SUPPORTING INFORMATION

α-Glucosidase inhibition of Vietnam's medicinal plants belonging to Zingiberaceae family and some flavonoids isolated from the rhizomes of *Zingiber zerumbet* Sm.

Hai Xuan Nguyen[1,2,3,*], Tho Huu Le[1,2,3], Truong Nhat Van Do[1,2,3], Mai Thanh Thi Nguyen[1,2,3,*]

[1]Faculty of Chemistry, University of Science, Cho Quan ward, Ho Chi Minh City, Viet Nam
[2]Vietnam National University, Linh Xuan ward, Ho Chi Minh City, Viet Nam
[3]Research Lab for Drug Discovery and Development, University of Science, Cho Quan ward, Ho Chi Minh City, Viet Nam

[*]Emails: *nxhai@hcmus.edu.vn; nttmai@hcmus.edu.vn*

Received: 04 September 2023; Accepted for publication: 15 July 2025

Abstract. 23 extracts from the rhizomes of seven An Giang's medicinal plants belonging to the Zingiberaceae family were tested for *α*-glucosidase inhibitory activity. The screening results showed that 21/23 samples showed IC_{50} values less than 250 μg/mL, 17 samples with IC_{50} values below 100 μg/mL, and 6 samples displayed IC_{50} values below 10 μg/mL. *Zingiber zerumbet* is a perennial herb belonging to the Zingiberaceae family, and its rhizomes show various biological activities. A further phytochemical study on the $CHCl_3$ extract of this plant furnished the isolation of seven flavonoids, consisting of naringenin (**1**), aromadendrin (**2**), kaempferol (**3**), *iso*-kaempferide (**4**), afzelin (**5**), kaempferol-3-*O*-(4''-*O*-acetyl)-*α*-L-rhamnopyranoside (**6**), and kaempferol-3-*O*-(2,3,4-tri-*O*-acetyl)-*α*-L-rhamnopyranoside (**7**). Their structures were determined based on extensive spectroscopic analysis and in comparison with previous works. Among them, compounds **1**, **2**, **5**, and **7** have been found for the first time in this plant. All compounds possessed significant *α*-glucosidase inhibitory activity and showed more potent inhibitory activity than that of a positive control, acarbose (IC_{50}, 214.5 μM or 138.2 μg/mL).

Keywords: *Zingiber zerumbet*, Zingiberaceae, flavonoids, *α*-glucosidase.

Classification numbers: 1.1.1.

SUPPLEMENT FILE

α-Glucosidase inhibitory activity of extracts (Tables S1–7).

Copies of spectroscopic data for all compounds (Figures S1–29).

Table S1. α-Glucosidase inhibitory activity of *Alpinia fficinarum* extracts

Extracts	**Percentage inhibition (%)**				**IC_{50} (µg/mL)**
	100 µg/mL	**50 µg/mL**	**25 µg/mL**	**10 µg/mL**	
Hexane	*	95.58 ± 0.66	87.64 ± 0.42	16.4 ± 1.6	17.1 ± 0.4
MeOH	89.77 ± 0.46	67.5 ± 0.32	48.07 ± 0.54	28.03 ± 0.61	27.5 ± 0.7
	10 µg/mL	**5 µg/mL**	**2.5 µg/mL**	**1.0 µg/mL**	
EtOAc	*	98.77 ± 0.32	80.5 ± 1.0	48.24 ± 0.65	1.10 ± 0.05

Table S2. α-Glucosidase inhibitory activity of *Boesenbergia pandurata* extracts

Extracts	**Percentage inhibition (%)**				**IC_{50} (µg/mL)**
	100 µg/mL	**50 µg/mL**	**25 µg/mL**	**10 µg/mL**	
$CHCl_3$	96.2 ± 1.9	81.5 ± 2.3	74.1 ± 2.9	27.5 ± 2.9	17.2 ± 0.4
EtOAc	64.3 ± 1.8	46.03 ± 0.13	3.0 ± 1.0	–	60.9 ± 1.5
MeOH	97.3 ±1.6	79.80 ± 0.88	41.8 ± 1.9	19.6 ± 2.9	30.4 ± 0.8

Table S3. α-Glucosidase inhibitory activity of *Curcuma aromatica* extracts

Extracts	**Percentage inhibition (%)**					**IC_{50} (µg/mL)**
	250 µg/mL	**100 µg/mL**	**50 µg/mL**	**25 µg/mL**	**10 µg/mL**	
Hexane	53.1 ± 2.9	27.9 ± 2.2	19.5 ± 2.7	6.2 ± 1.2	–	231.3 ± 3.5
H_2O	*	92.65 ± 0.81	83.32 ± 0.81	57.0 ± 2.2	36.8 ± 1.6	19.7 ± 0.5
		10 µg/mL	**5 µg/mL**	**2.5 µg/mL**	**1 µg/mL**	
$CHCl_3$	*	65.93 ± 0.24	37.67 ± 0.86	22.85 ± 0.97	2.91 ± 0.50	7.2 ± 0.3
EtOAc	*	60.19 ± 0.54	33.8 ± 3.6	15.8 ± 1.6	8.98 ± 0.77	8.1 ± 0.4

Table S4. α-Glucosidase inhibitory activity of *Curcuma zanthorrhiza* extracts

Extracts	**Percentage inhibition (%)**				**IC_{50} (µg/mL)**
	100 µg/mL	**50 µg/mL**	**25 µg/mL**	**10 µg/mL**	
Hexane	*	99.22 ± 0.11	83.70 ± 0.42	31.5 ± 2.9	15.3 ± 0.4
EtOAc	98.32 ± 0.48	77.2 ± 2.9	45.4 ± 1.4	10.6 ± 2.4	28.6 ± 0.7
	10 µg/mL	**5 µg/mL**	**2.5 µg/mL**	**1 µg/mL**	
MeOH	51.84 ± 0.69	14.9 ± 1.9	–	–	9.7 ± 0.4

Table S5. α-Glucosidase inhibitory activity of *Curcuma zedoaria* extracts

Extracts	**Percentage inhibition (%)**				**IC_{50} (µg/mL)**
	100 µg/mL	**50 µg/mL**	**25 µg/mL**	**10 µg/mL**	
EtOAc	89.89 ± 0.13	64.2 ± 3.0	25.17 ± 0.87	3.54 ± 0.45	40.9 ± 1.0
	10 µg/mL	**5 µg/mL**	**2.5 µg/mL**	**1µg/mL**	
Hexane	93.81 ± 0.74	42.1 ± 2.2	8.4 ± 1.5	–	5.8 ± 0.3
MeOH	82.6 ± 2.9	30.32 ± 0.85	8.9 ± 2.0	–	6.9 ± 0.3

Table S6. α-Glucosidase inhibitory activity of *Zingiber montanum* extracts

Extracts	Percentage inhibition (%)					IC_{50} (µg/mL)
	250 µg/mL	100 µg/mL	50 µg/mL	25 µg/mL	10 µg/mL	
Hexane	87.9 ± 1.8	49.1 ± 2.5	35.2 ± 2.0	–	–	103.5 ± 1.6
EtOAc	92.7 ± 2.8	58.1 ± 1.3	31.5 ± 2.0	5.4 ± 1.4	–	84.8 ± 2.1
MeOH	46.1 ± 2.2	33.2 ± 2.1	20.7 ± 2.4	18.5 ± 1.0	10.2 ± 1.4	**> 250**

Table S7. α-Glucosidase inhibitory activity of *Zingber zerumbert* extracts

Extracts	Percentage inhibition (%)					IC_{50} (µg/mL)
	250 µg/mL	100 µg/mL	50 µg/mL	25 µg/mL	10 µg/mL	
Hexane	79.1 ± 2.8	18.6 ± 1.4	–	–	–	177.7 ± 2.7
$CHCl_3$	94.8 ± 1.5	40.2 ± 2.9	6.4 ± 1.8	–	–	126.9 ± 1.9
EtOAc	72.1 ± 2.2	52.0 ± 3.2	28.54 ± 0.61	7.3 ± 1.4	–	95.7 ± 2.4
MeOH	25.2 ± 2.0	7.6 ± 1.1	–	–	–	**> 250**

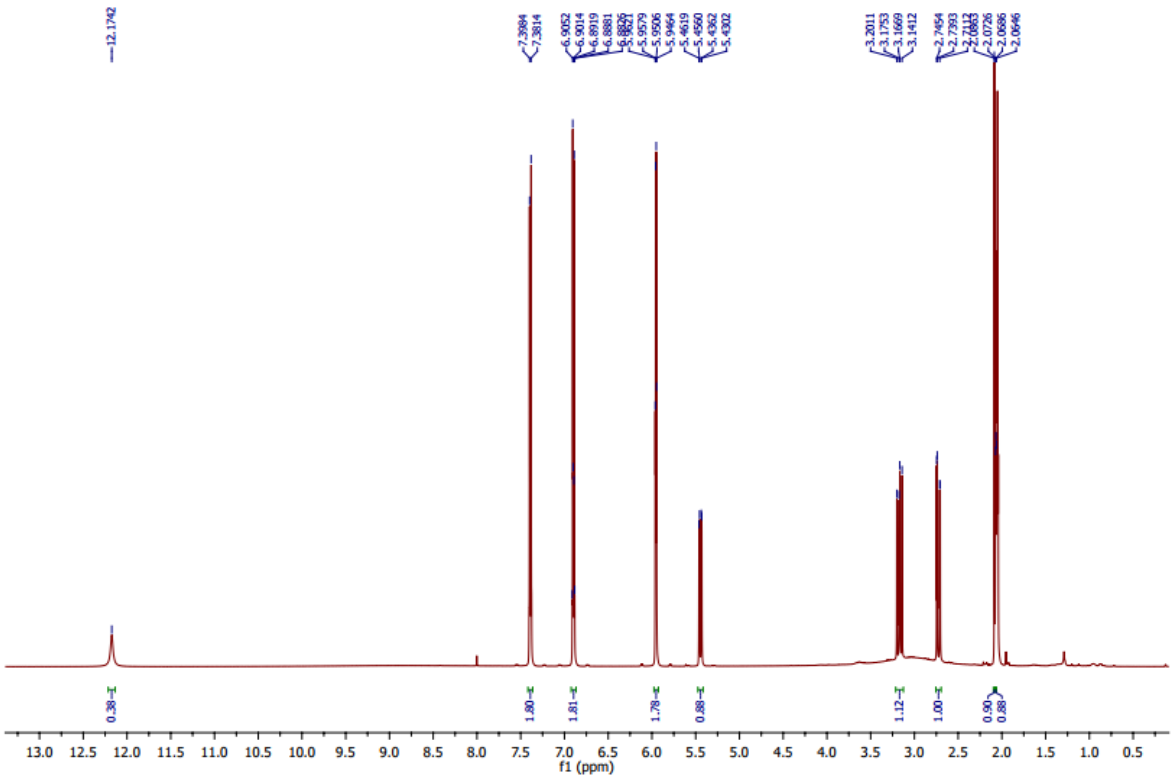


Figure S1. ^{1}H-NMR spectrum of the compound **1** (500 MHz – CD_3COCD_3)

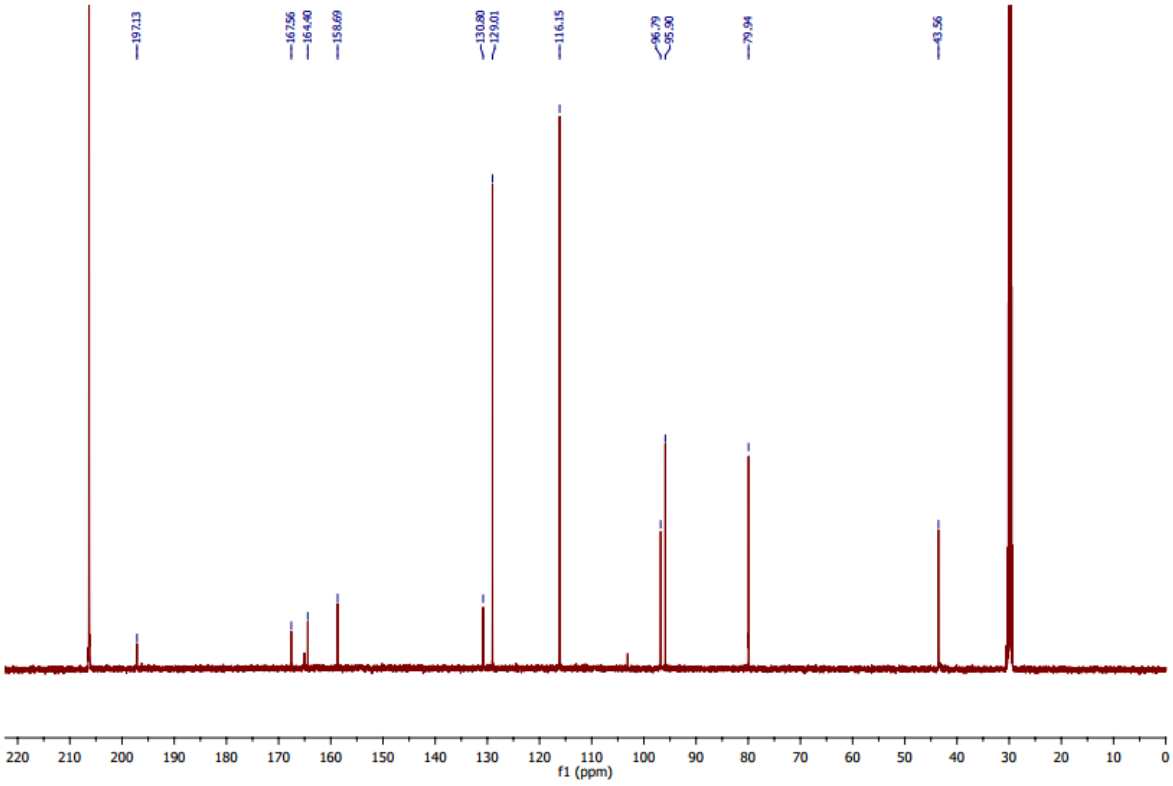


Figure S2. ^{13}C-NMR spectrum of the compound **1** (125 MHz – CD_3COCD_3)

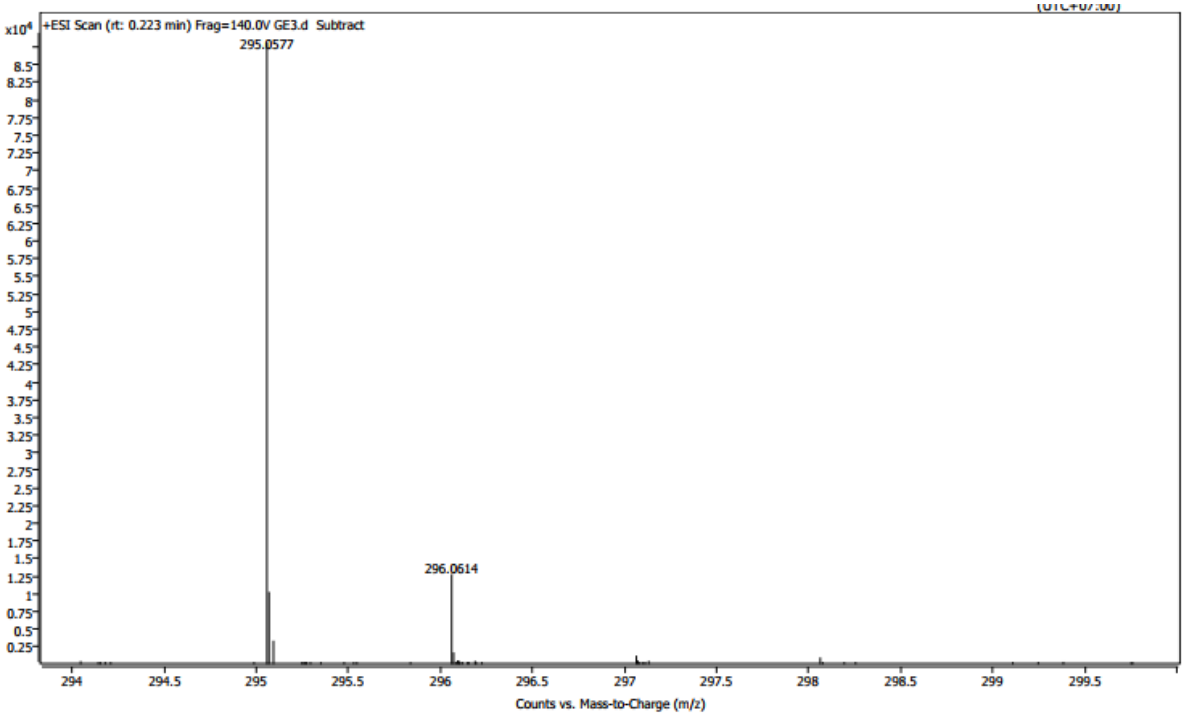


Figure S3. HR-ESI-MS of the compound **1**

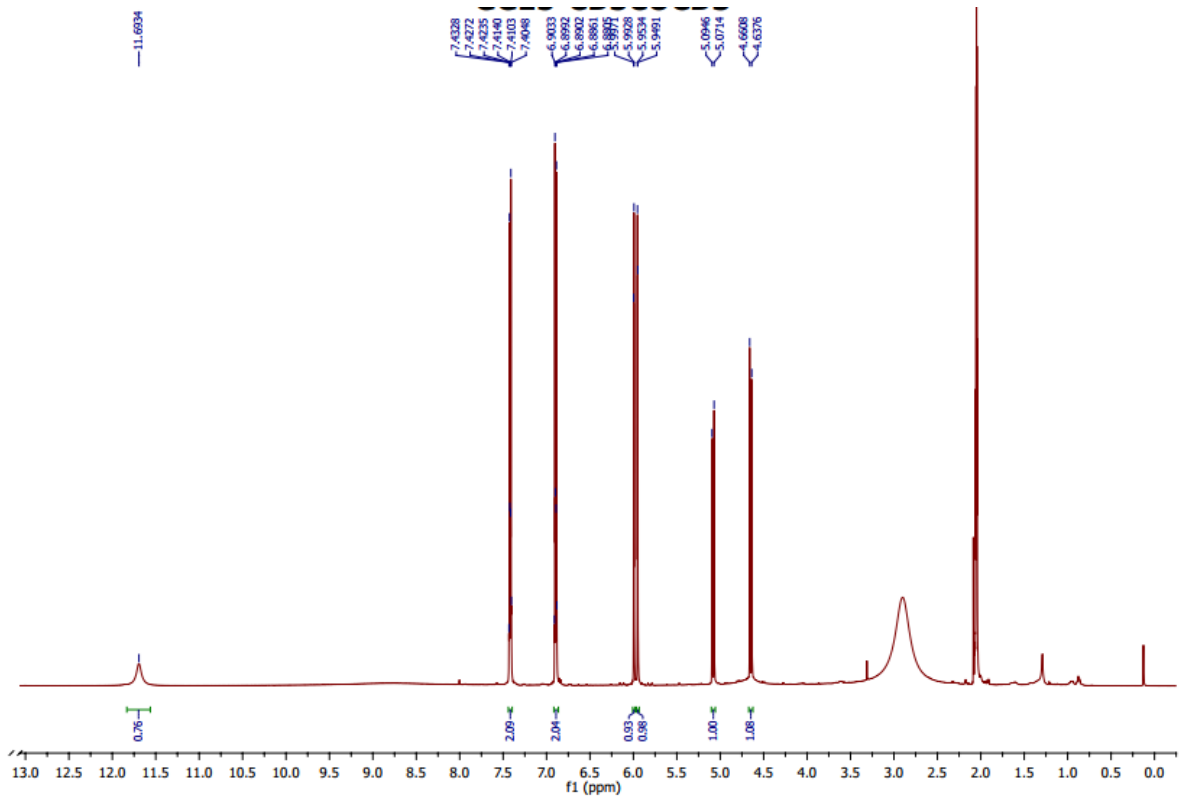


Figure S4. ^{1}H-NMR spectrum of the compound **2** (500 MHz – CD_3COCD_3)

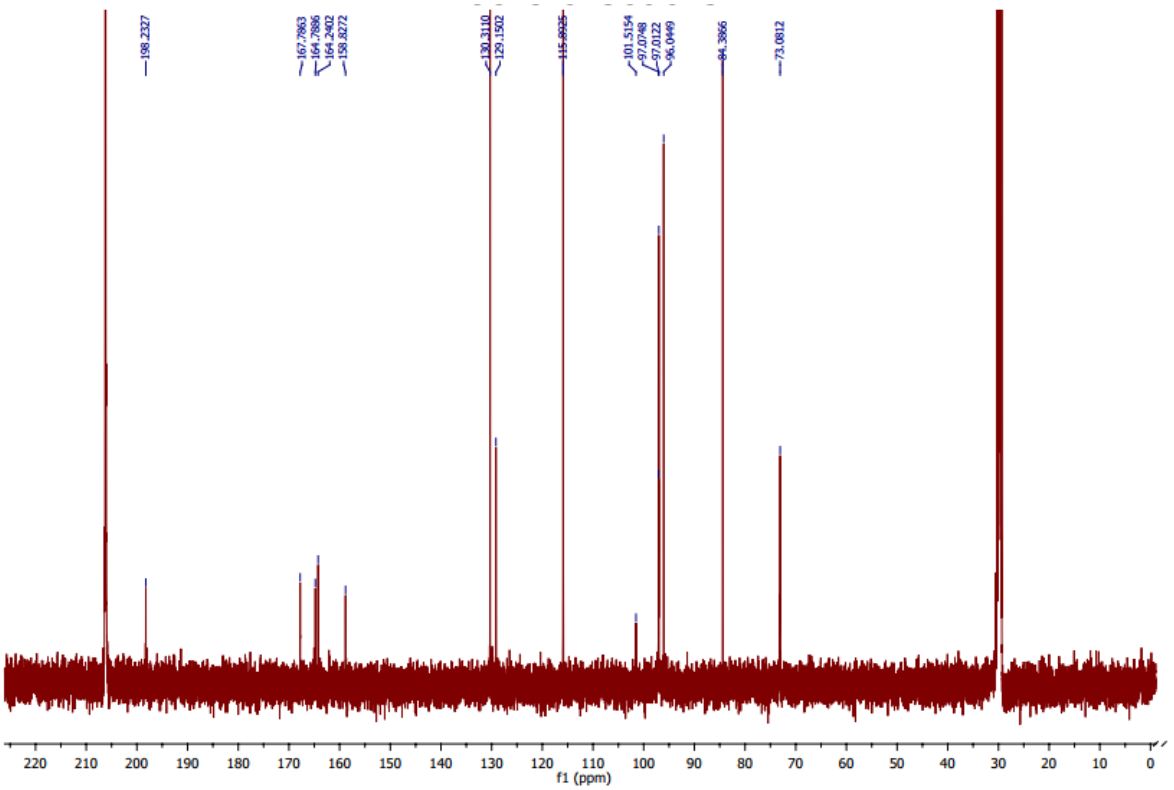


Figure S5. ^{13}C-NMR spectrum of the compound **2** (125 MHz – CD_3COCD_3)

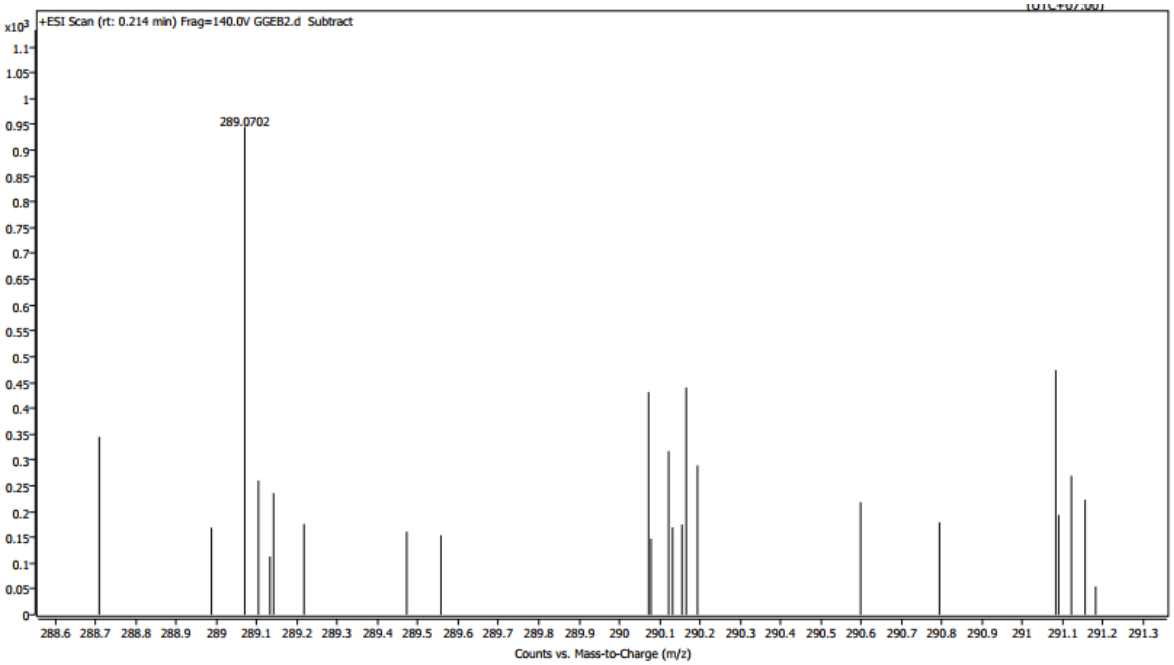


Figure S6. HR-ESI-MS of the compound **2**

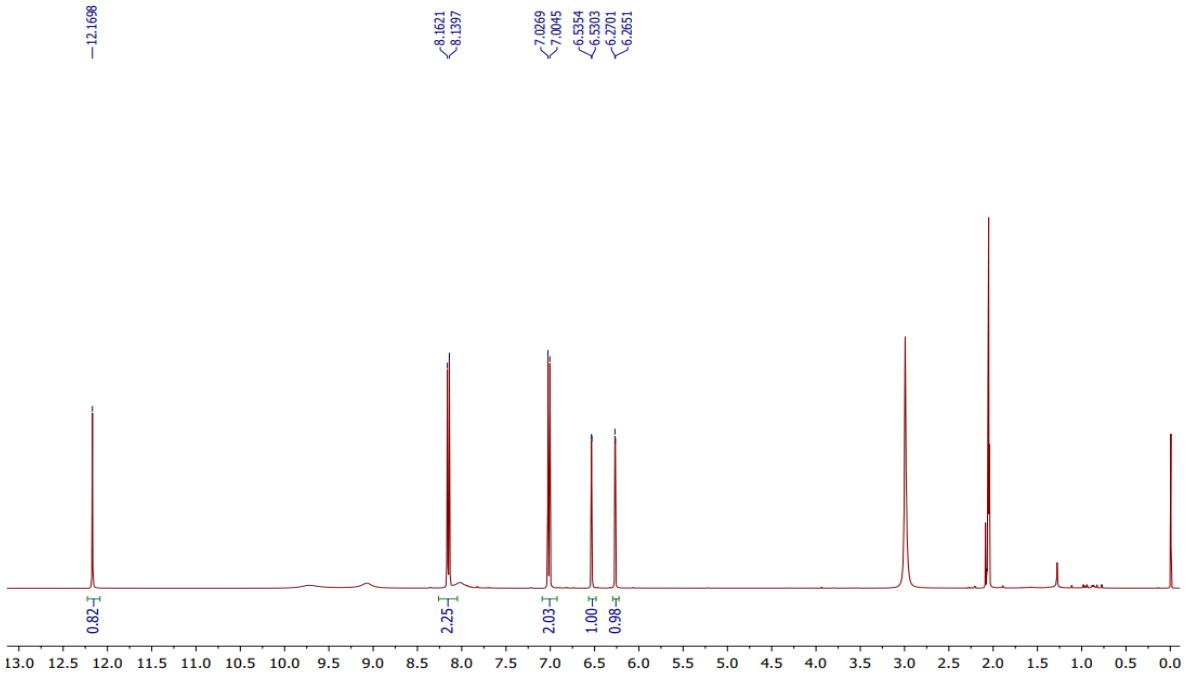


Figure S7. ^{1}H-NMR spectrum of the compound **3** (500 MHz – CD_3COCD_3)

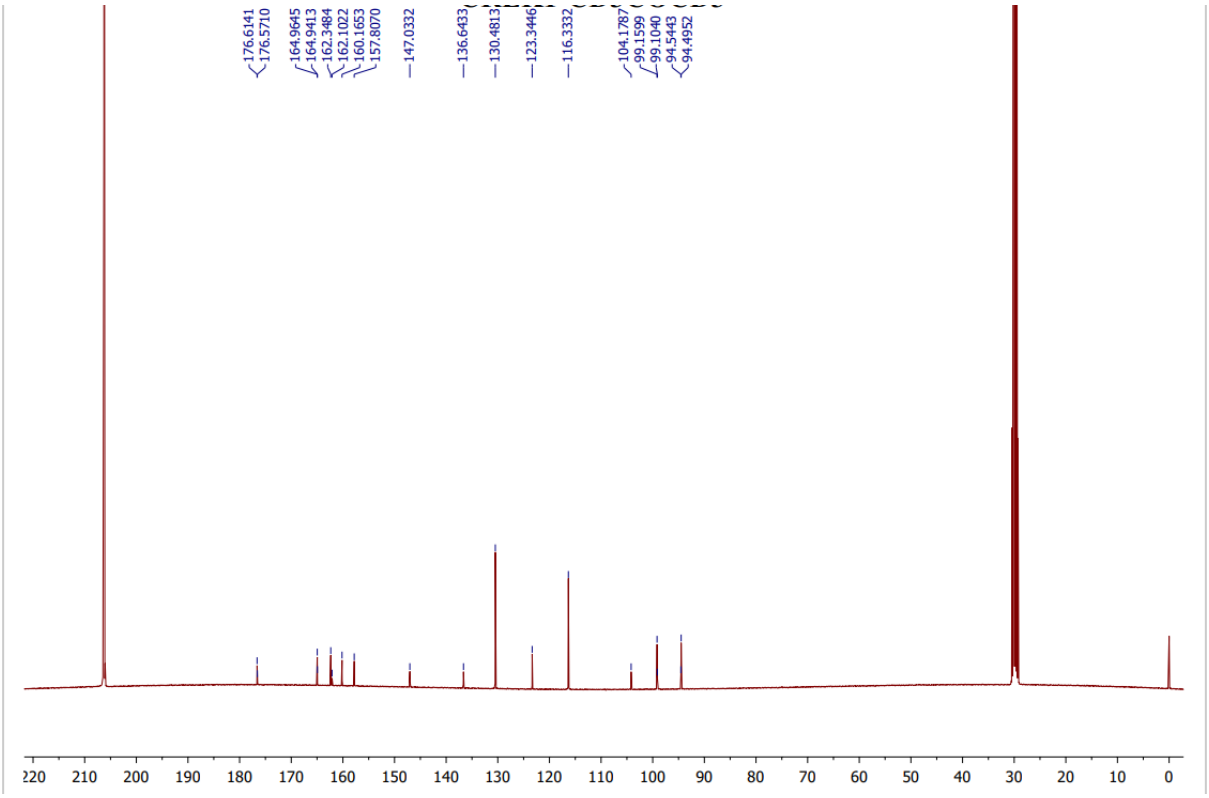


Figure S8. ^{13}C-NMR spectrum of the compound **3** (125 MHz – CD_3COCD_3)

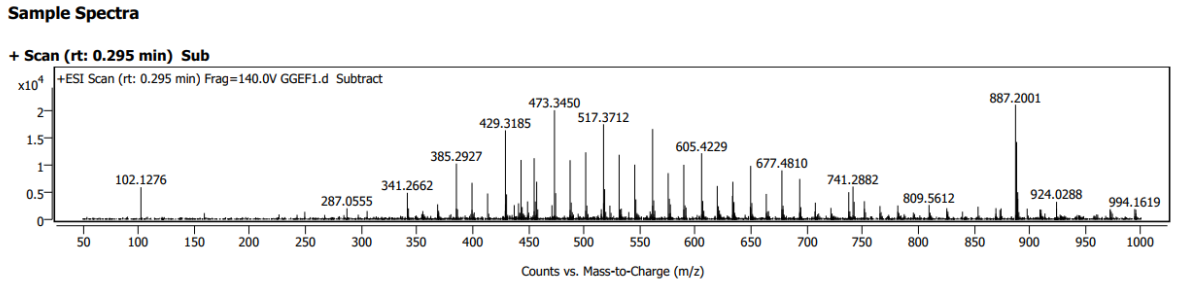


Figure S9. HR-ESI-MS of the compound **3**

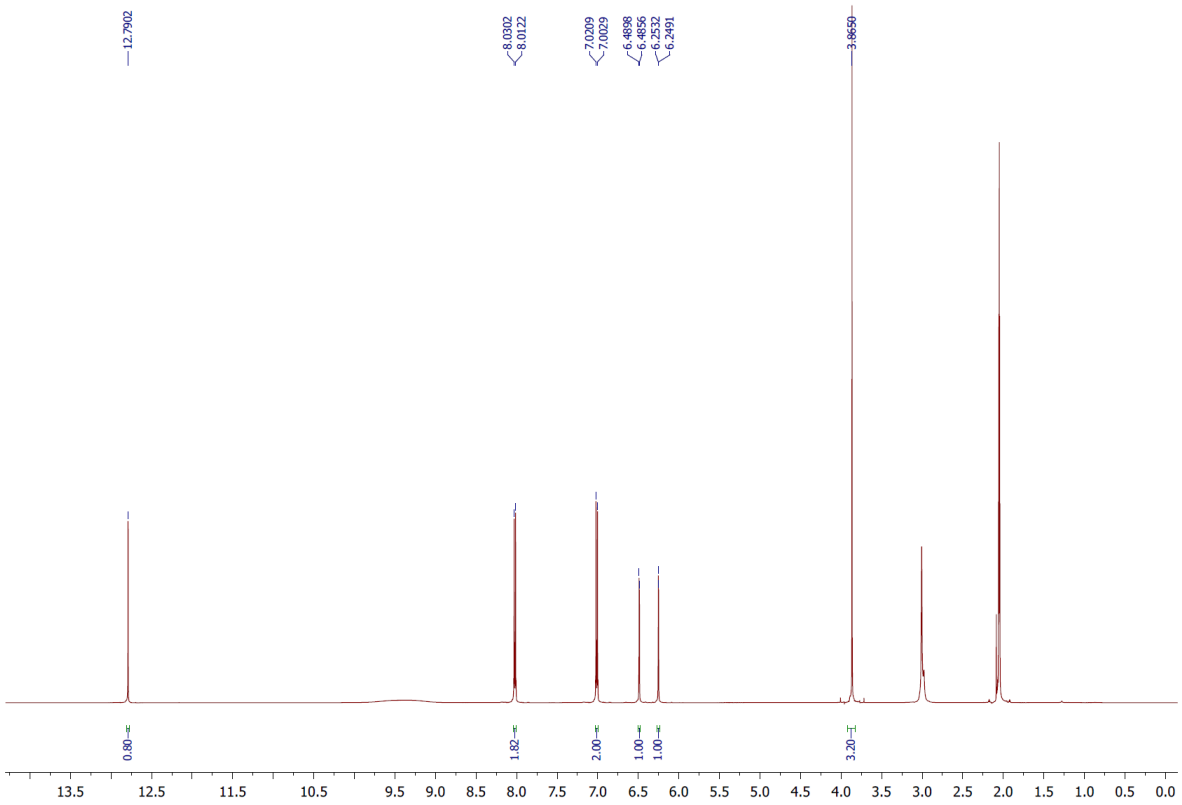


Figure S10. ^{1}H-NMR spectrum of the compound **4** (500 MHz – CD_3COCD_3)

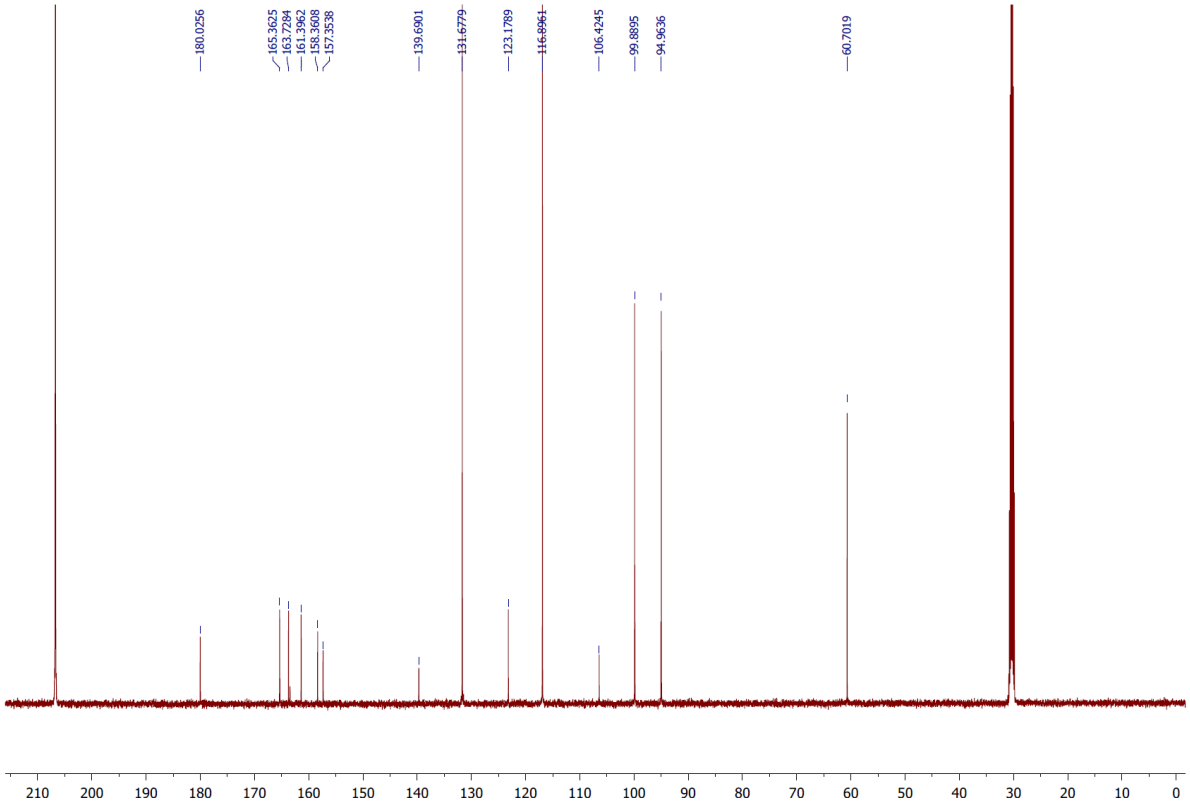


Figure S11. ^{13}C-NMR spectrum of the compound **4** (125 MHz – CD_3COCD_3)

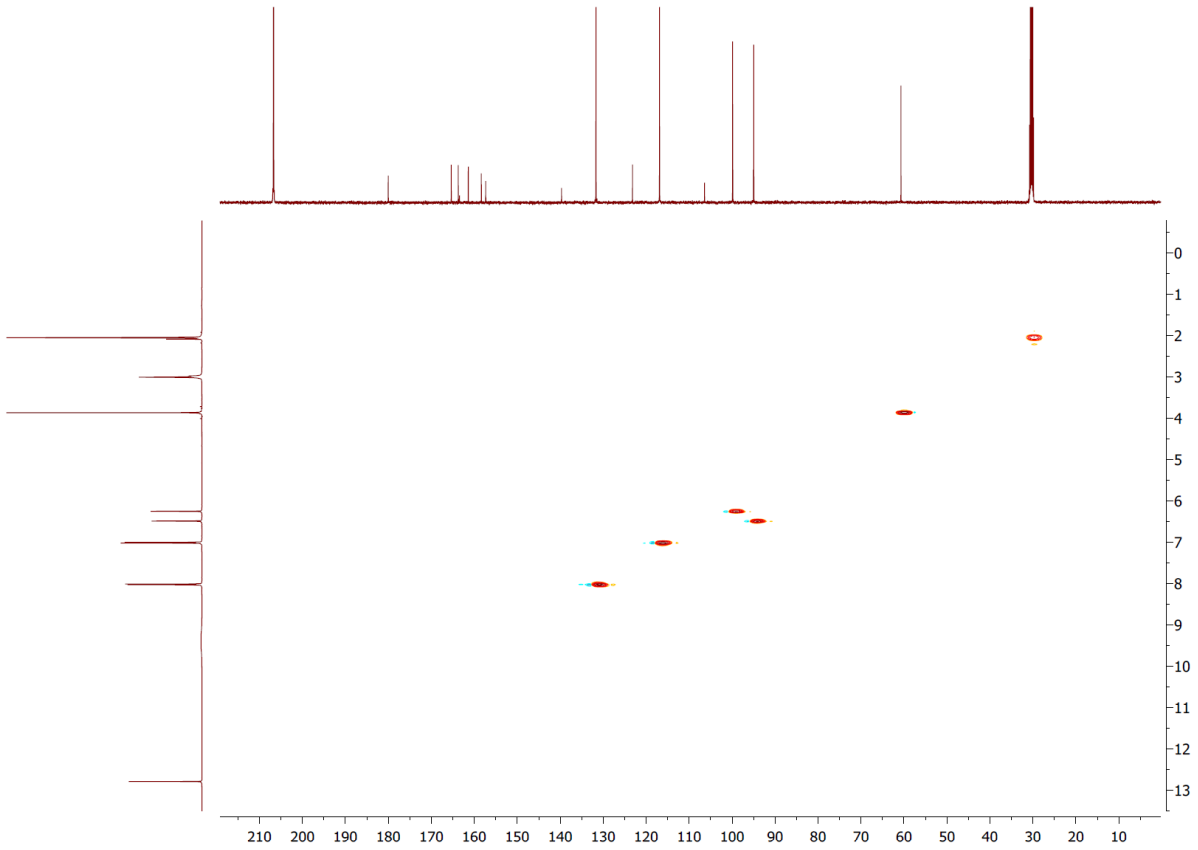


Figure S12. HSQC-NMR spectrum of the compound **4**

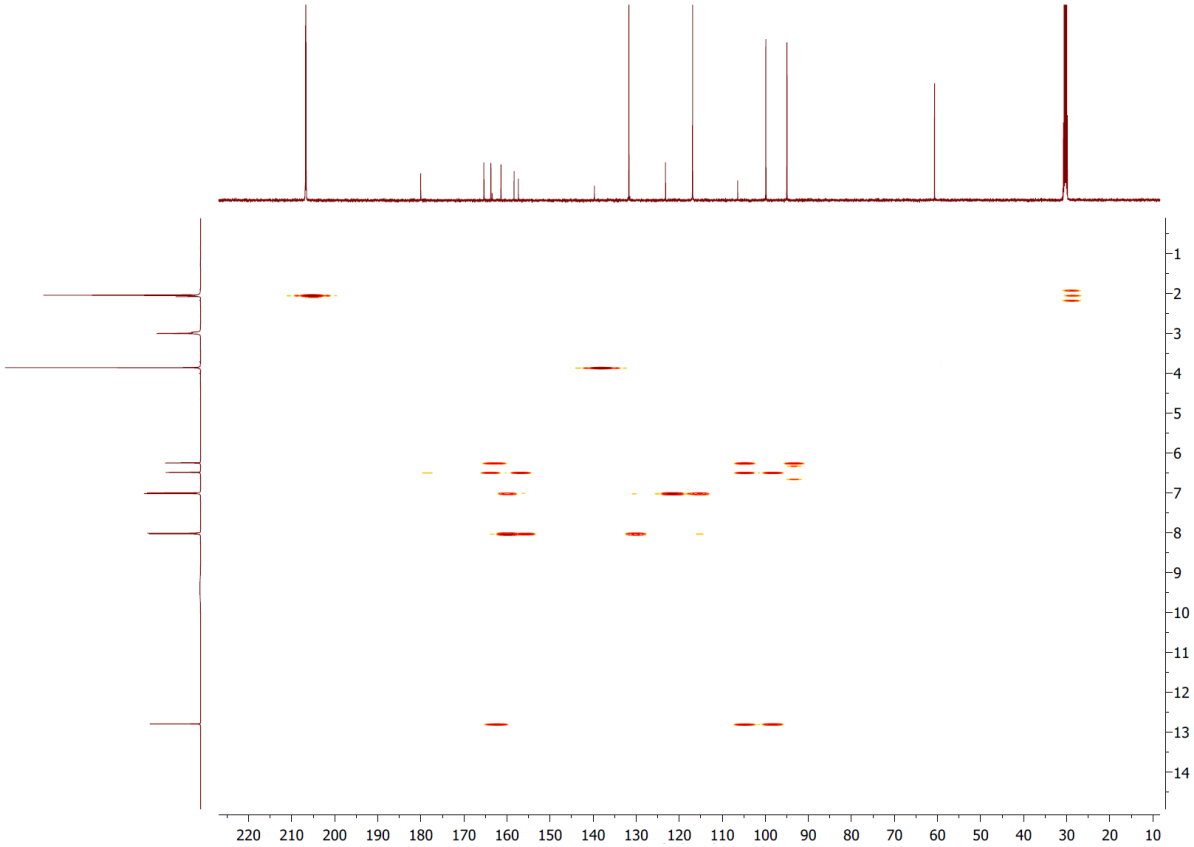
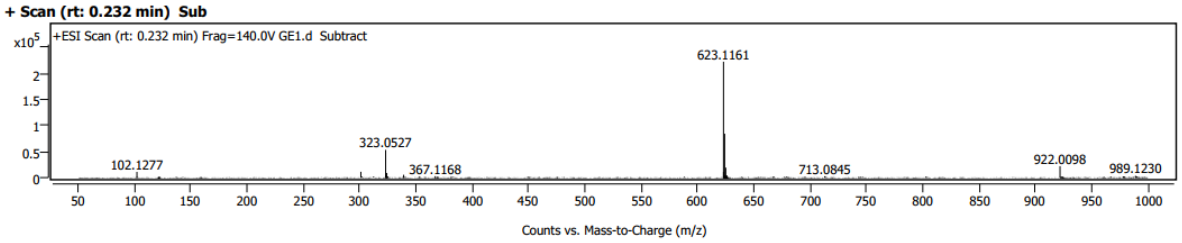


Figure S13. HMBC-NMR spectrum of the compound **4**



Spectrum Peaks

m/z	Z	Abund	Abund %	m/z (Calc)	Diff (ppm)	Ion Species	Formula	Ion Type
102.1277		10936	4.91					
301.0708		11188	5.03					
323.0527	1	53217	23.91					
323.0657		4634	2.08					
324.0559	1	8919	4.01					
339.0267		5387	2.42					
367.1168		2687	1.21					
623.1161	1	222577	100.00					
623.1648	1	10828	4.86					
624.1193	1	84274	37.86					
624.1752	1	3704	1.66					
625.1214	1	19131	8.60					
625.1381		3887	1.75					
626.1242	1	4230	1.90					
713.0845		2605	1.17					
922.0098		21968	9.87					
978.1316		2248	1.01					
989.1230		3379	1.52					

Figure S14. HR-ESI-MS of the compound **4**

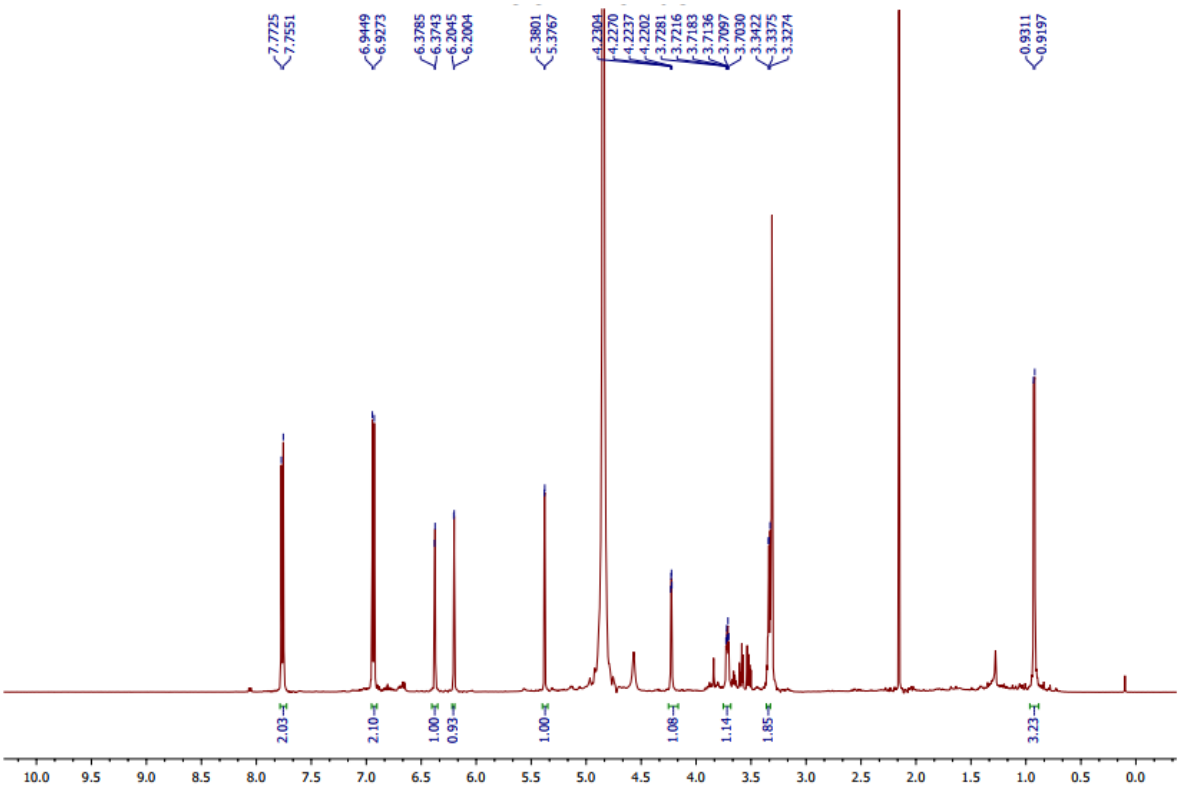


Figure S15. ^{1}H-NMR spectrum of the compound **5** (500 MHz – CD_3OD)

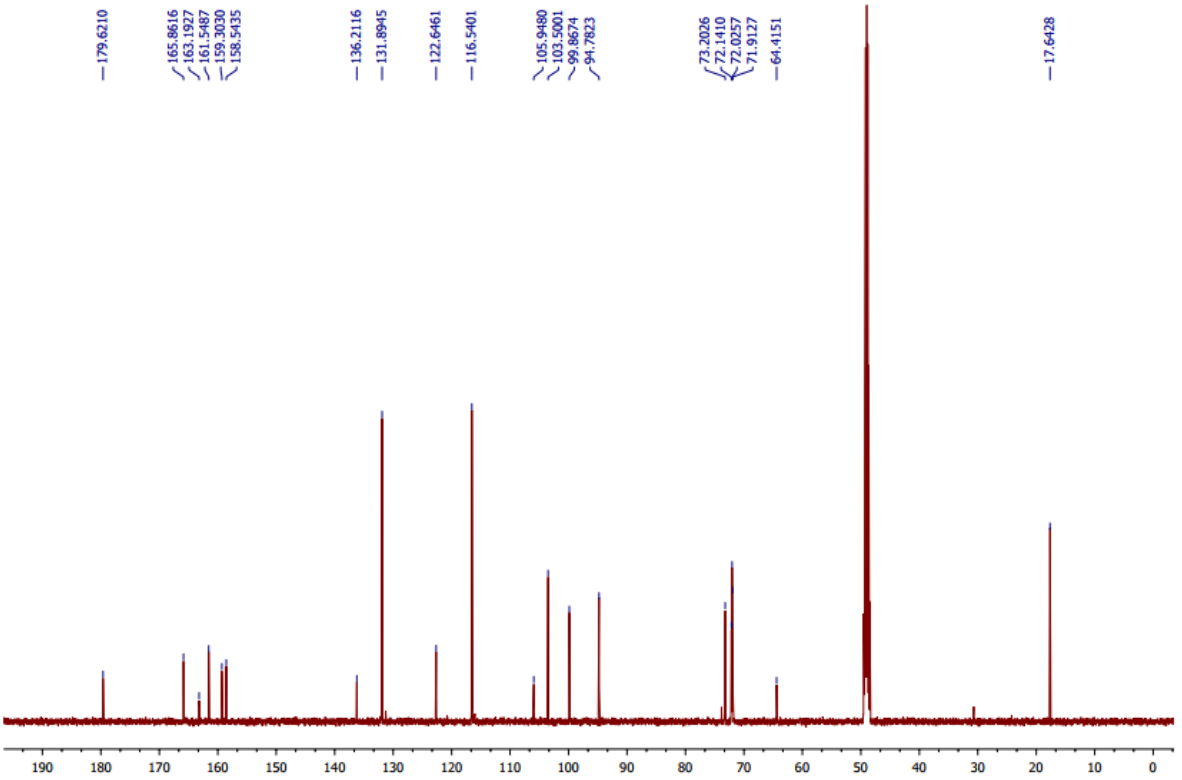


Figure S16. ^{13}C-NMR spectrum of the compound **5** (125 MHz – CD_3OD)

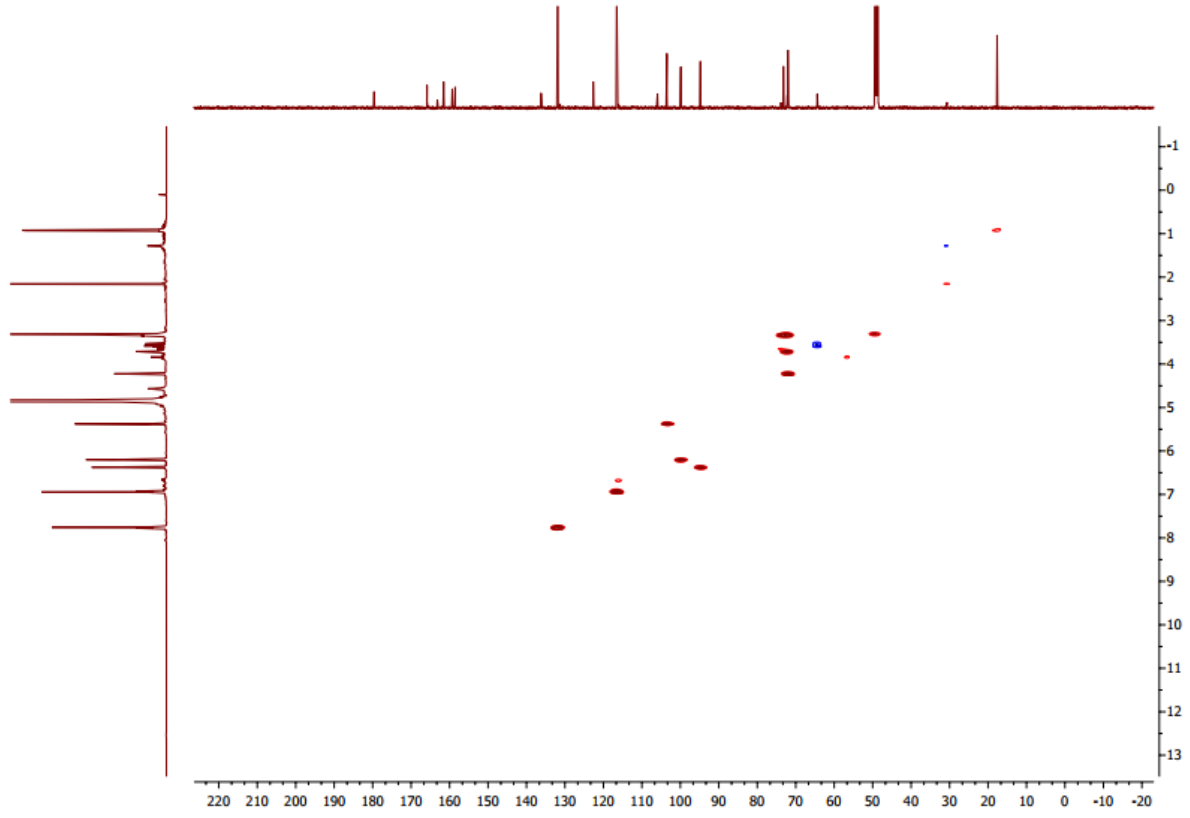


Figure S17. HSQC-NMR spectrum of the compound **5**

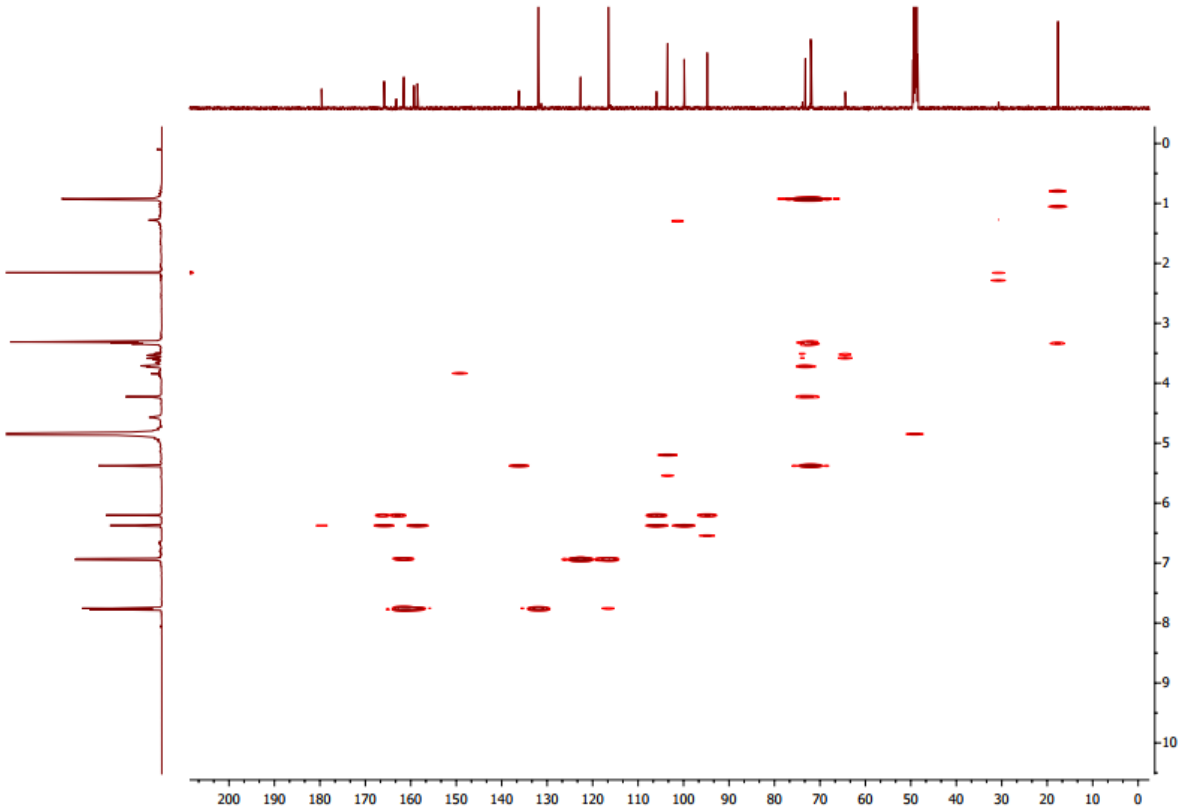


Figure S18. HMBC-NMR spectrum of the compound **5**

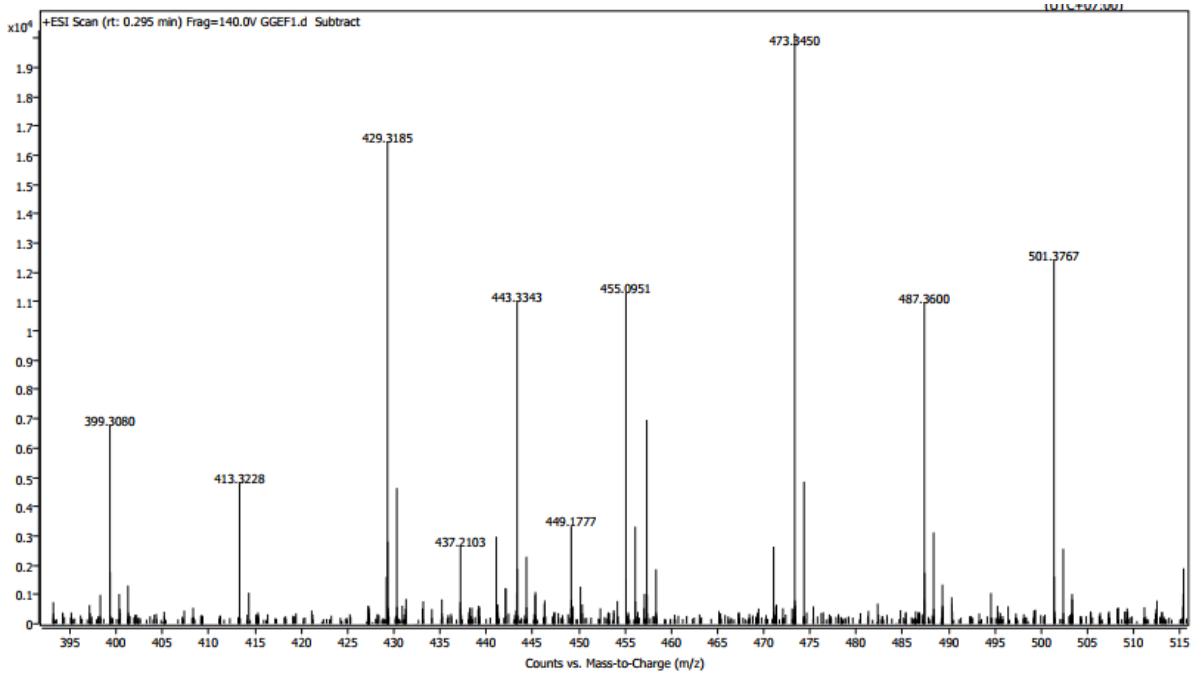


Figure S19. HR-ESI-MS of the compound **5**

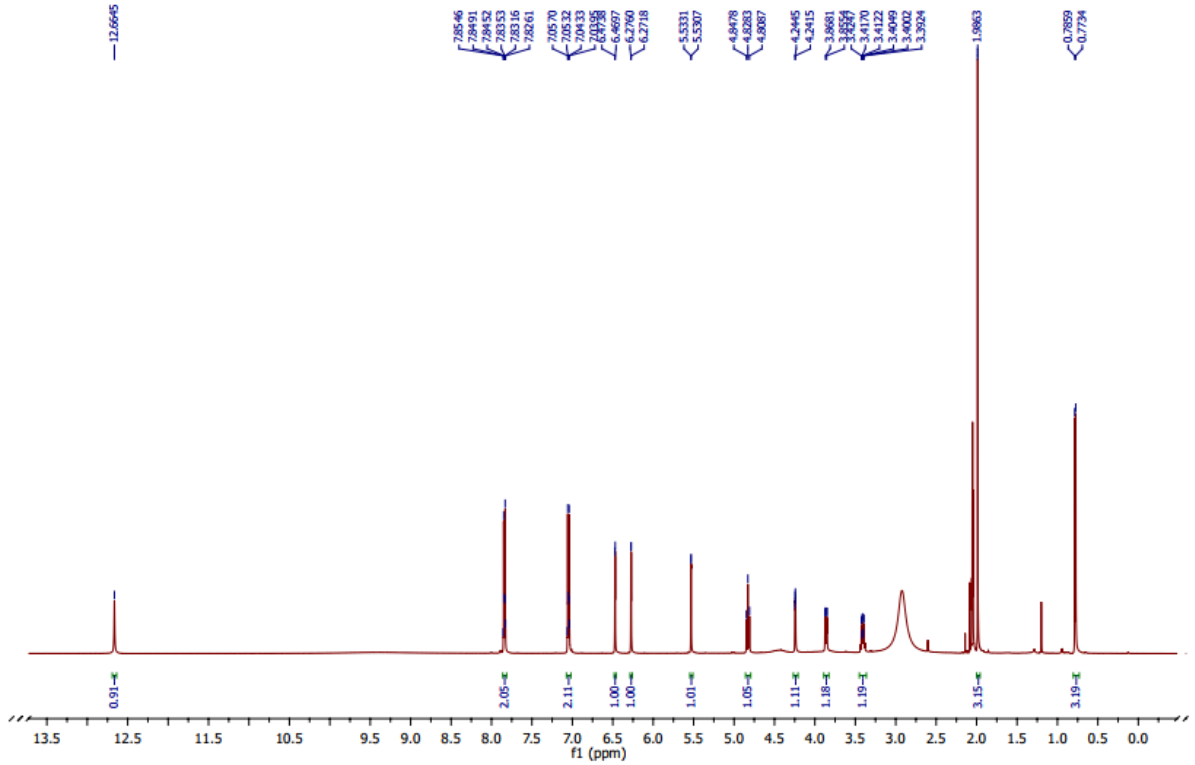


Figure S20. ^{1}H-NMR spectrum of the compound **6** (500 MHz – CD_3COCD_3)

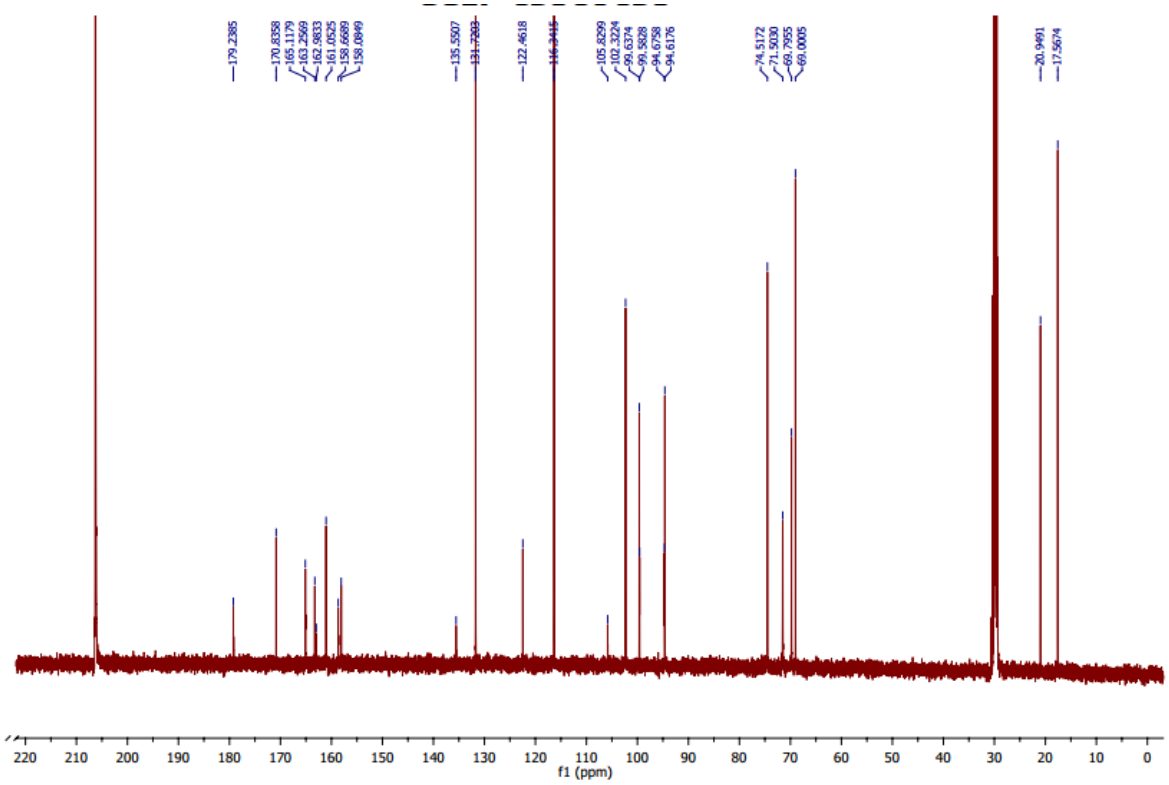


Figure S21. ^{13}C-NMR spectrum of the compound **6** (125 MHz – CD_3COCD_3)

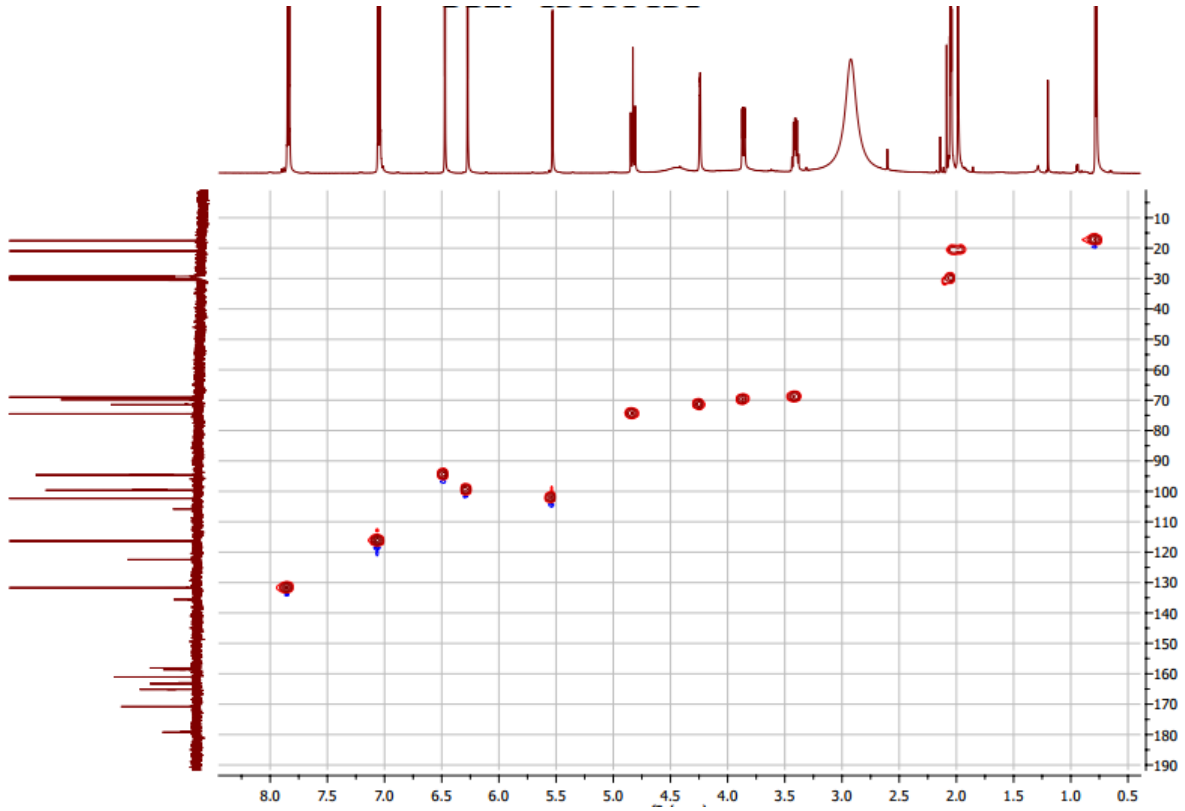


Figure S22. HSQC-NMR spectrum of the compound **6**

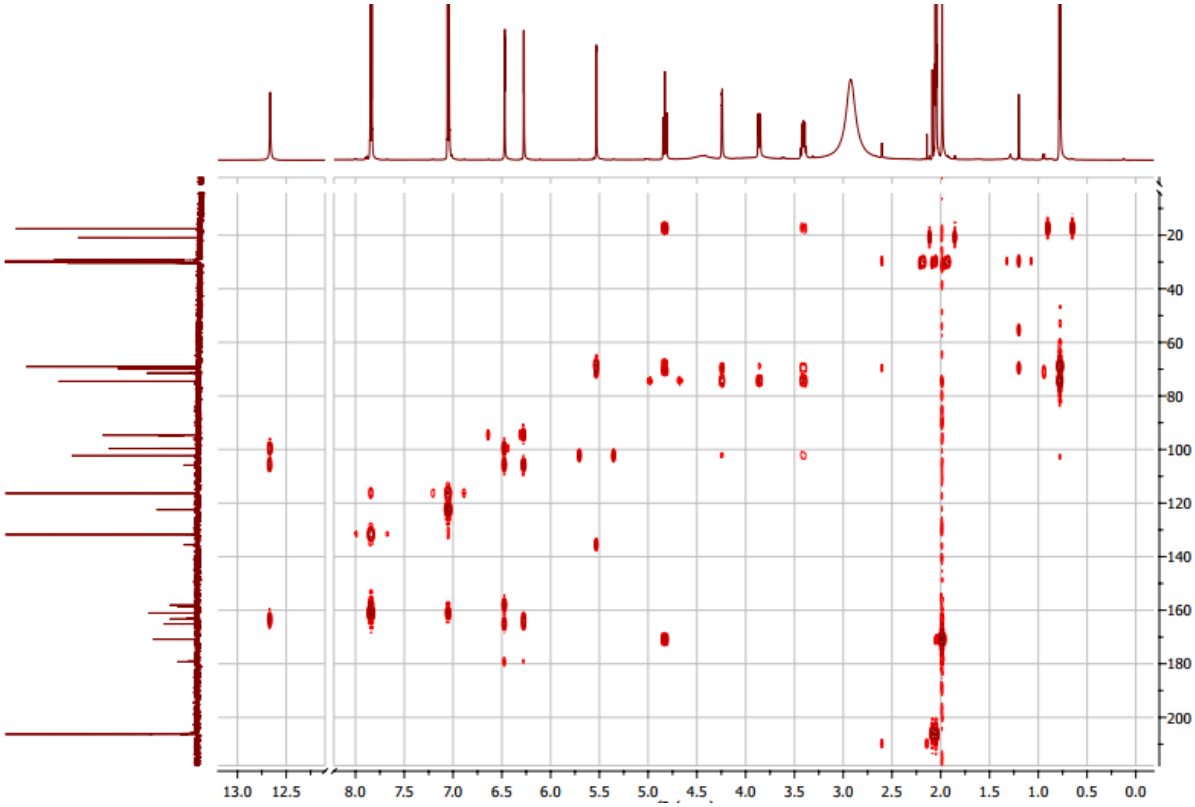


Figure S23. HMBC-NMR spectrum of the compound **6**

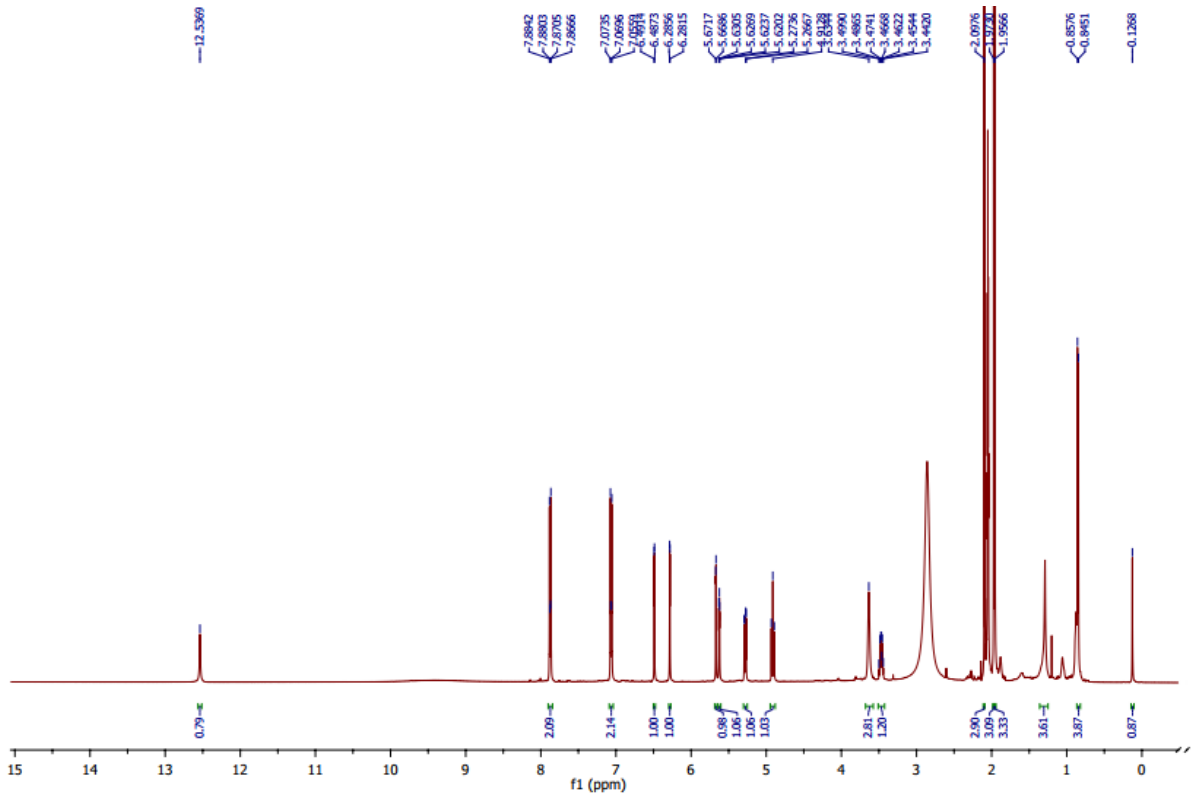


Figure S24. ^{1}H-NMR spectrum of the compound **7** (500 MHz – CD_3COCD_3)

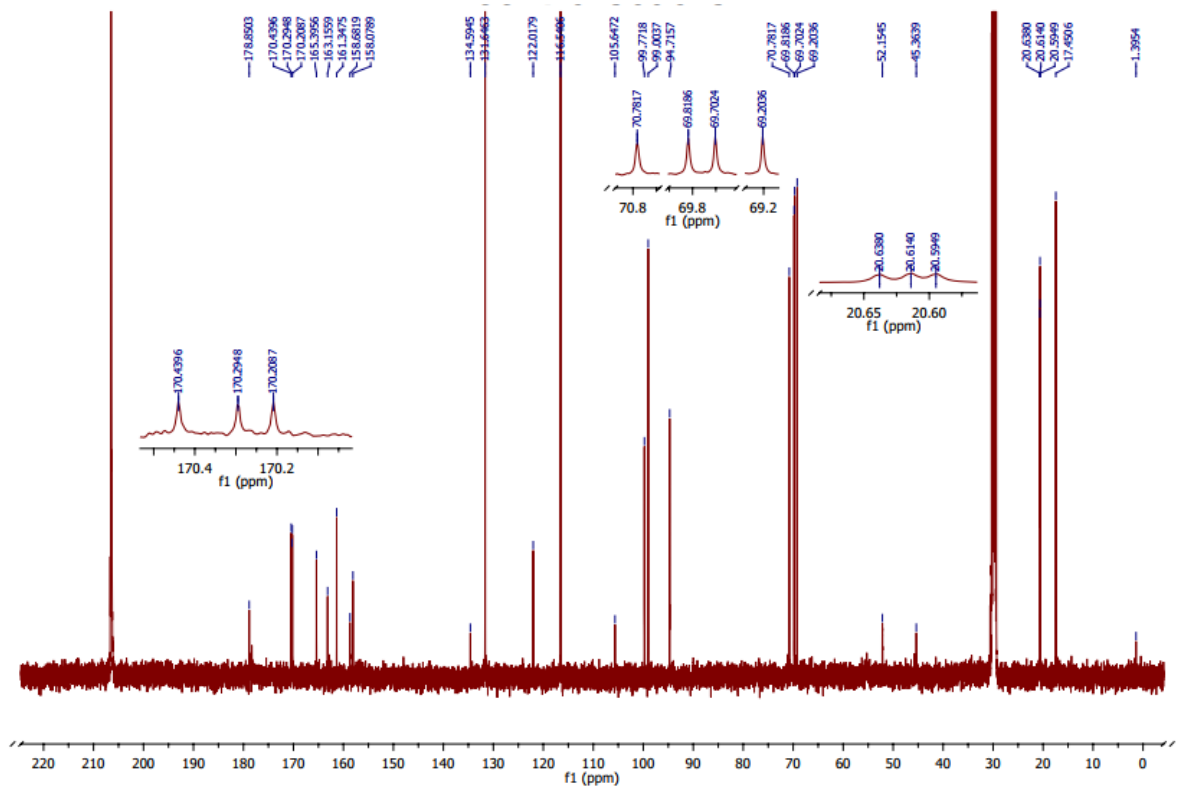


Figure S25. ^{13}C-NMR spectrum of the compound **7** (125 MHz – CD_3COCD_3)

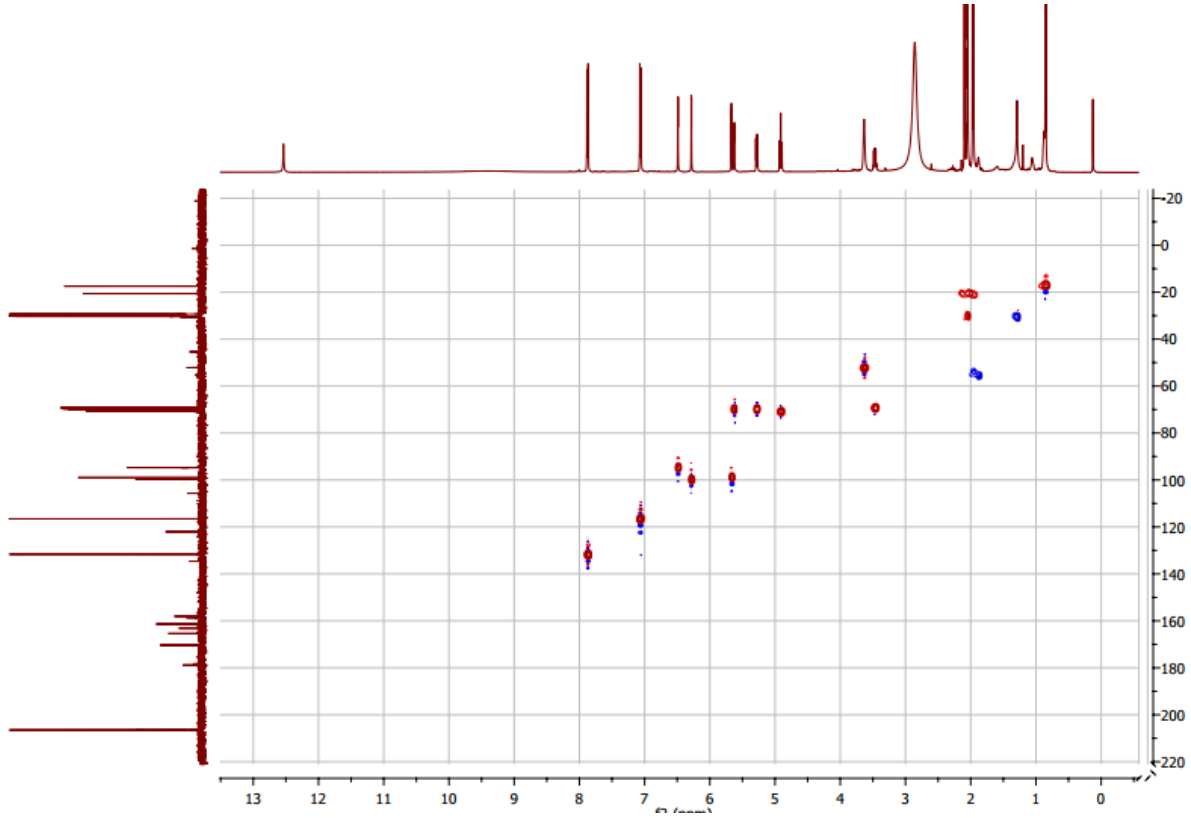


Figure S26. HSQC-NMR spectrum of the compound **7**

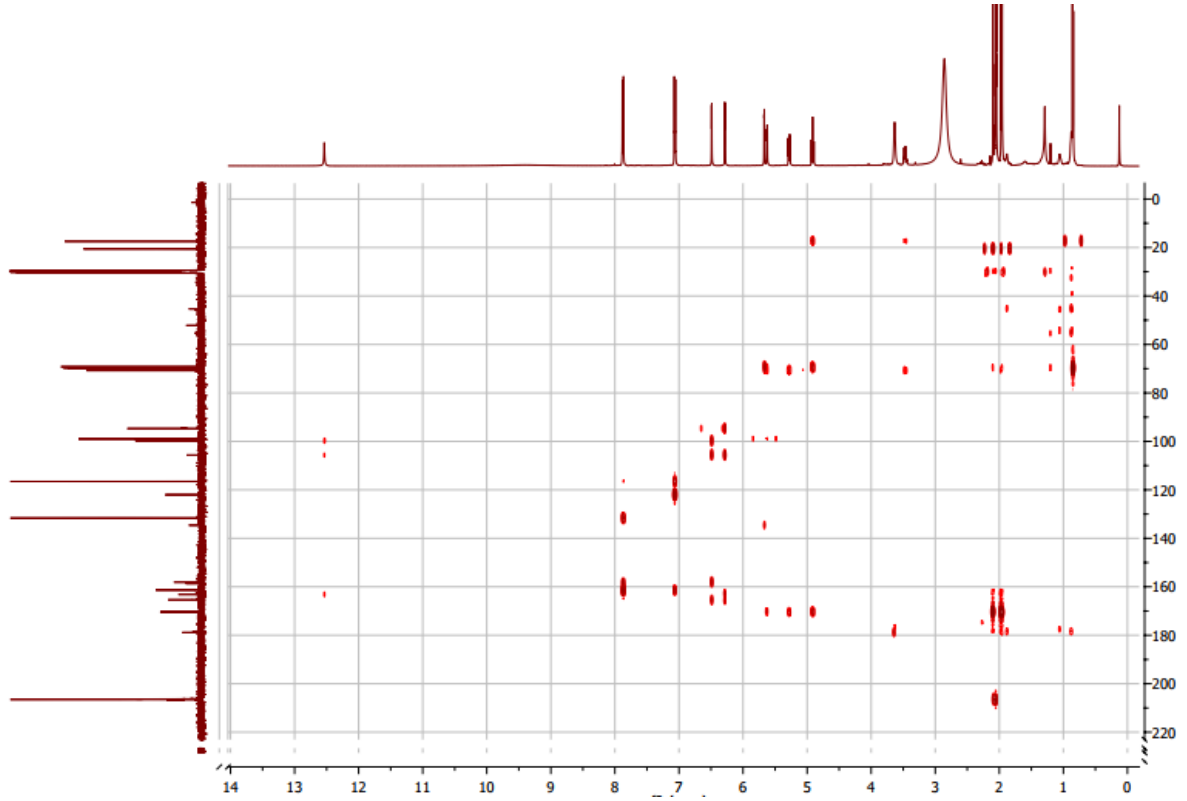


Figure S27. HMBC-NMR spectrum of the compound **7**

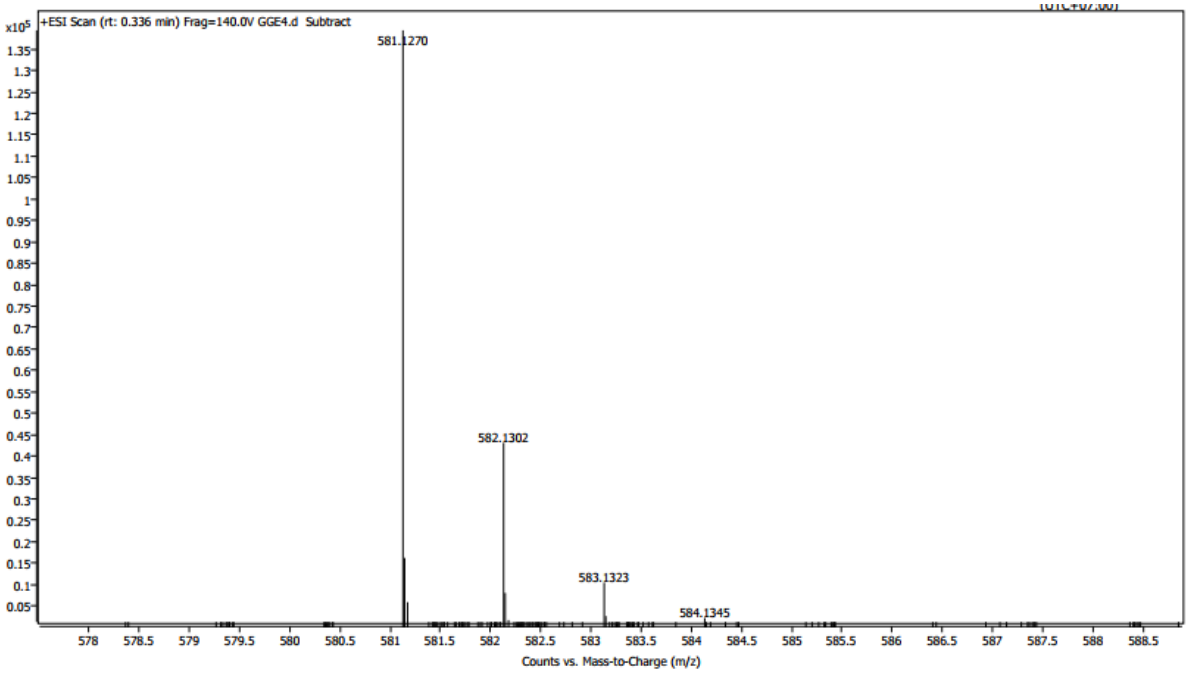


Figure S28. HR-ESI-MS of the compound **7**