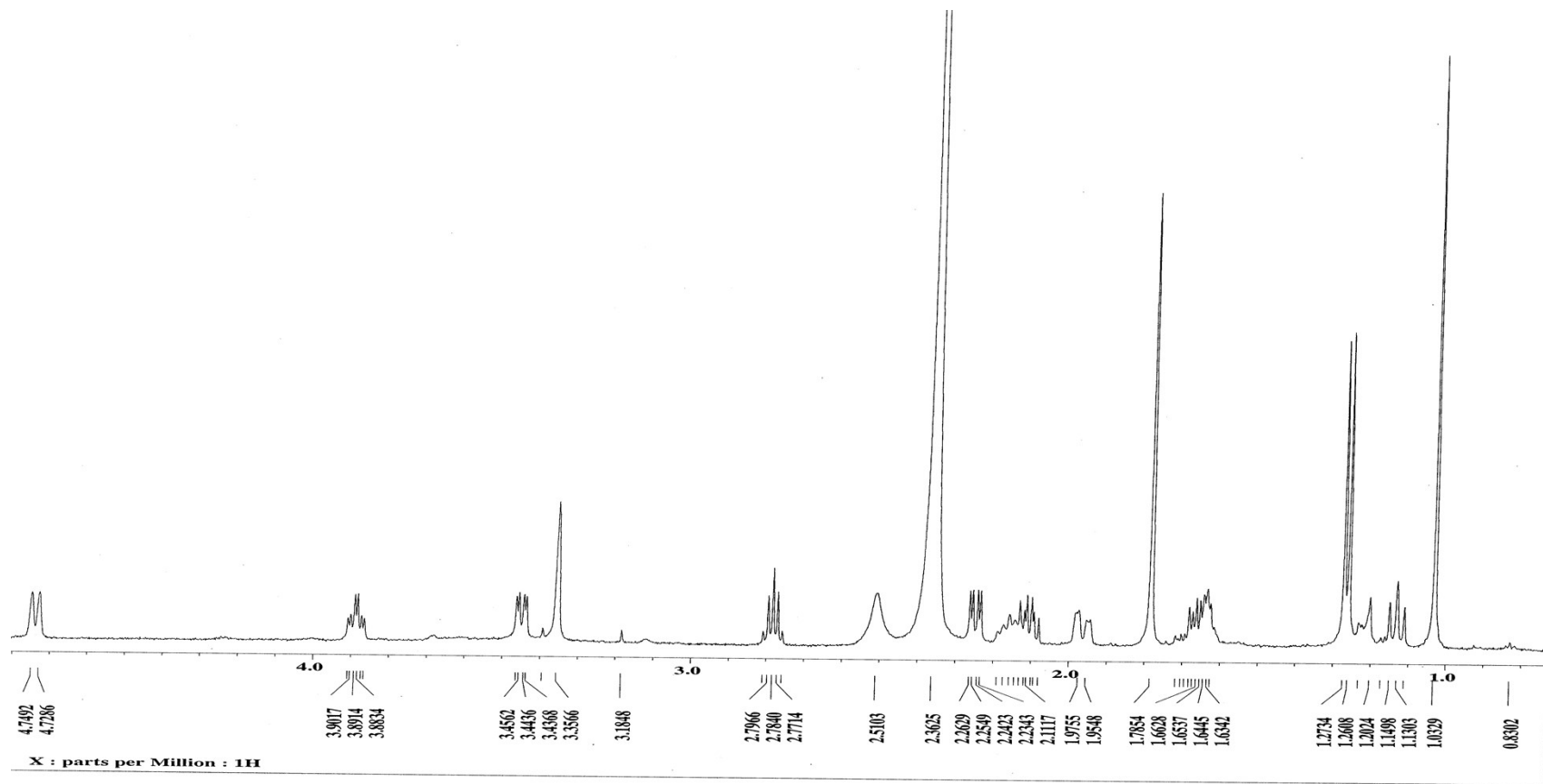
\*Correspondence: [tarik.nrc83@yahoo.com](mailto:tarik.nrc83@yahoo.com) (T.A.M.); [elamir77@live.com](mailto:elamir77@live.com) (M.-E.F.H.); Tel.: +20-11-275-39-989(T.A.M.); +20-33-371-635(M.-E.F.H.)

## Contents

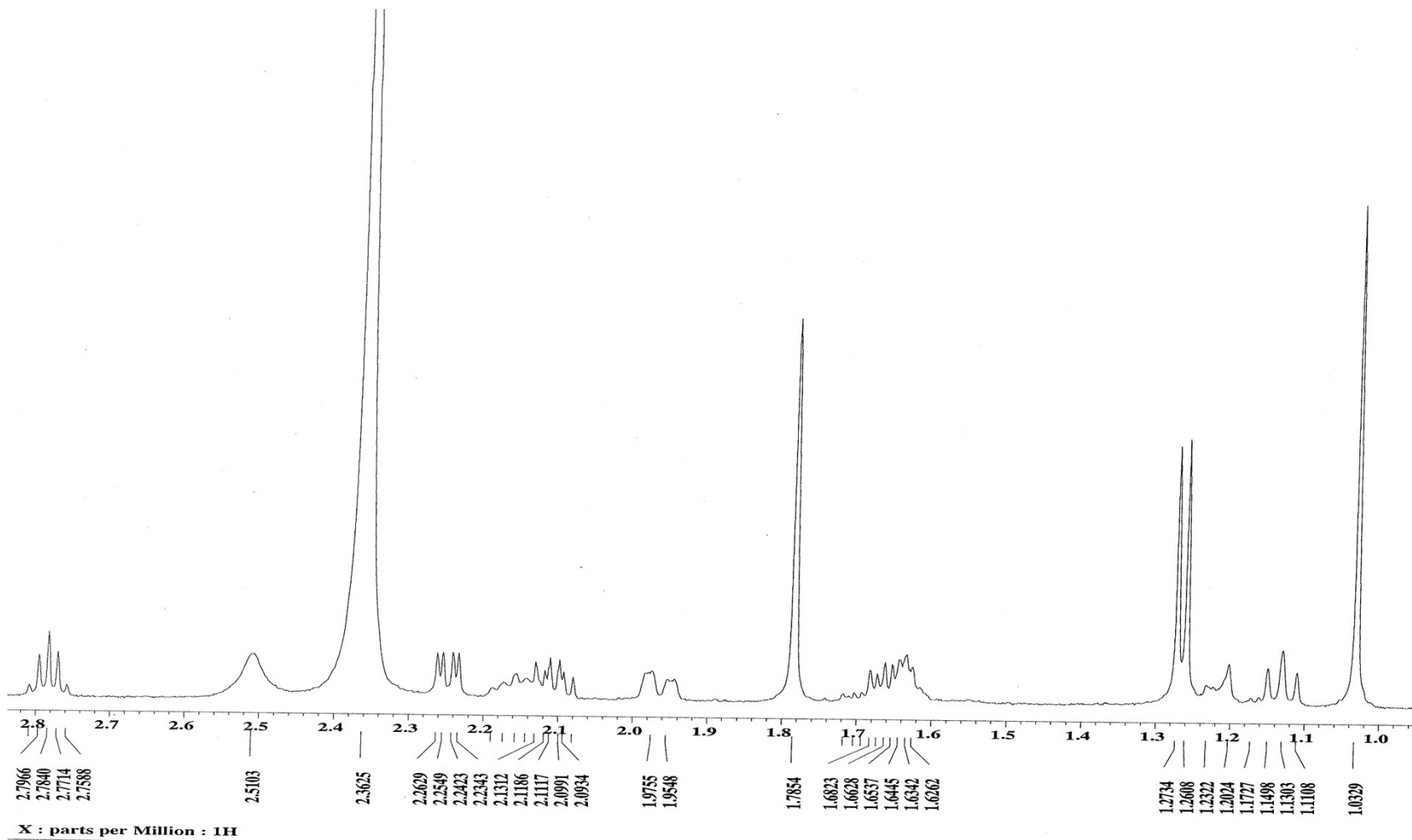
Supporting data	Page
<b>Figure S1:</b> <sup>1</sup> H NMR spectrum (CDCl <sub>3</sub> , 600 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	3
<b>Figure S1a:</b> Expansion of <sup>1</sup> H NMR spectrum (CDCl <sub>3</sub> , 600 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	4
<b>Figure S1b:</b> Expansion of <sup>1</sup> H NMR spectrum (CDCl <sub>3</sub> , 600 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	5
<b>Figure S2:</b> <sup>13</sup> C NMR spectrum (CDCl <sub>3</sub> , 150 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	6
<b>Figure S2a:</b> Expansion of <sup>13</sup> C NMR spectrum (CDCl <sub>3</sub> , 150 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	7
<b>Figure S2b:</b> Expansion of <sup>13</sup> C NMR spectrum (CDCl <sub>3</sub> , 150 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	8
<b>Figure S3:</b> DEPT spectrum of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	9
<b>Figure S4:</b> <sup>1</sup> H- <sup>1</sup> H COSY spectrum of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	10
<b>Figure S5:</b> HSQC spectrum of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	11
<b>Figure S5a:</b> Expansion of HSQC spectrum of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	12
<b>Figure S6:</b> HMBC spectrum of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	13
<b>Figure S7:</b> HR-TOF ESI MS spectrum of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (1)	14
<b>Figure S8:</b> <sup>1</sup> H NMR spectrum (CDCl <sub>3</sub> , 600 MHz) of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	15
<b>Figure S9:</b> <sup>13</sup> C NMR spectrum (CDCl <sub>3</sub> , 150 MHz) of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	16
<b>Figure S10:</b> DEPT spectrum of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	17
<b>Figure S11:</b> <sup>1</sup> H- <sup>1</sup> H COSY spectrum of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	18
<b>Figure S12:</b> HSQC spectrum of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	19
<b>Figure S13:</b> HMBC spectrum of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	20
<b>Figure S14:</b> NOESY spectrum of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	21
<b>Figure S15:</b> HR-TOF ESI MS spectrum of 1β,6α,8α-trihydroxy, 11α- methyl-eudesma-4(15)-en-13-propanoate (2)	22



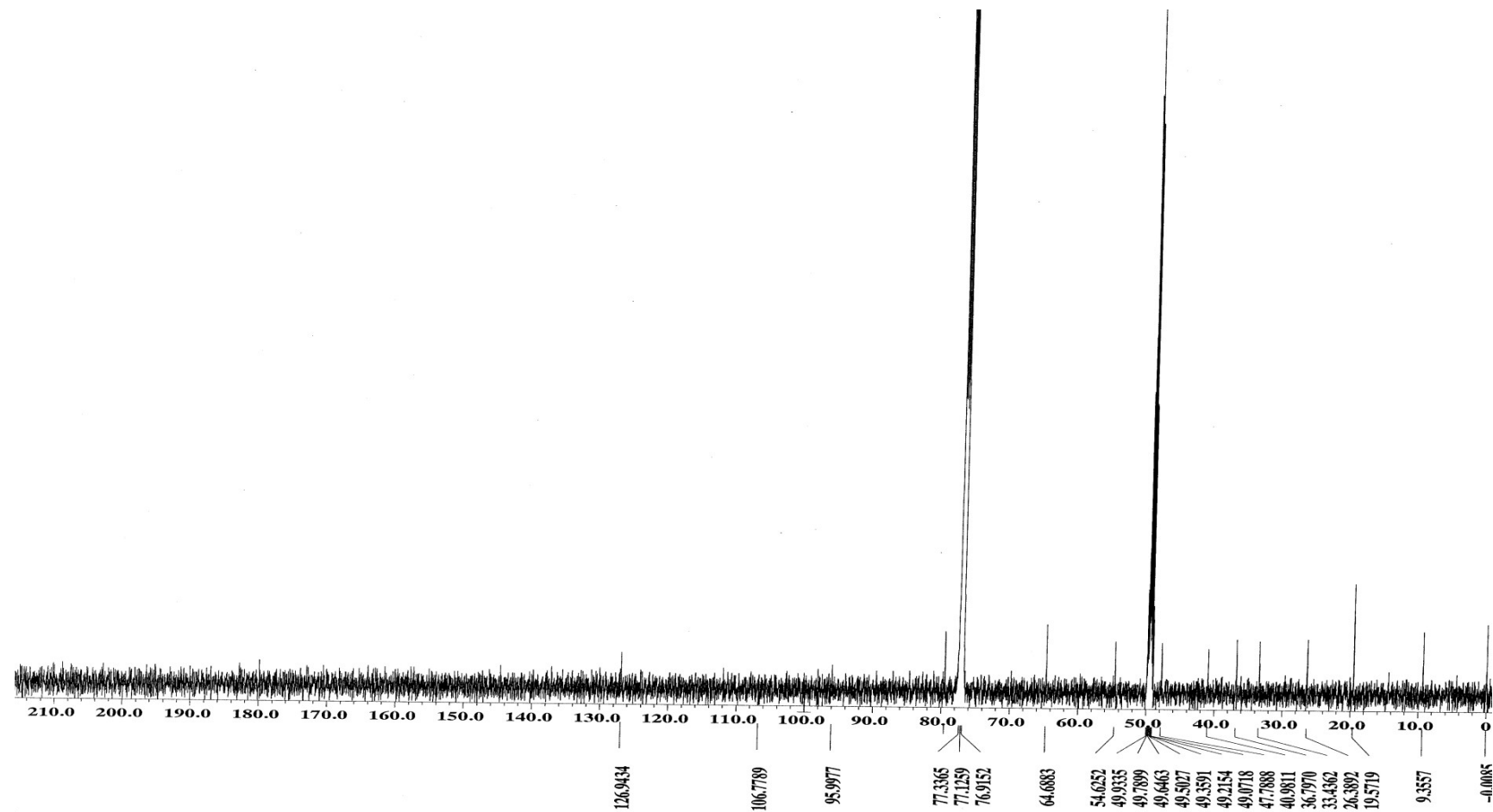
**Figure S1:** <sup>1</sup>H NMR spectrum (CDCl<sub>3</sub>, 600 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (**1**)



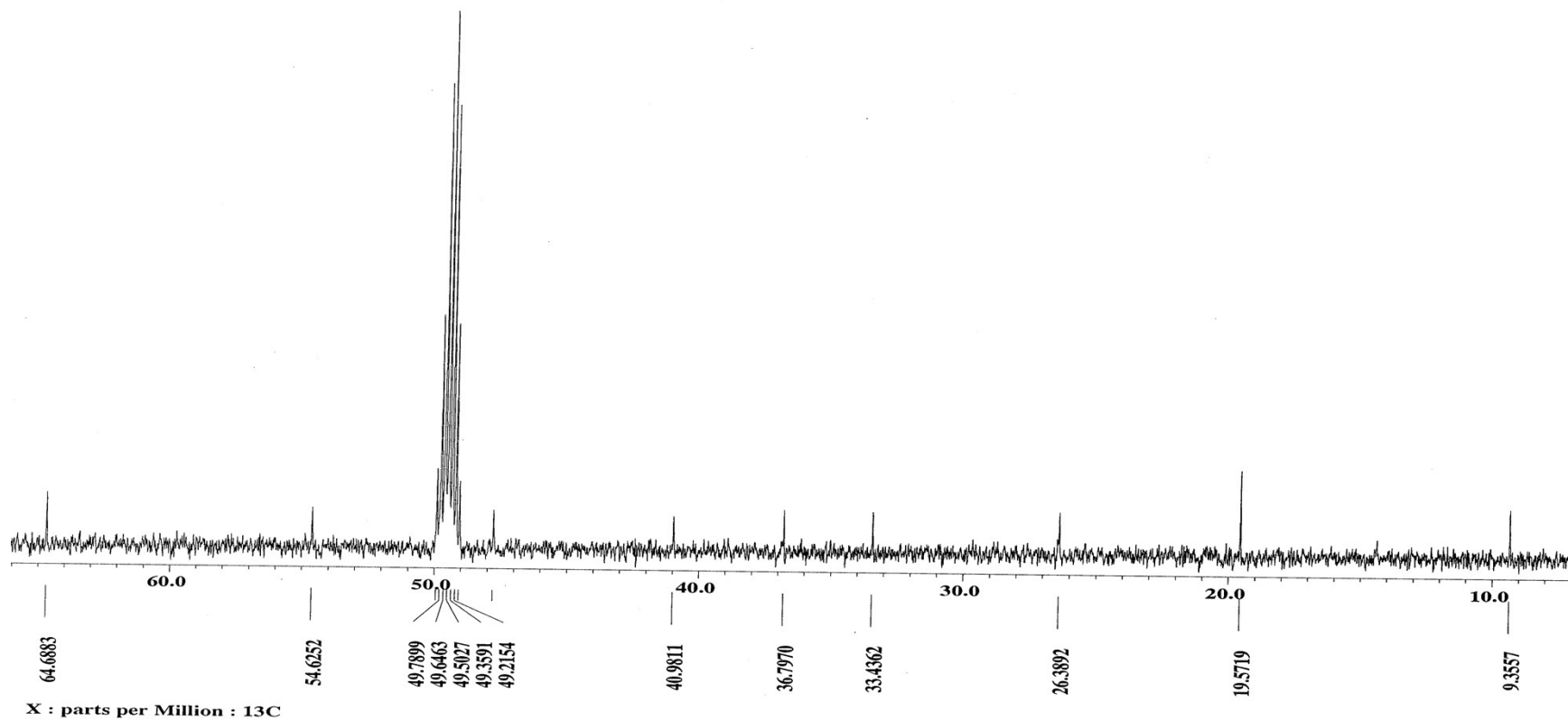
**Figure S1a:** Expansion of <sup>1</sup>H NMR spectrum (CDCl<sub>3</sub>, 600 MHz) of 1 $\beta$ ,8 $\alpha$ -dihydroxyeudesm-4-en-6 $\beta$ ,7 $\alpha$ ,11 $\beta$ H-12,6-olide (**1**)



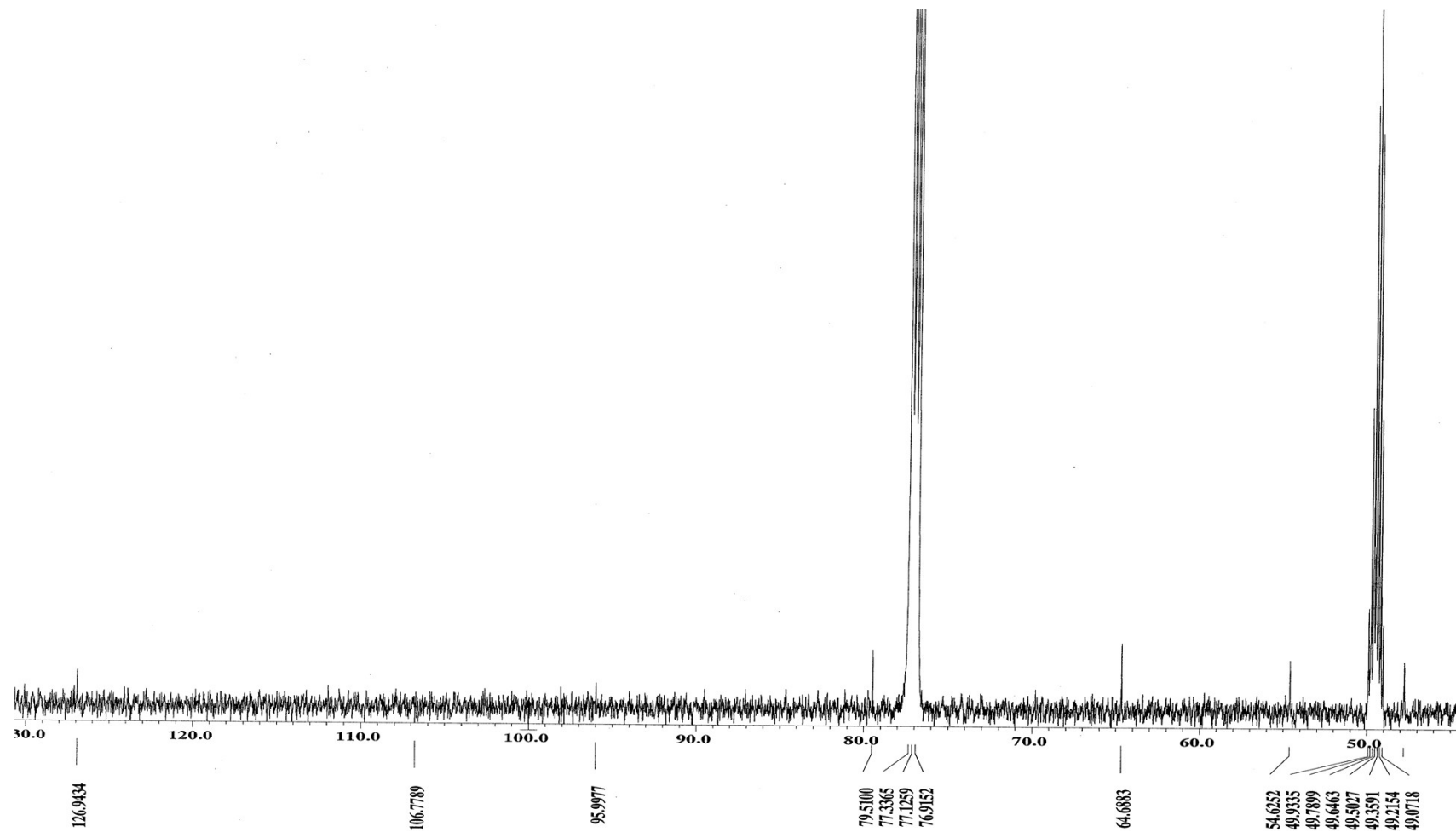
**Figure S1b:** Expansion of  $^1\text{H}$  NMR spectrum ( $\text{CDCl}_3$ , 600 MHz) of  $1\beta,8\alpha$ -dihydroxyeudesm-4-en- $6\beta,7\alpha,11\beta$ H-12,6-olide (**1**)



**Figure S2:**  $^{13}\text{C}$  NMR spectrum ( $\text{CDCl}_3$ , 150 MHz) of  $1\beta,8\alpha$ -dihydroyeudesm-4-en- $6\beta,7\alpha,11\beta\text{H}$ -12,6-olide (**1**)

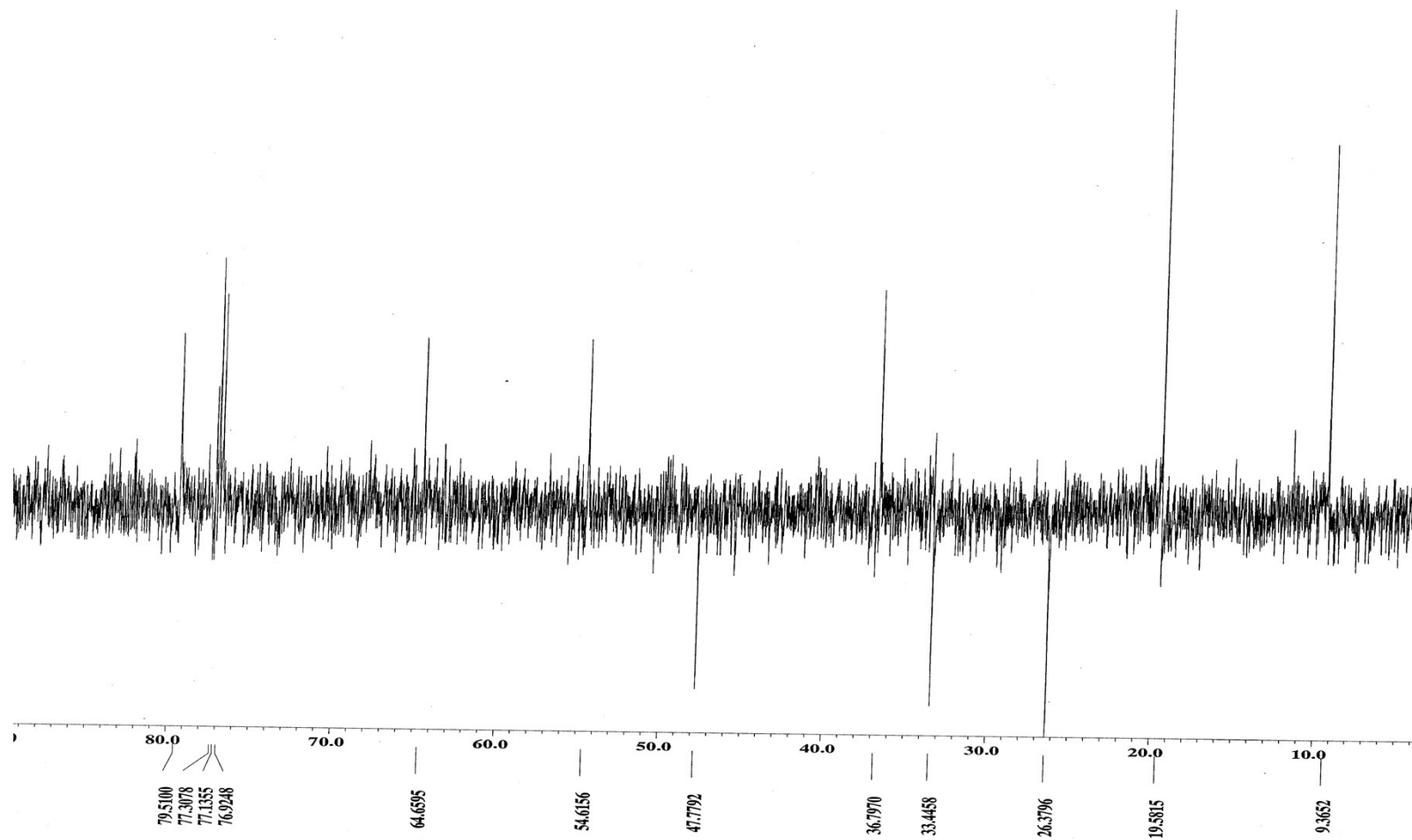


**Figure S2a:** Expansion of <sup>13</sup>C NMR spectrum (CDCl<sub>3</sub>, 150 MHz) of 1 $\beta$ ,8 $\alpha$ -dihydroxyeudesm-4-en-6 $\beta$ ,7 $\alpha$ ,11 $\beta$ H-12,6-olide (**1**)

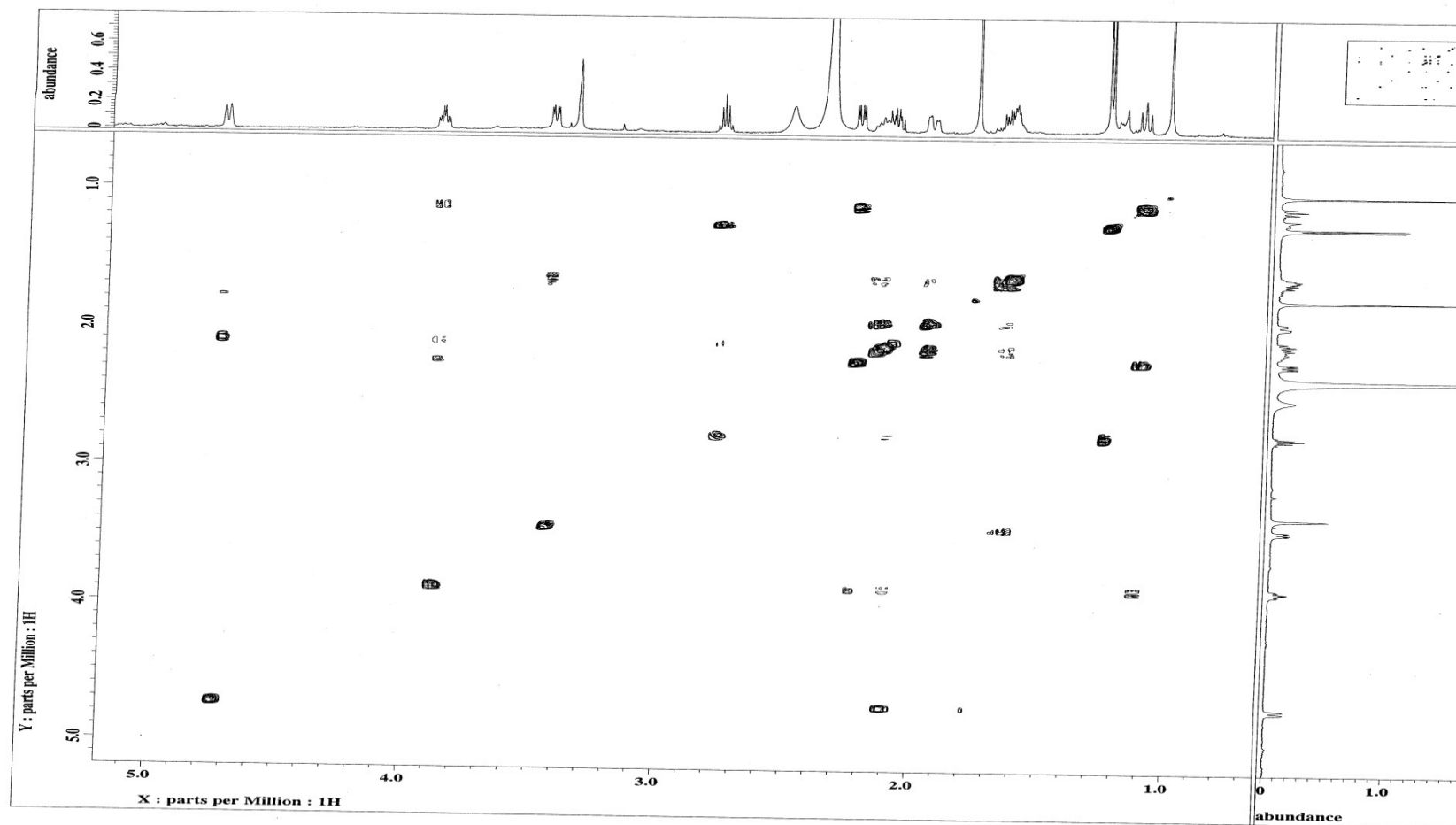


**Figure S2b:** Expansion of <sup>13</sup>C NMR spectrum (CDCl<sub>3</sub>, 150 MHz) of 1β,8α-dihydroxyeudesm-4-en-6β,7α,11βH-12,6-olide (**1**)

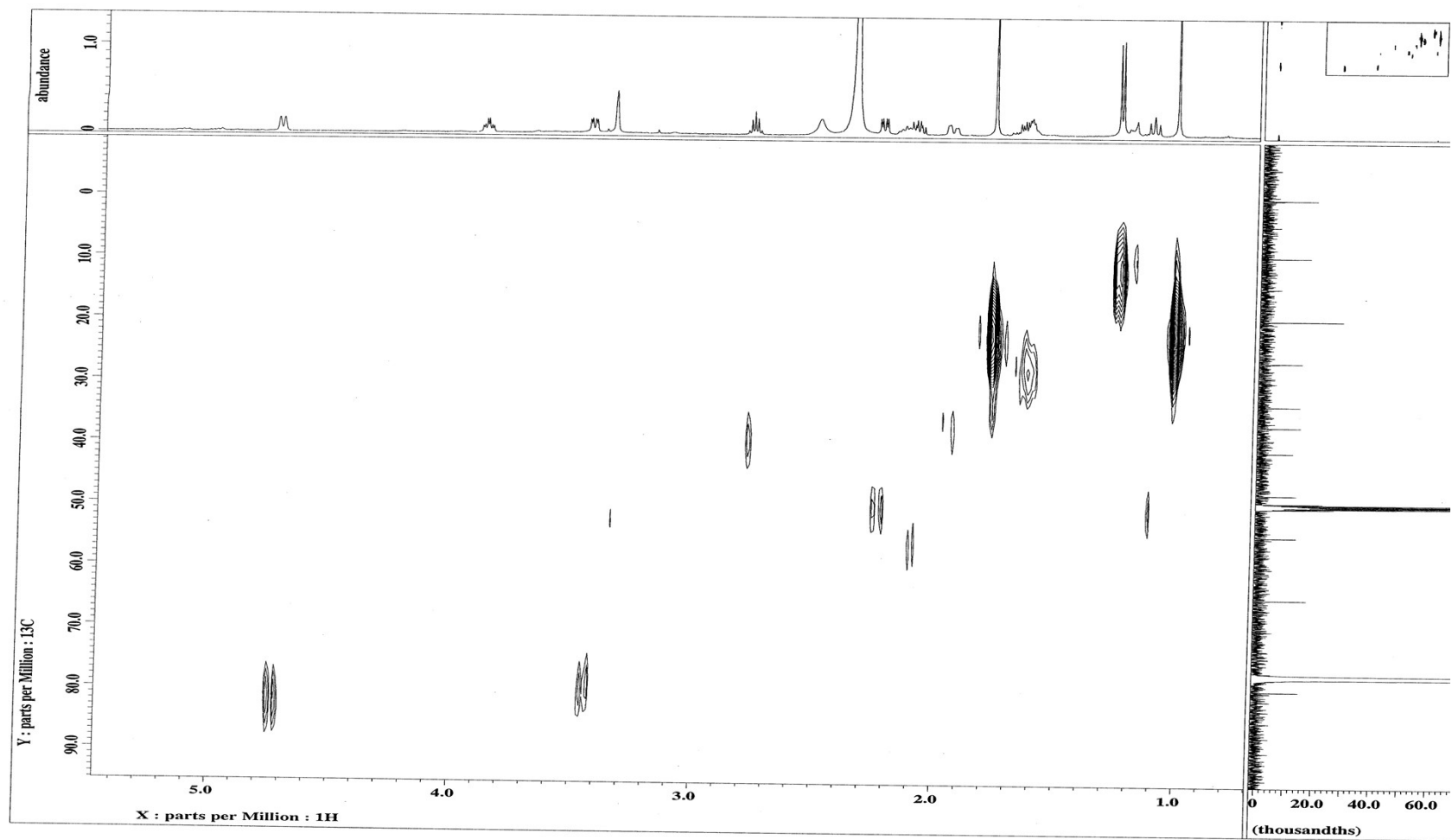




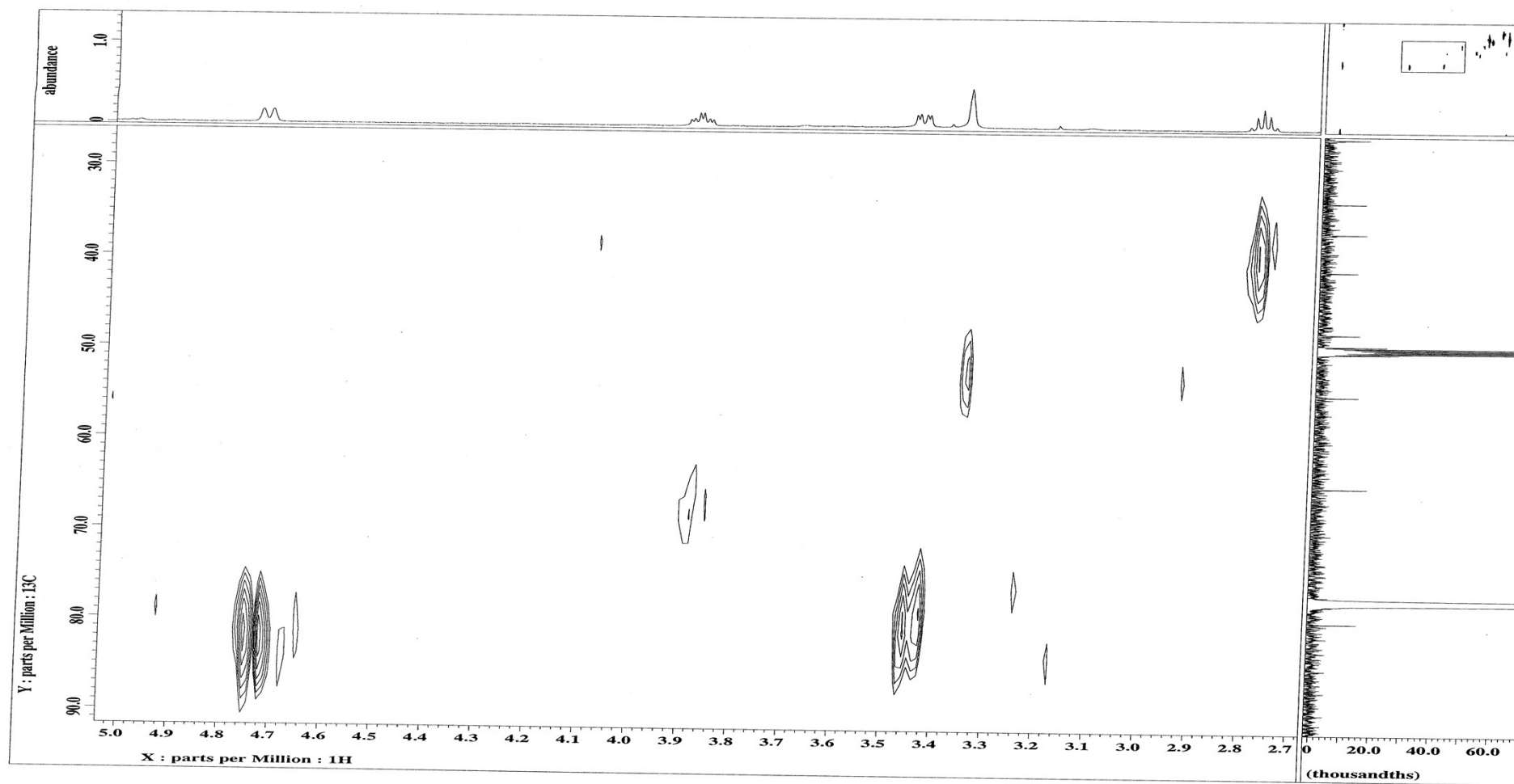
**Figure S3:** DEPT spectrum of 1 $\beta$ ,8 $\alpha$ -dihydroxyeudesm-4-en-6 $\beta$ ,7 $\alpha$ ,11 $\beta$ H-12,6-olide (1)



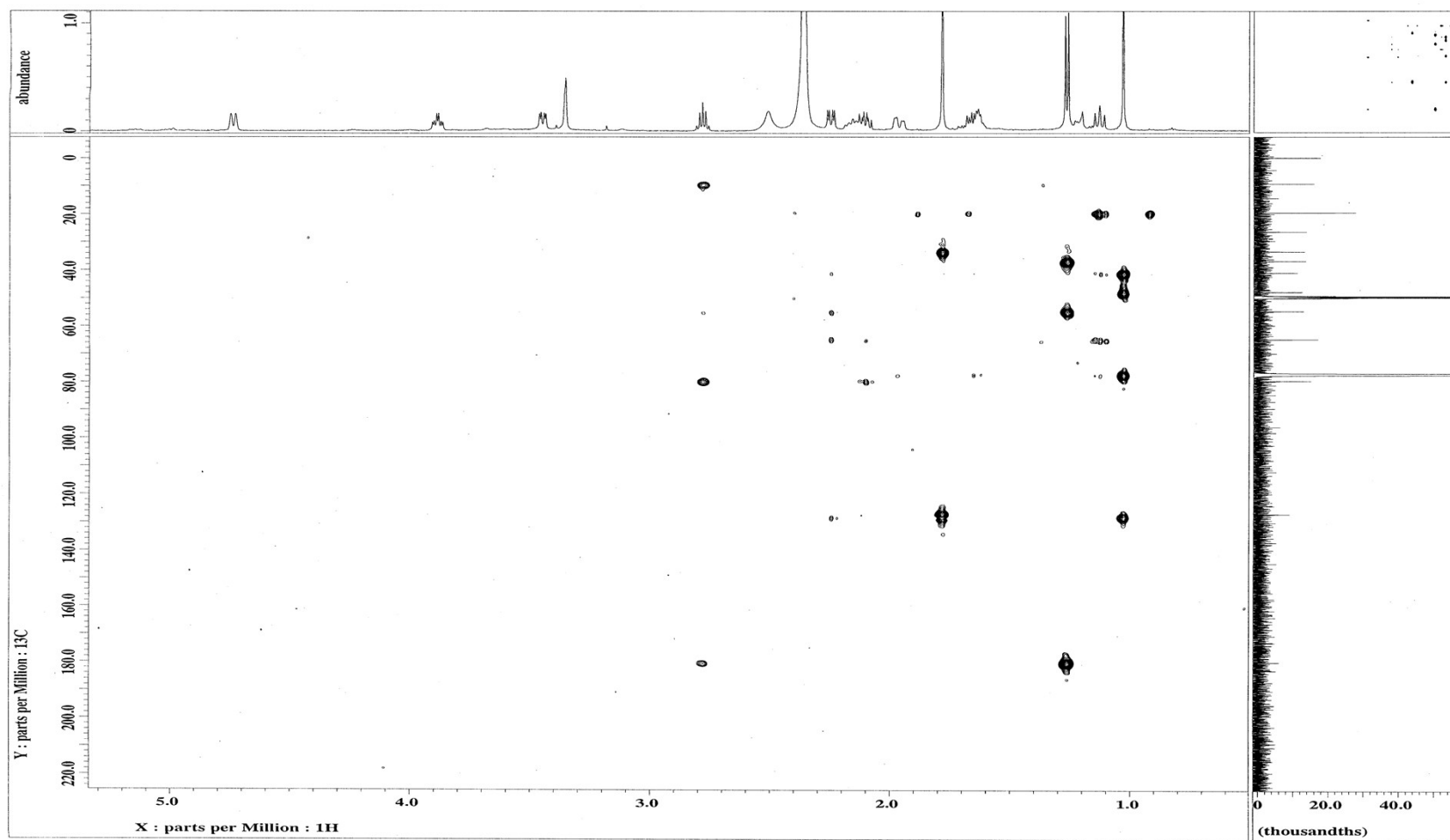
**Figure S4:**  $^1\text{H}$ - $^1\text{H}$  COSY spectrum of  $1\beta,8\alpha$ -dihydroxyeudesm-4-en-6 $\beta$ ,7 $\alpha$ ,11 $\beta$ H-12,6-olide (**1**)



**Figure S5:** HSQC spectrum of  $1\beta,8\alpha$ -dihydroxyeudesm-4-en- $6\beta,7\alpha,11\beta$ H-12,6-olide (**1**)



**Figure S5a:** Expansion of HSQC spectrum of  $1\beta,8\alpha$ -dihydroxyeudesm-4-en- $6\beta,7\alpha,11\beta$ H-12,6-olide (**1**)



**Figure S6:** HMBC spectrum of  $1\beta,8\alpha$ -dihydroxyeudesm-4-en- $6\beta,7\alpha,11\beta$ H-12,6-olide (**1**)

Data : Umeyama-CIHR.11-Jan-2021.006

Date : 11-Jan--2021

Instrument : MS700D

13:35

Sample : SHA-4820-5-7

Note : MStation

Inlet : Direct Ion Mode : CI+

RT : 1.11 min Scan# : 30

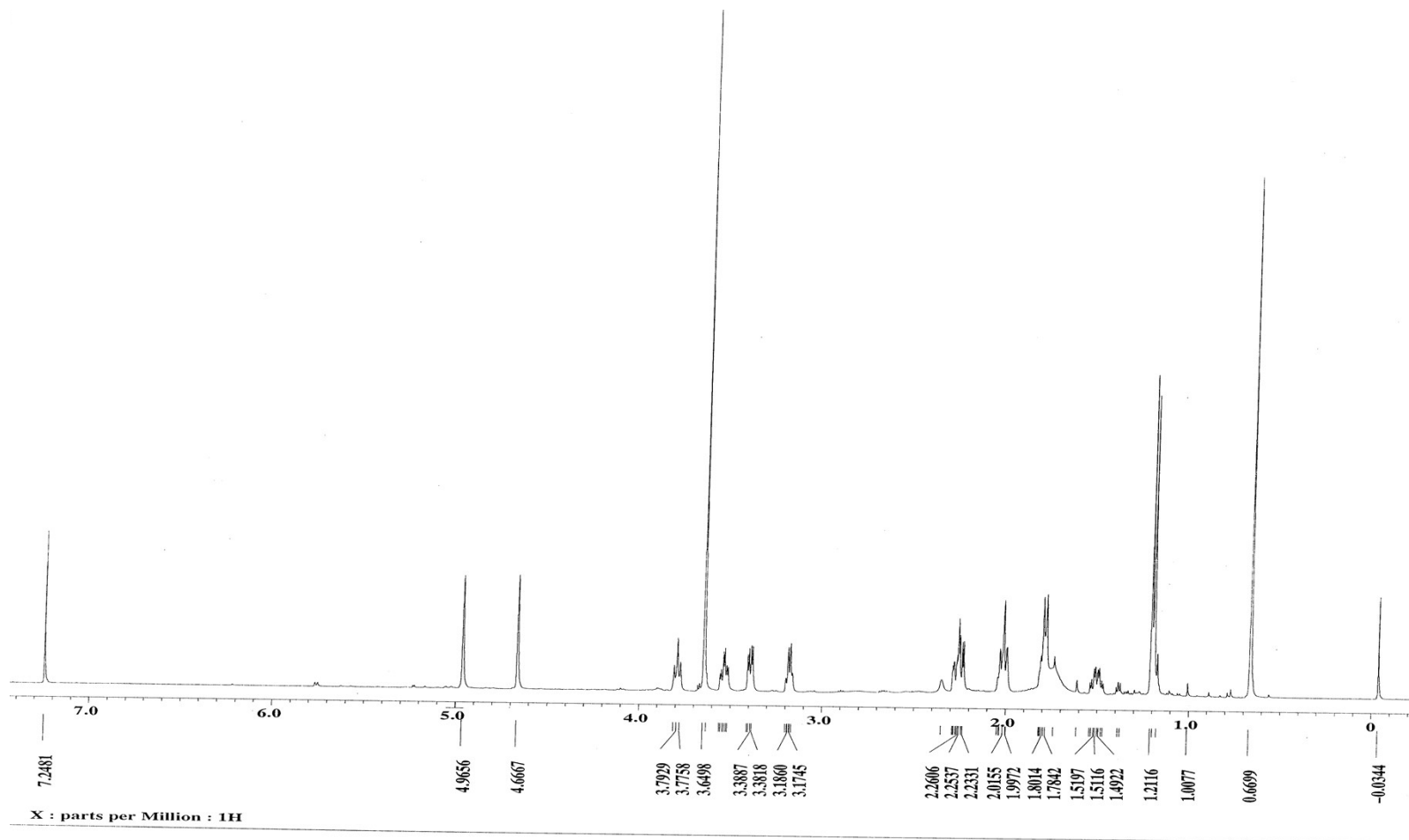
Elements : C 150/0, H 250/0, 35Cl 1/0, 50/0, C

Mass Tolerance : 5mmu

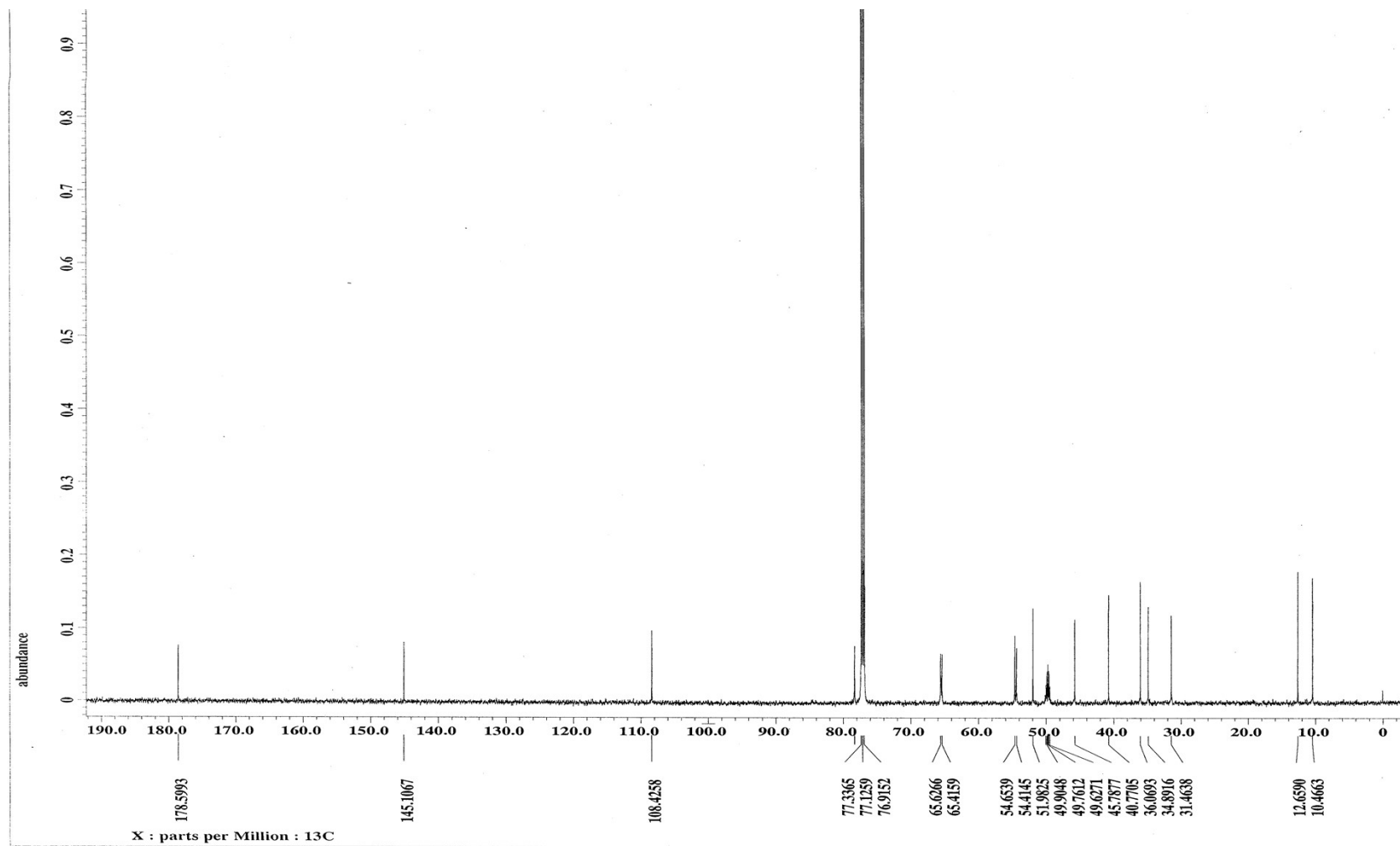
Unsaturation (U.S.) : 0.0 - 20.0

	Observed	m/z	Int %	Err [ppm / mmu]	U.S.	Composition
1	267.1522		32.21	+0.4 / +0.7	5.0	C15 H22 O4

**Figure S7:** HR-TOF ESI MS spectrum of 1 $\beta$ ,8 $\alpha$ -dihydroxyeudesm-4-en-6 $\beta$ ,7 $\alpha$ ,11 $\beta$ H-12,6-olide (**1**)



**Figure S8:**  $^1\text{H}$  NMR spectrum ( $\text{CDCl}_3$ , 600 MHz) of  $1\beta,6\alpha,8\alpha$ -trihydroxy,  $11\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (**2**)



**Figure S9:**  $^{13}\text{C}$  NMR spectrum ( $\text{CDCl}_3$ , 150 MHz) of  $1\beta,6\alpha,8\alpha$ -trihydroxy,  $11\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (**2**)



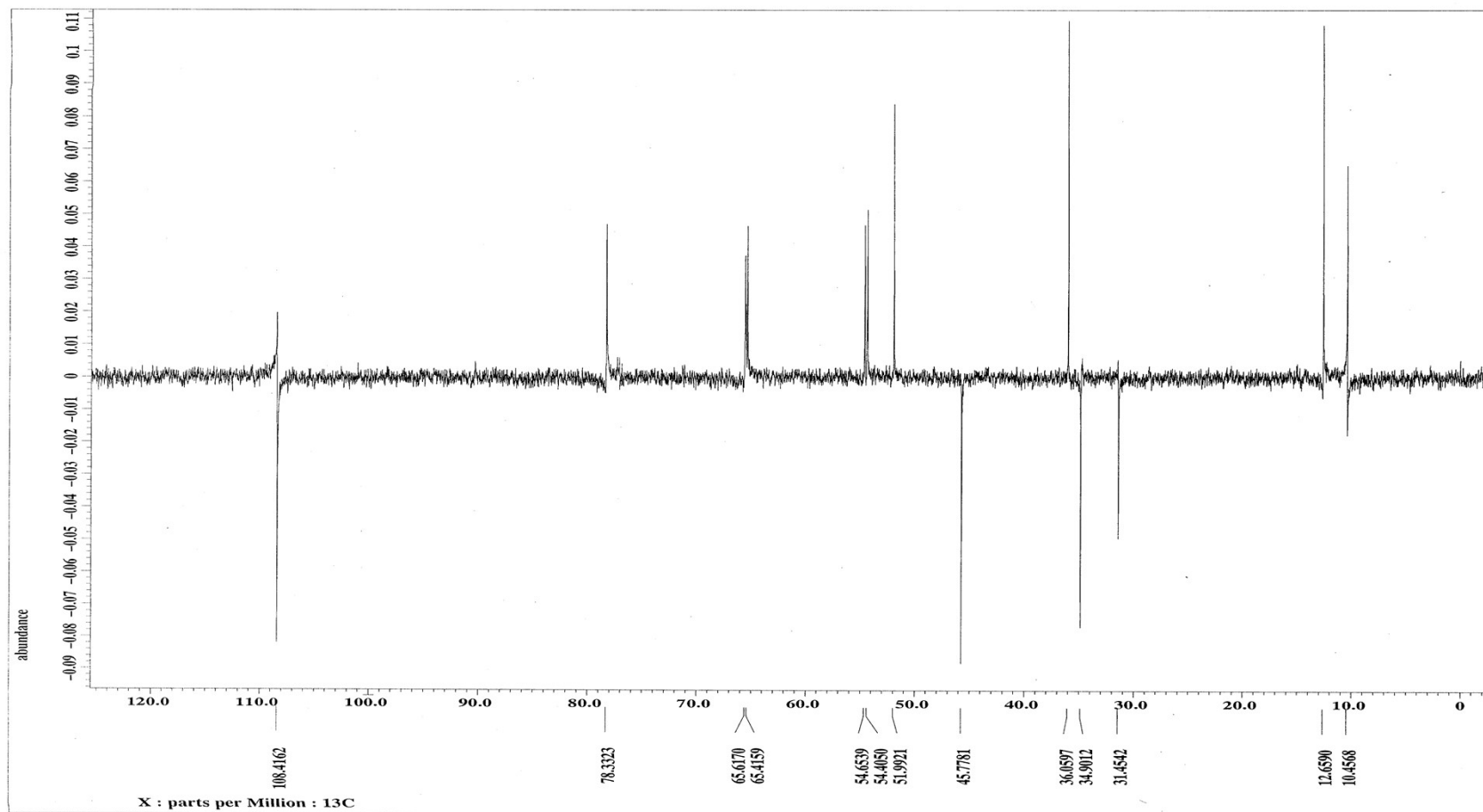
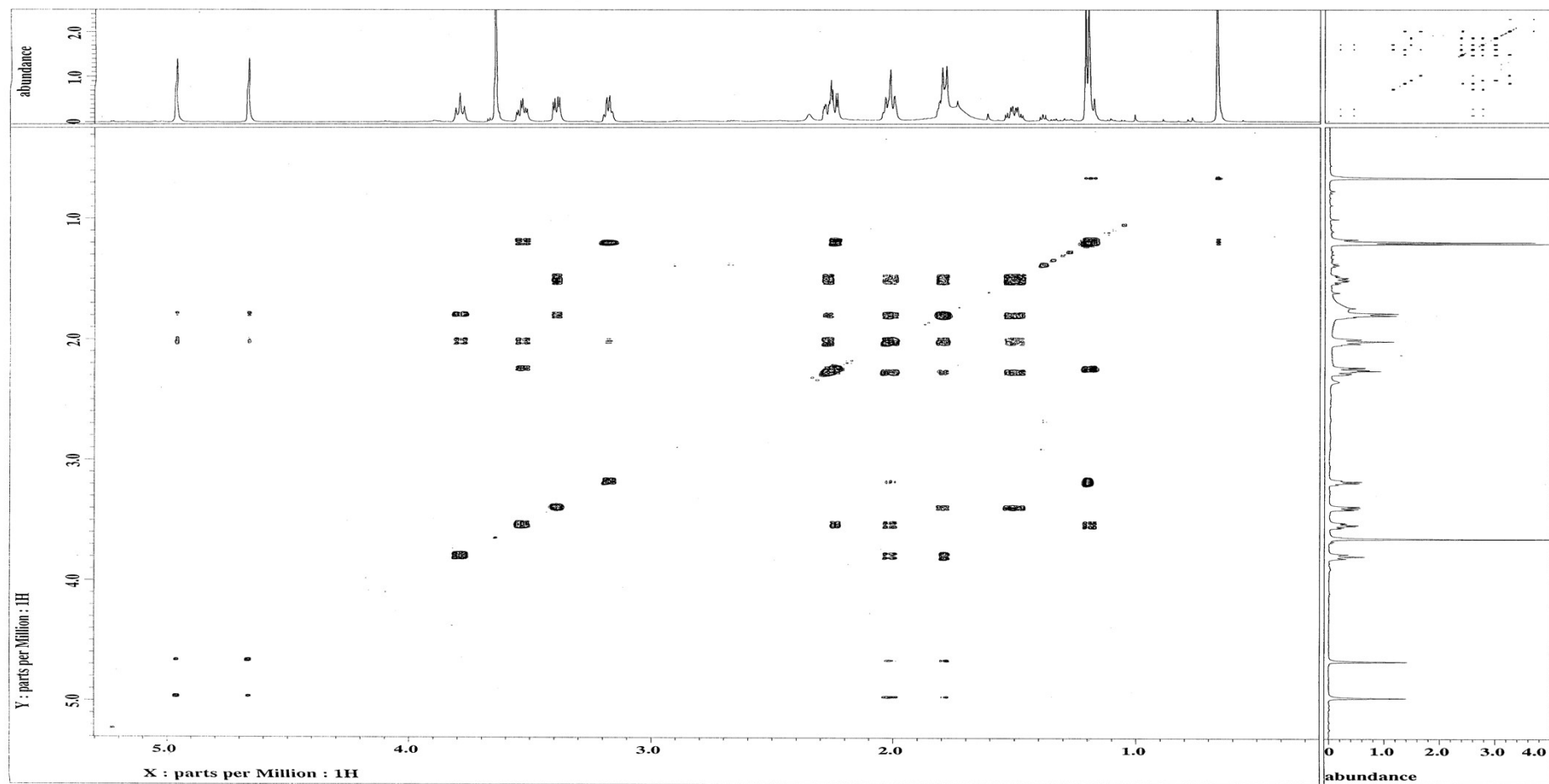
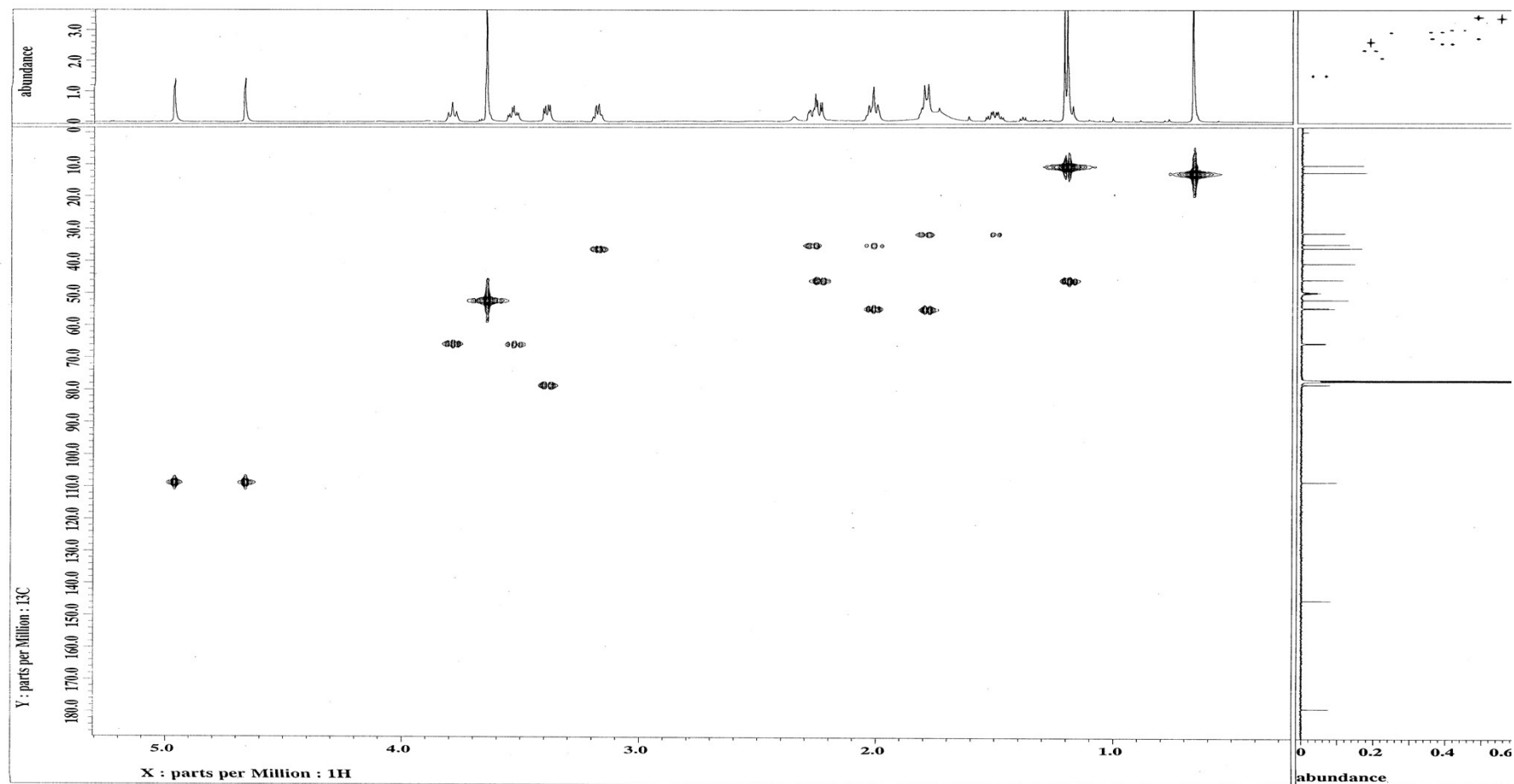


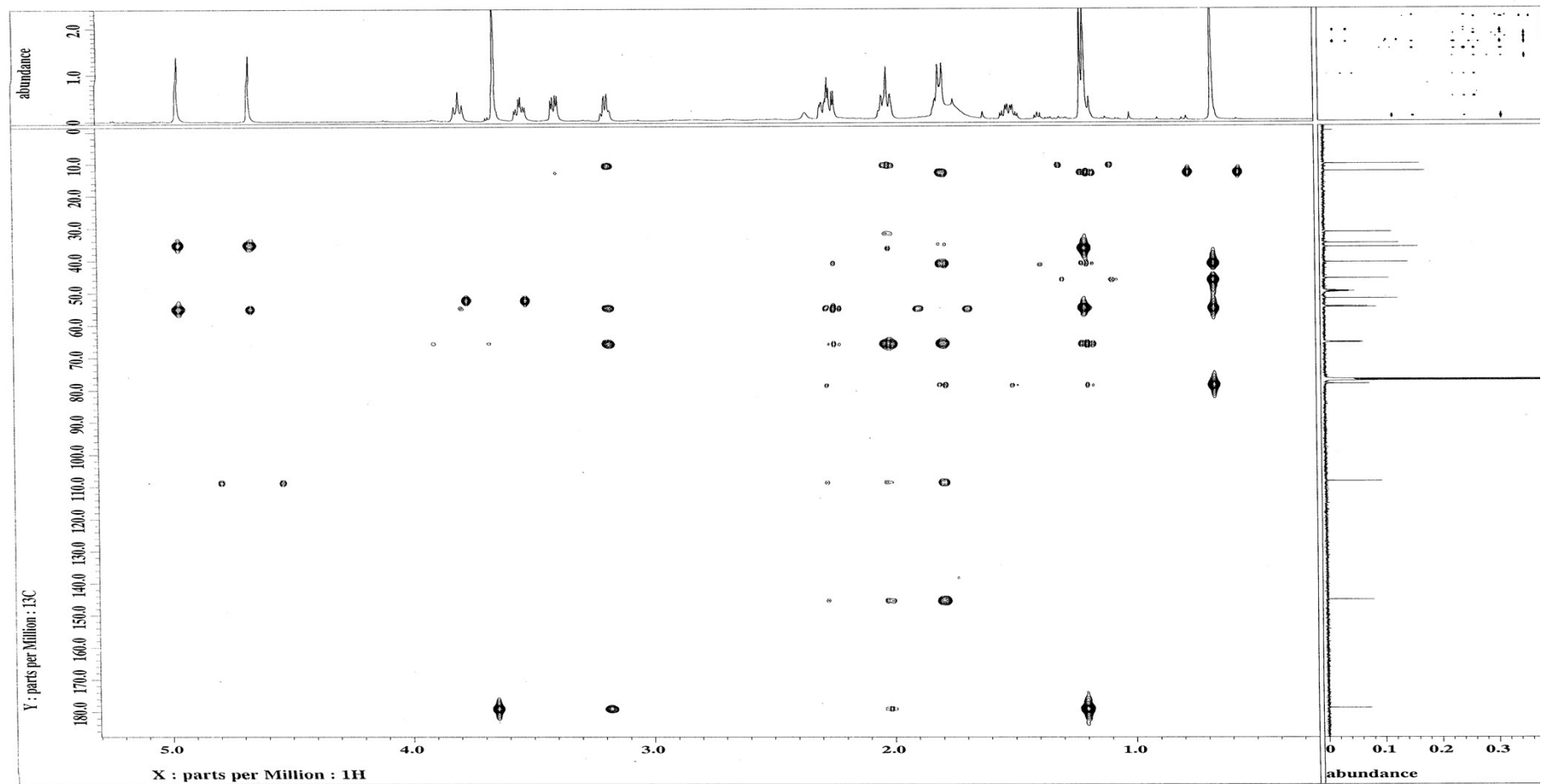
Figure S10: DEPT spectrum of 1 $\beta$ ,6 $\alpha$ ,8 $\alpha$ -trihydroxy, 11 $\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (2)



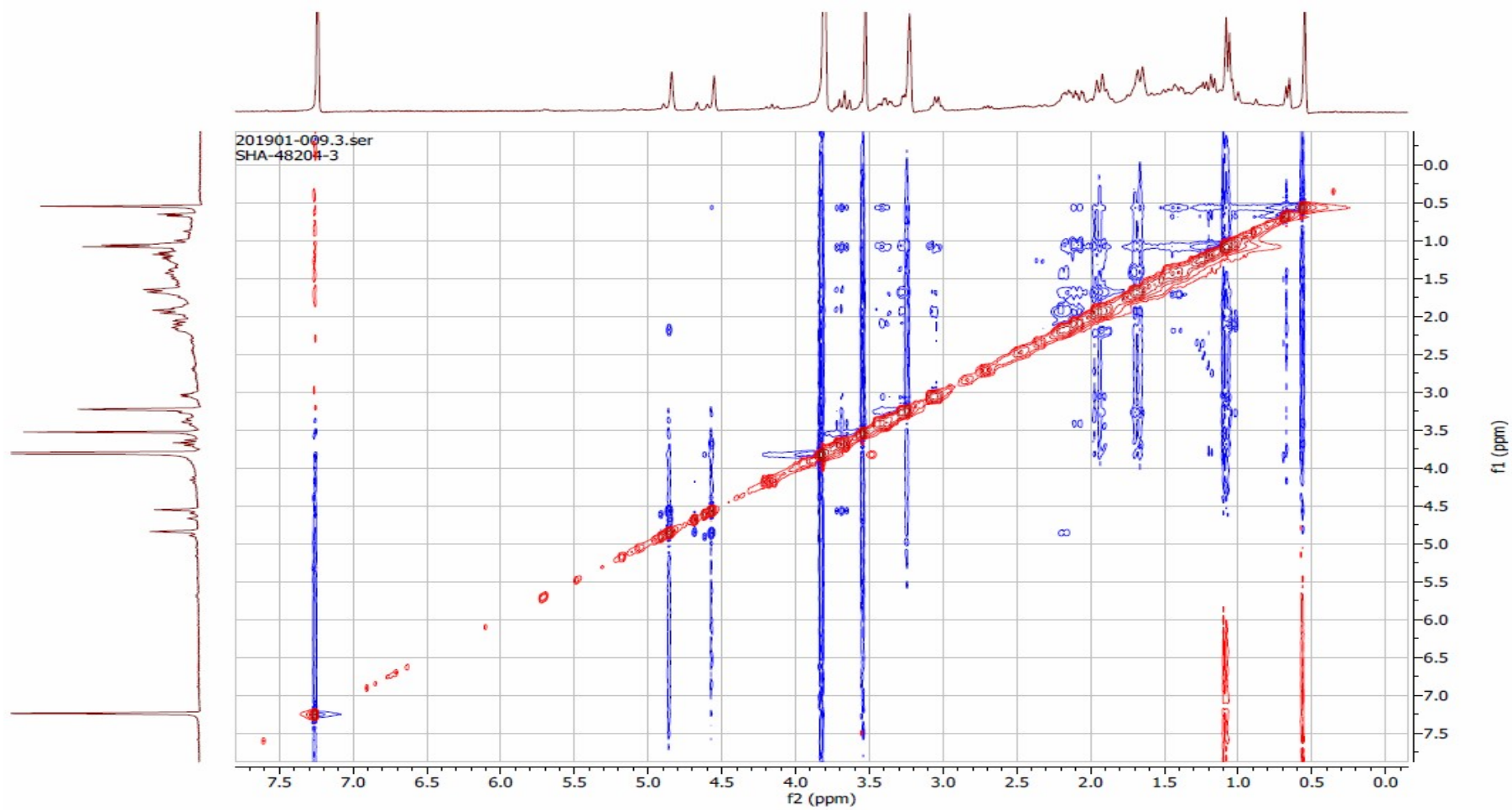
**Figure S11:**  $^1\text{H}$ - $^1\text{H}$  COSY spectrum of  $1\beta,6\alpha,8\alpha$ -trihydroxy,  $11\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (2)



**Figure S12:** HSQC spectrum of  $1\beta,6\alpha,8\alpha$ -trihydroxy,  $11\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (2)



**Figure S13:** HMBC spectrum of  $1\beta,6\alpha,8\alpha$ -trihydroxy,  $11\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (2)



**Figure S14:** NOESY spectrum of 1 $\beta$ ,6 $\alpha$ ,8 $\alpha$ -trihydroxy, 11 $\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (2)

Data : Umeyama-CIHR.21-Jan-2021 .006

Date : 21-Jan--2021

Instrument : MS700D

13:20

Sample : SHA-4820-4-3

Note : MStation

Inlet : Direct Ion Mode : CI+

RT : 1.11 min Scan# : 30

Elements : C 150/0, H 250/0, 35Cl 1/0, 50/0, C

Mass Tolerance : 5mmu

Unsaturation (U.S.) : 0.0 - 20.0

Observed	m/z	Int %	Err [ppm / mmu]	U.S.	Composition
1	299.1782	32.21	+0.2 / +0.7	5.0	C15 H22 O4

**Figure S15:** HR-TOF ESI MS spectrum of  $1\beta,6\alpha,8\alpha$ -trihydroxy,  $11\alpha$ -methyl-eudesma-4(15)-en-13-propanoate (2)