

Supporting Information

Marine Terpenoid Diacylguanidines: Structure, Synthesis and Biological Evaluation of Naturally Occurring Actinofide and Synthetic Analogs

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S1 - ¹H NMR spectrum of actinofide (**1**) from *A. papillatus* in methanol-*d*₄ (400 MHz).

S2 - ¹³C NMR spectrum of actinofide (**1**) from *A. papillatus* in methanol-*d*₄ (600 MHz).

S3 - ¹H-¹H COSY spectrum of actinofide (**1**) from *A. papillatus* in methanol-*d*₄ (400 MHz).

S4 - HSQC spectrum of actinofide (**1**) from *A. papillatus* in methanol-*d*₄ (400 MHz).

S5 - HMBC spectrum of actinofide (**1**) from *A. papillatus* in methanol-*d*₄ (400 MHz, *J* = 10 Hz).

S6 - ¹H NMR spectrum of actinofide (**1**) (protonated form) from *A. papillatus* in CDCl₃ (400 MHz).

S7 - ¹H-¹H COSY spectrum of actinofide (**1**) (protonated form) from *A. papillatus* in CDCl₃ (400 MHz).

S8 - HSQC spectrum of actinofide (**1**) (protonated form) from *A. papillatus* in CDCl₃ (400 MHz).

S9 - HMBC spectrum of actinofide (**1**) (protonated form) from *A. papillatus* in CDCl₃ (400 MHz, *J* = 10 Hz).

S10 - HRESIMS spectrum of actinofide from *A. papillatus* (**1**).

S11 - ¹H NMR spectrum of synthetic actinofide (**1**) in CDCl₃ (400 MHz).

S12 - HRESIMS spectrum of synthetic actinofide (**1**).

S13 - ¹H NMR spectrum of farnesoyl-guanidine (**2**) in CDCl₃ (400 MHz).

S14 - HMBC spectrum of farnesoyl-guanidine (**2**) in CDCl₃ (400 MHz, *J* = 10 Hz).

S15 - HRESIMS spectrum of farnesoyl-guanidine (**2**).

S16 - ¹H NMR spectrum of geranoyl-guanidine (**3**) in CDCl₃ (400 MHz).

S17 - HMBC spectrum of geranoyl-guanidine (**3**) in CDCl₃ (400 MHz, *J* = 10 Hz).

S18 - HRESIMS spectrum of geranoyl-guanidine (**3**).

S19 - ¹H NMR spectrum of senecioid-guanidine (**4**) in CDCl₃ (400 MHz).

S20 - HRESIMS spectrum of senecioid-guanidine (**4**).

S21 - ¹H NMR spectrum of *N,N'*-difarnesoyl-guanidine (**5**) (protonated form) in CDCl₃ (400 MHz).

S22 - HRESIMS spectrum of *N,N'*-difarnesoyl-guanidine (**5**).

S23 - ¹H NMR spectrum of *N,N'*-digeranoyl-guanidine (**6**) (protonated form) in CDCl₃ (400 MHz).

S24 - HRESIMS spectrum of *N,N'*-digeranoyl-guanidine (**6**).

S25 - ¹H NMR spectrum of *N,N'*-disenecioid-guanidine (**7**) (protonated form) in CDCl₃ (400 MHz).

S26 - HRESIMS spectrum of *N,N'*-disenecioid-guanidine (**7**).

S27 - ¹H NMR spectrum of *N*-geranoyl-*N'*-senecioid-guanidine (**8**) (protonated form) in CDCl₃ (400 MHz).

S28 - HSQC spectrum of *N*-geranoyl-*N'*-senecioid-guanidine (**8**) (protonated form) in CDCl₃ (400 MHz).

S29 - HMBC spectrum of *N*-geranoyl-*N'*-senecioid-guanidine (**8**) (protonated form) in CDCl₃ (400 MHz, *J* = 10 Hz).

S30 - HRESIMS spectrum of *N*-geranoyl-*N'*-senecioid-guanidine (**8**).

S31 - ¹H NMR spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**) (protonated form) in CDCl₃ (400 MHz).

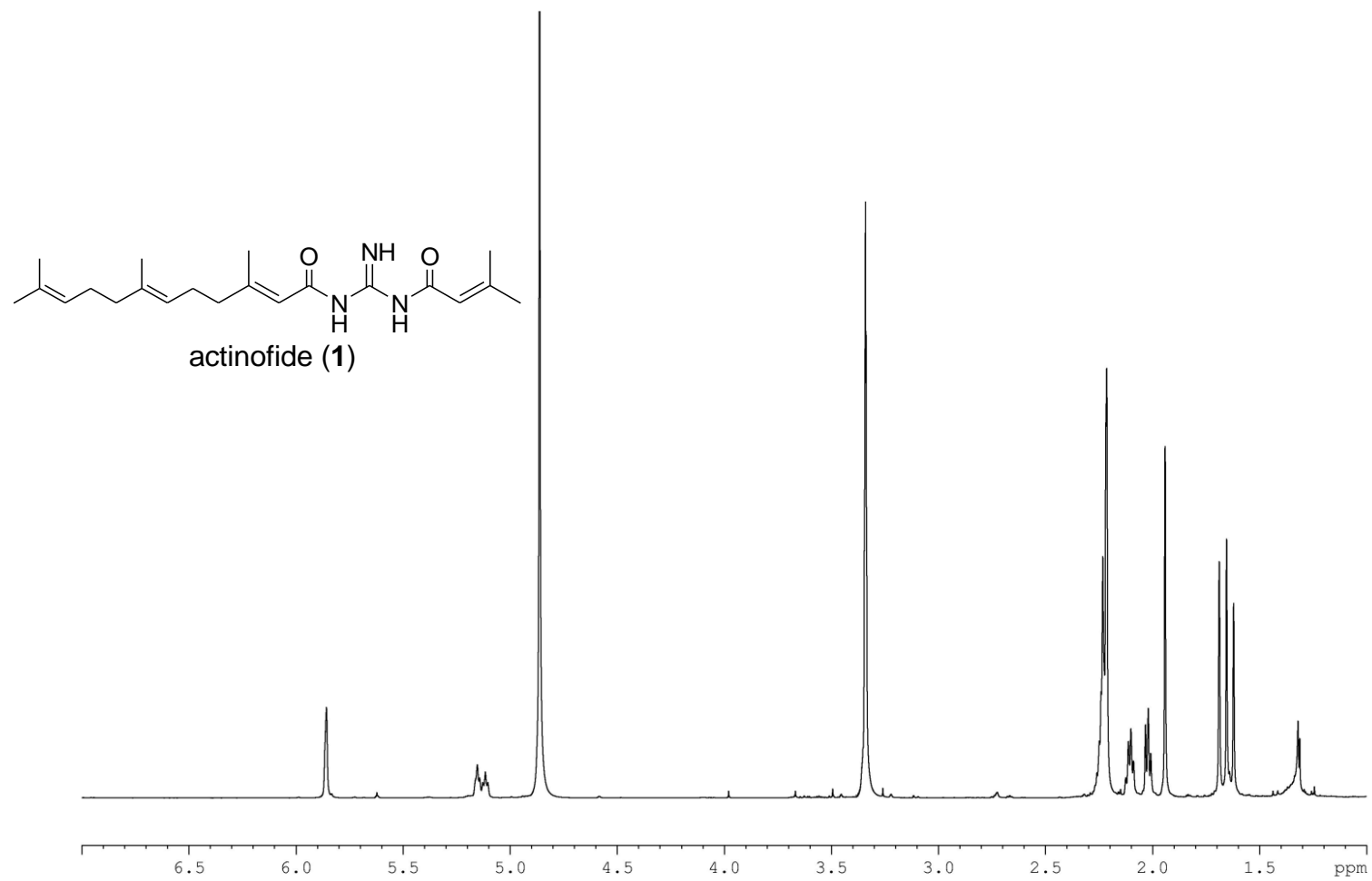
S32 - HSQC spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**) (protonated form) in CDCl₃ (400 MHz).

S33 - HMBC spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**) (protonated form) in CDCl₃ (400 MHz, *J* = 10 Hz).

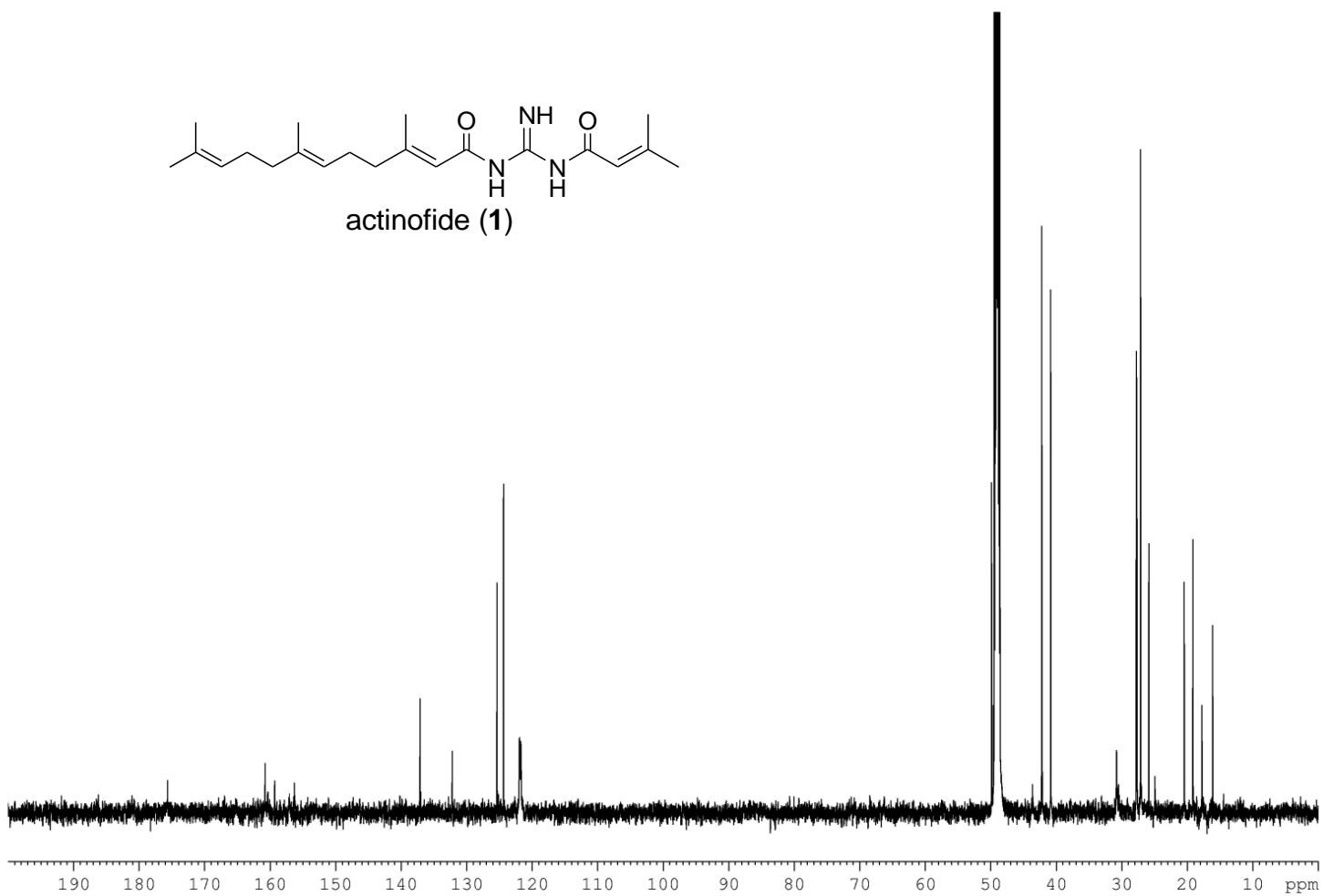
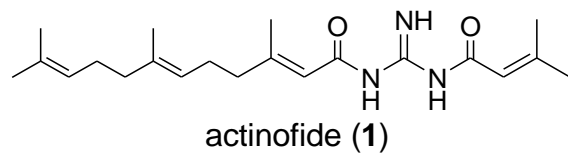
S34 - HRESIMS spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**).

S35 - ¹H NMR spectrum of dotofide (**10**) from *D. pinnatifida* in CDCl₃ (400 MHz).

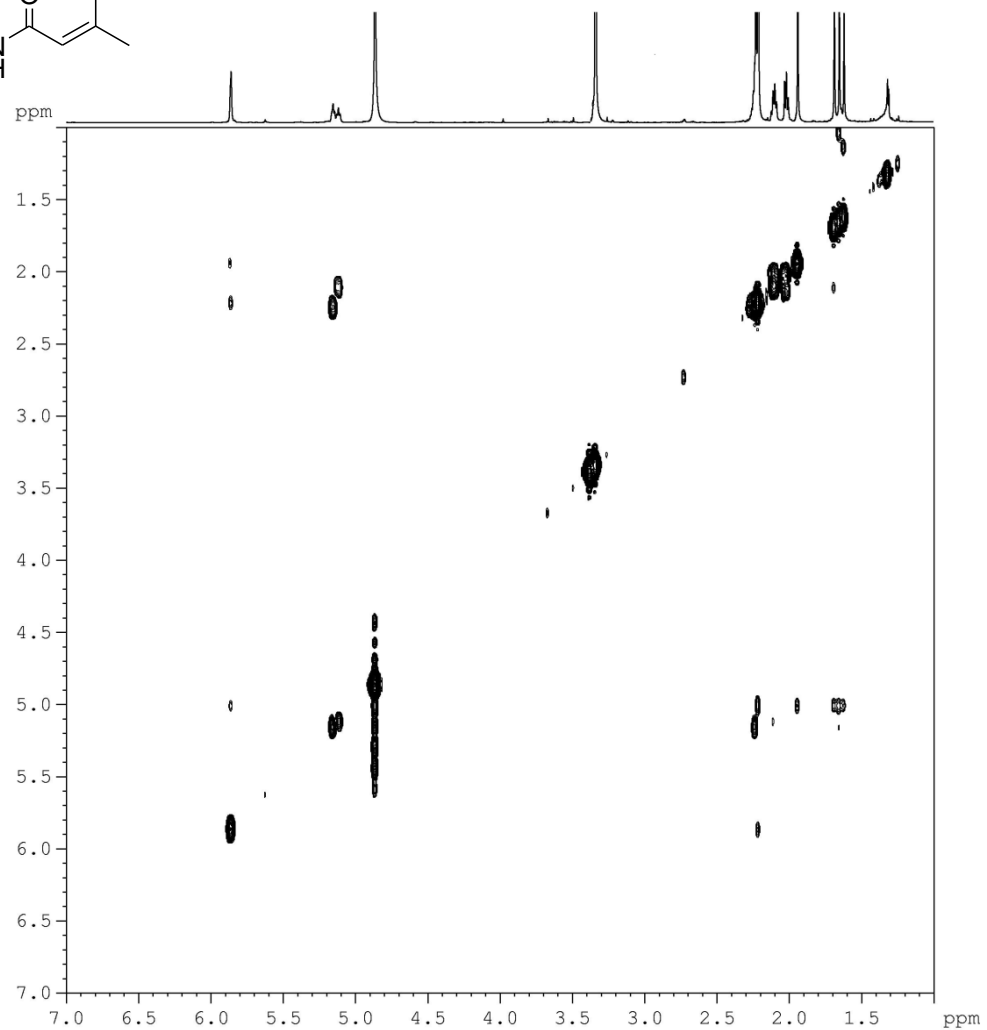
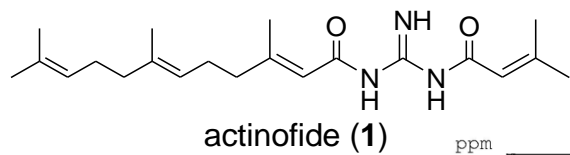
S36 - HRESIMS spectrum of dotofide (**10**) from *D. pinnatifida*.



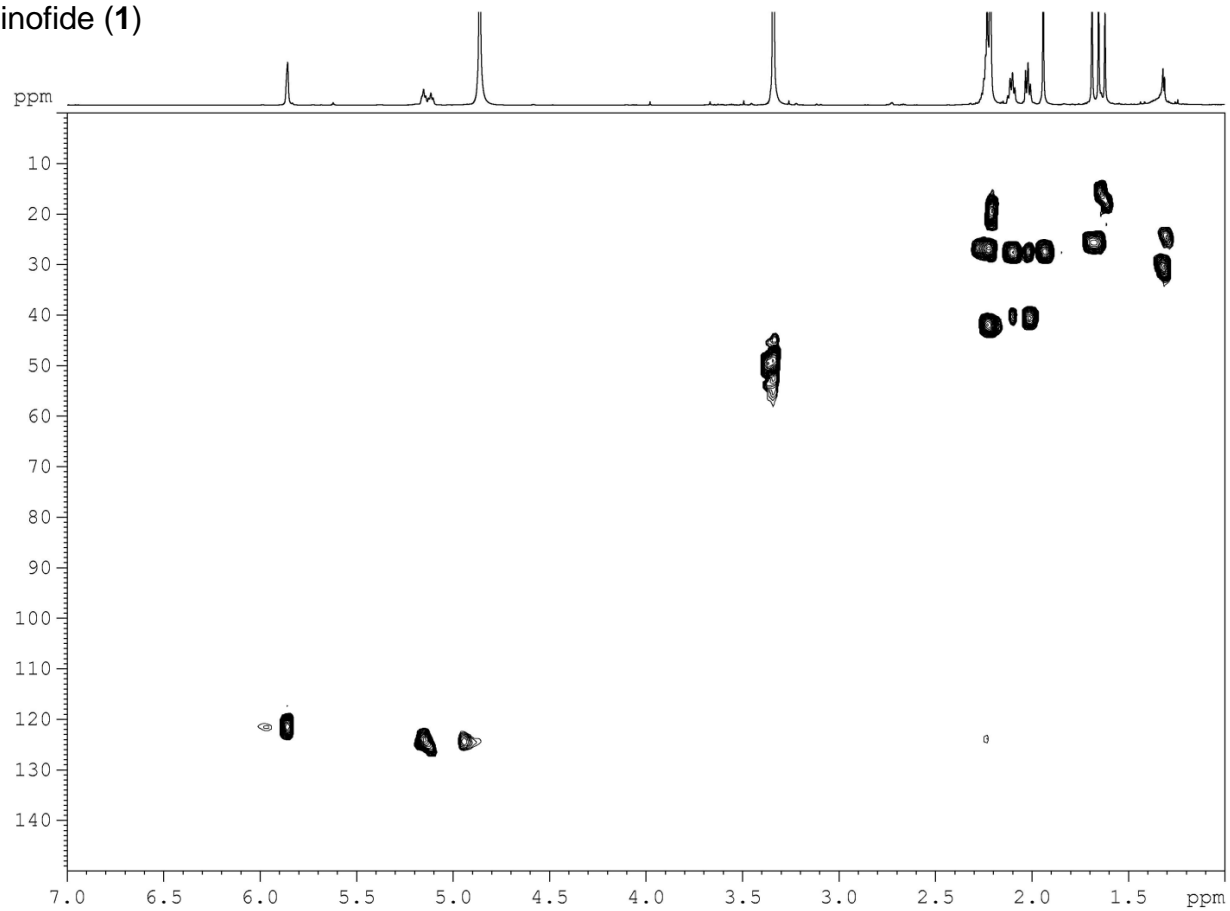
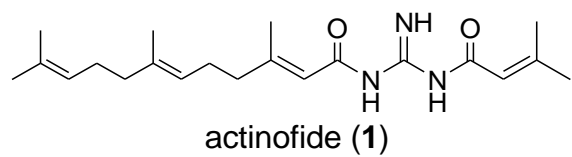
^1H NMR spectrum of actinofide from *A. papillatus* (1) (methanol- d_4 , 400 MHz)



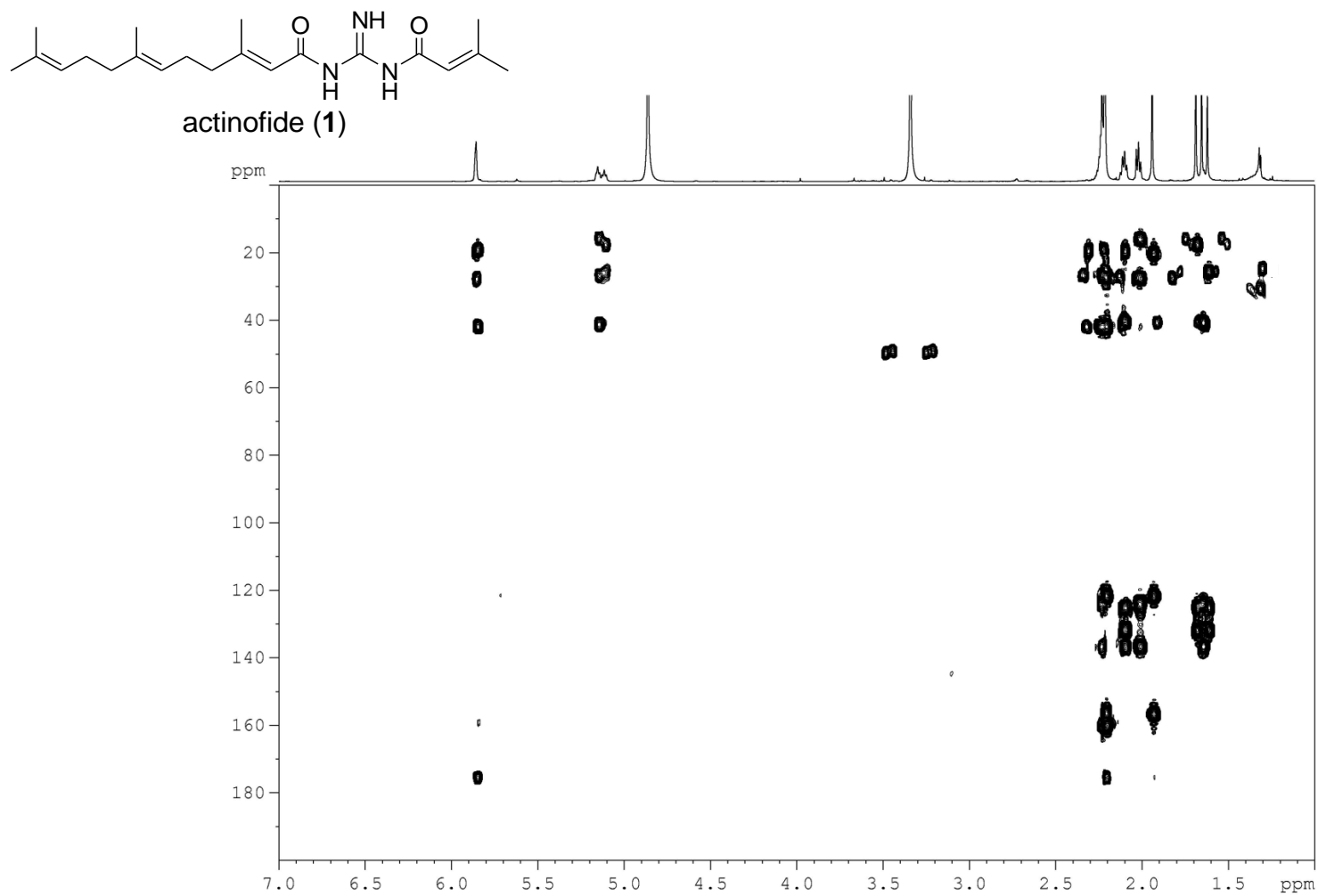
¹³C NMR spectrum of actinofide (**1**) from *A. papillatus* (methanol-*d*₄, 600 MHz)



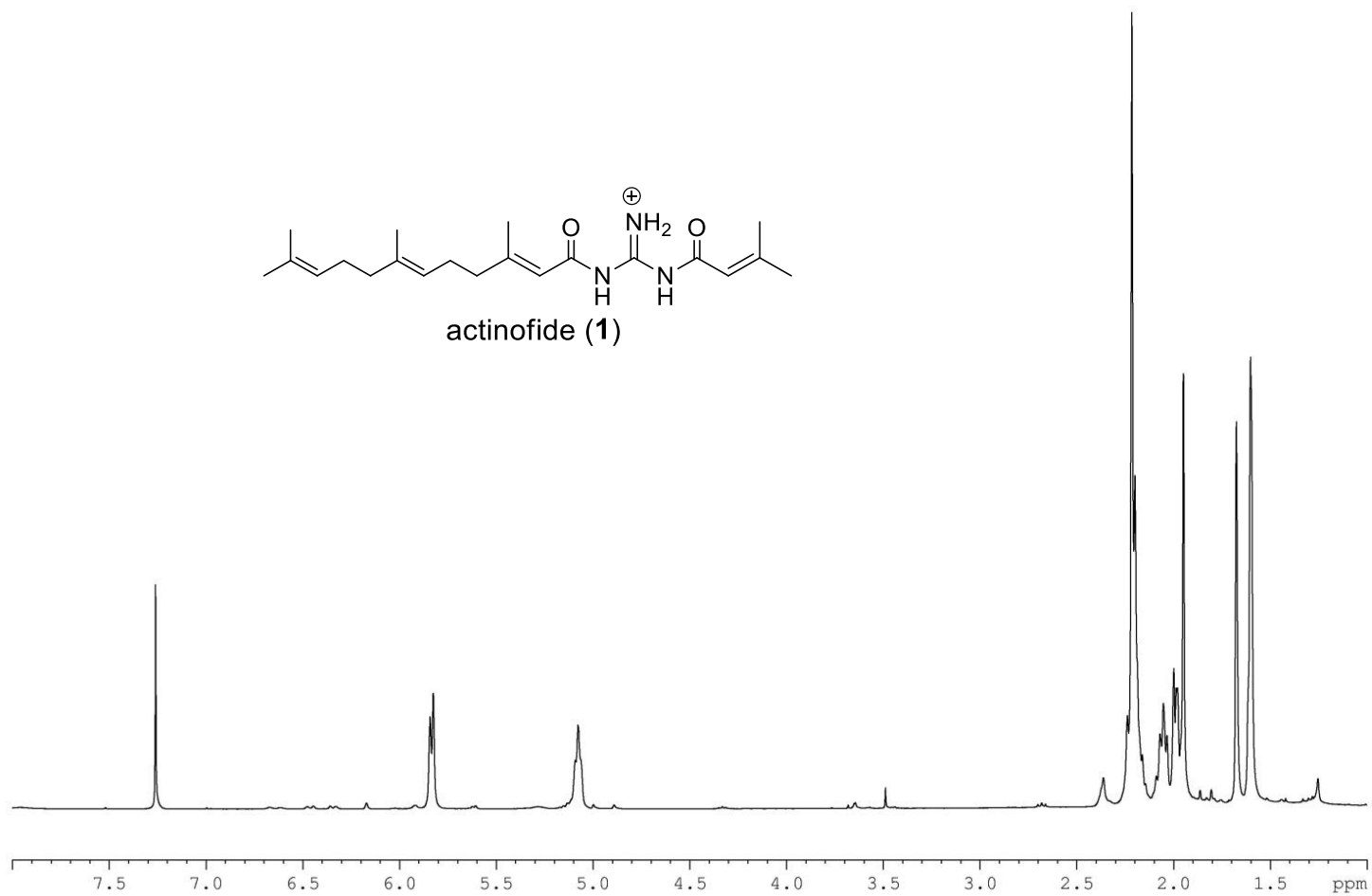
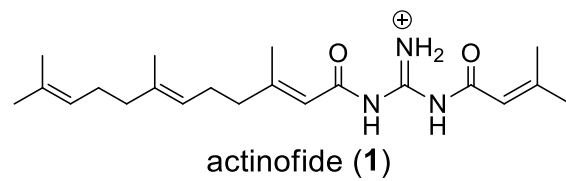
^1H - ^1H COSY spectrum of actinofide (1) from *A. papillatus* (methanol- d_4 , 400 MHz)



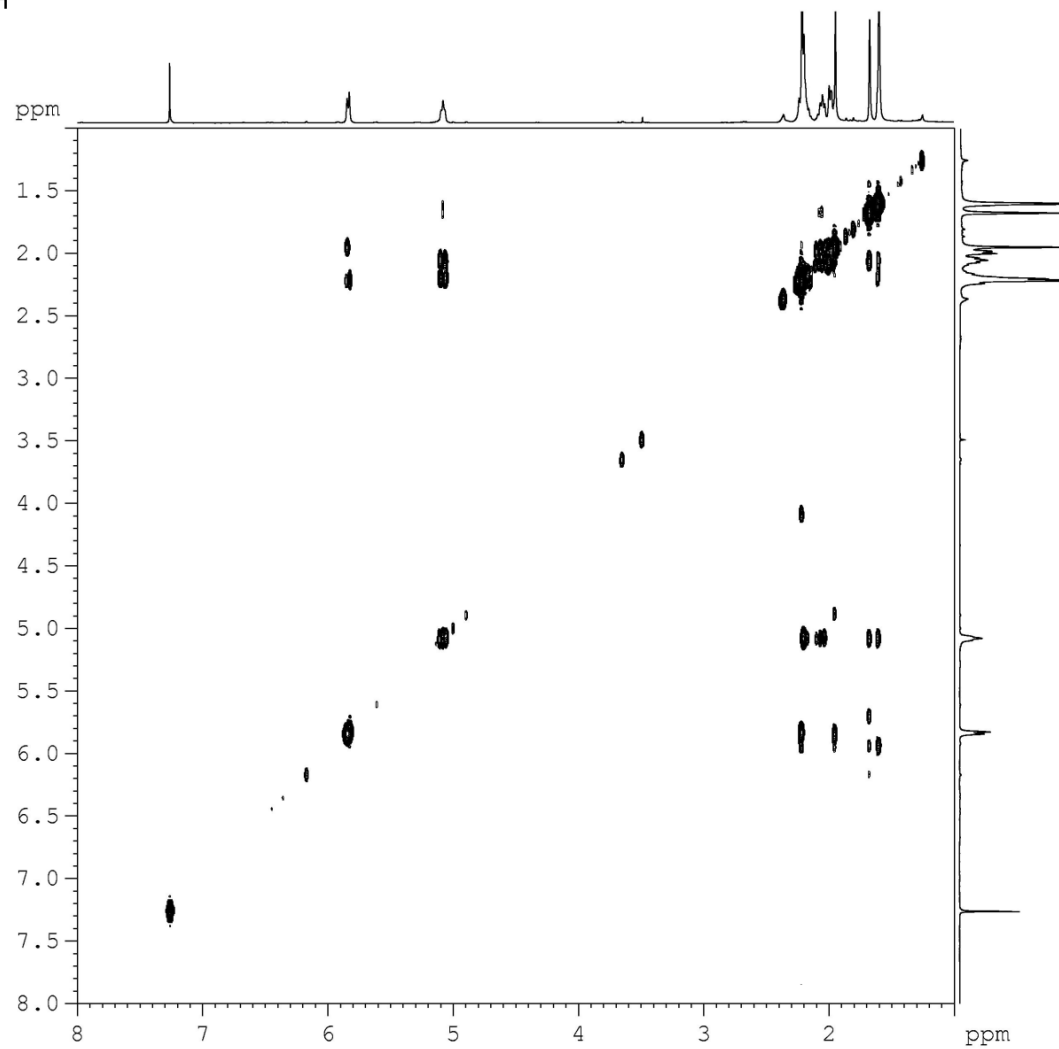
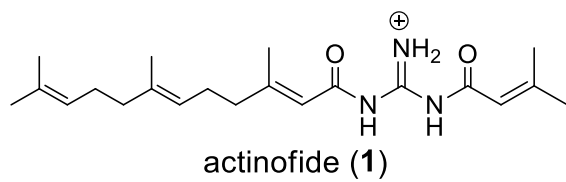
HSQC spectrum of actinofide (1) from *A. papillatus* (methanol-*d*₄, 400 MHz)



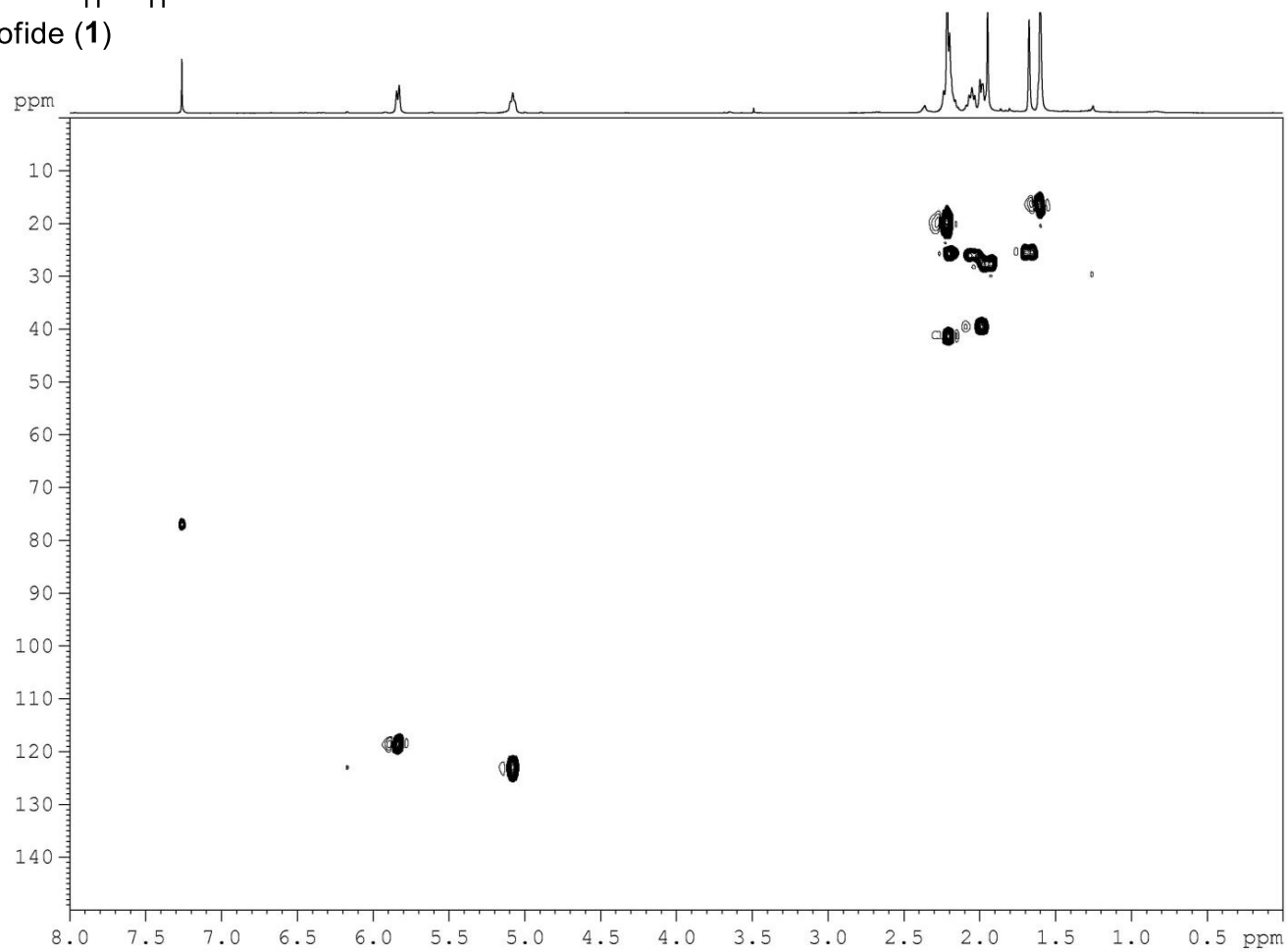
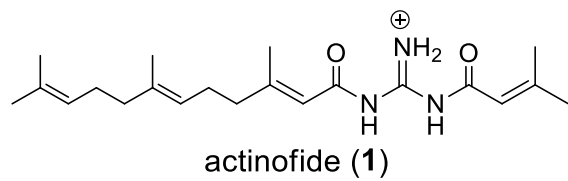
HMBC spectrum of actinofide (1) from *A. papillatus* (methanol- d_4 , 400 MHz, $J = 10$ Hz)



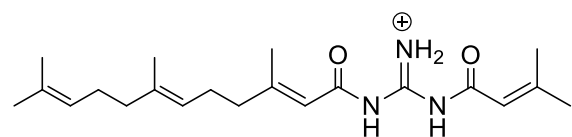
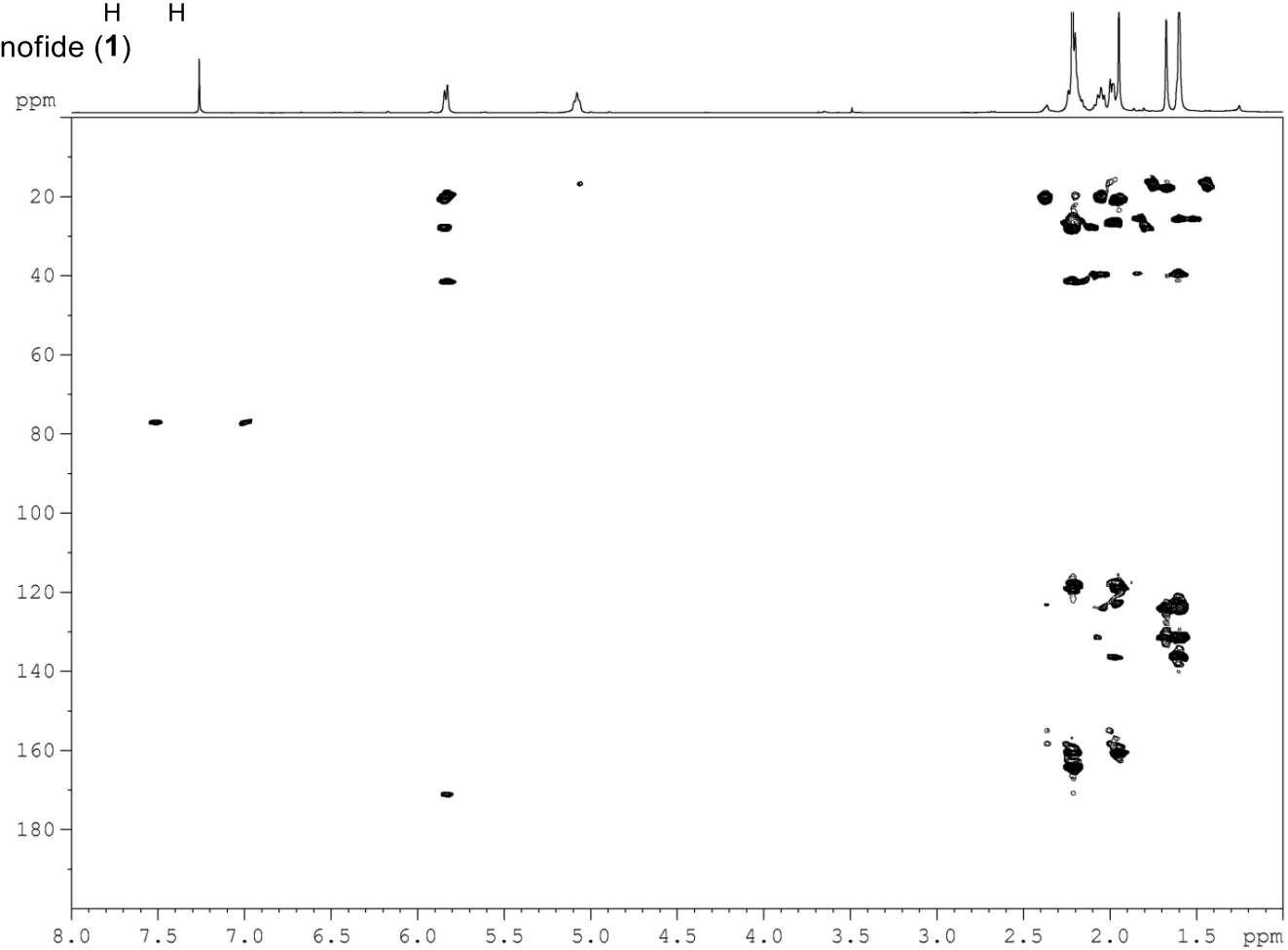
^1H NMR spectrum of actinofide from *A. papillatus* (**1**) (protonated form) (CDCl_3 , 400 MHz)



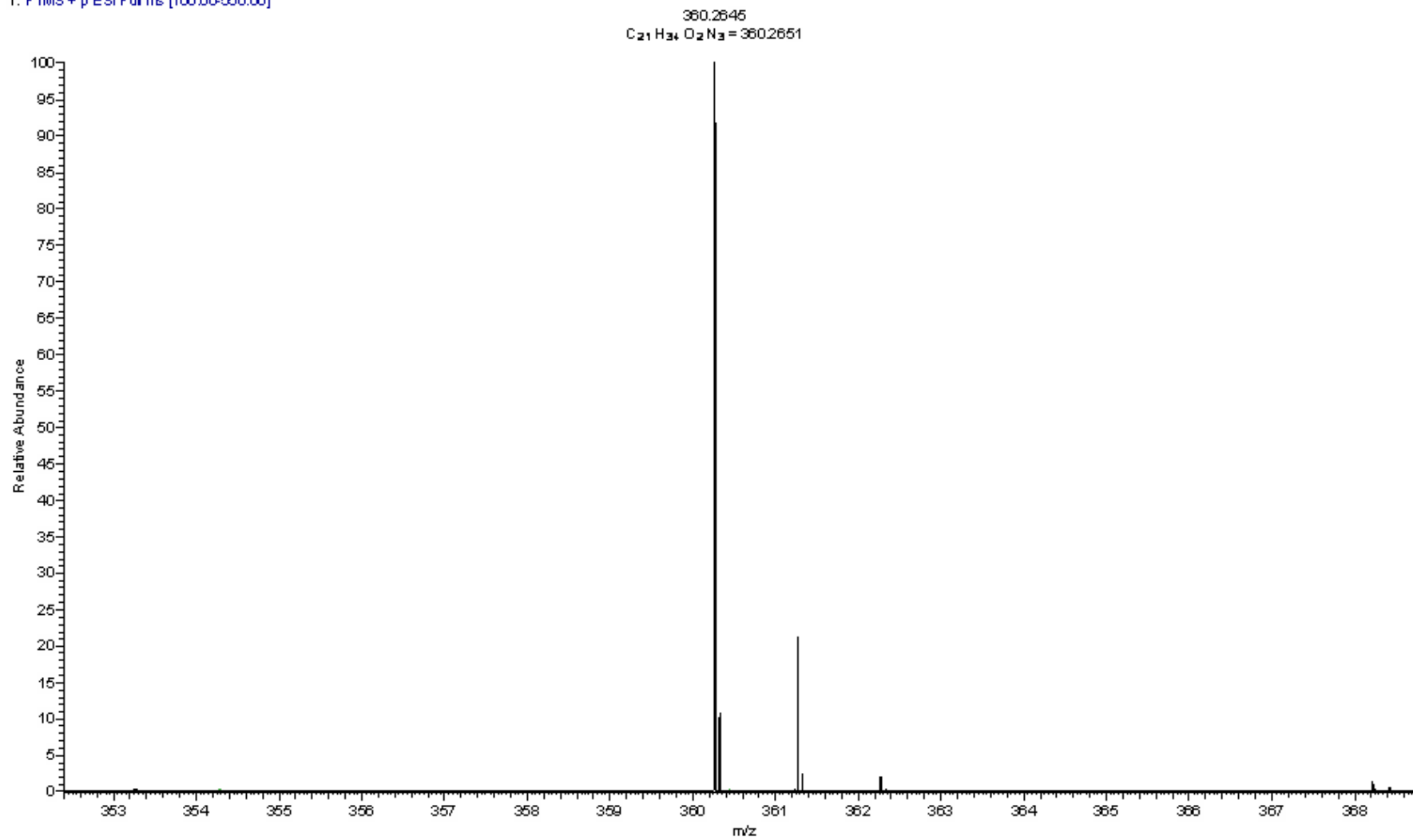
^1H - ^1H COSY spectrum of actinofide (**1**) (protonated form) from *A. papillatus* (CDCl_3 , 400 MHz)



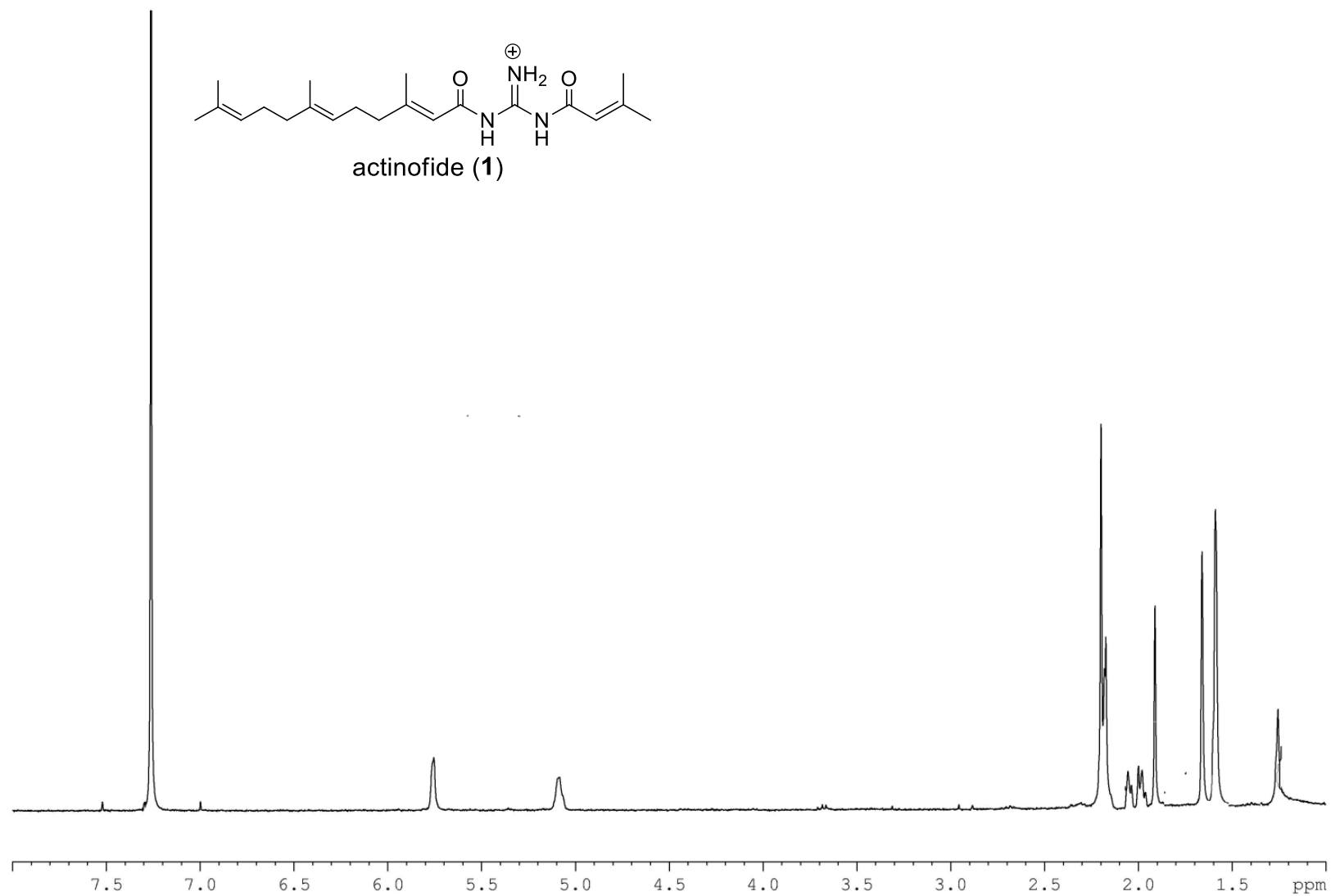
HSQC spectrum of actinofide (1) (protonated form) from *A. papillatus* (CDCl₃, 400 MHz)

actinofide (**1**)HMBC spectrum of actinofide (**1**) (protonated form) from *A. papillatus* (CDCl₃, 400 MHz, $J = 10$ Hz)

mg w287-3-13P #36-67 RT: 0.06-0.22 AV: 32 NL: 8.48E7
T: F TMS + p ESI Full ms [100.00-550.00]

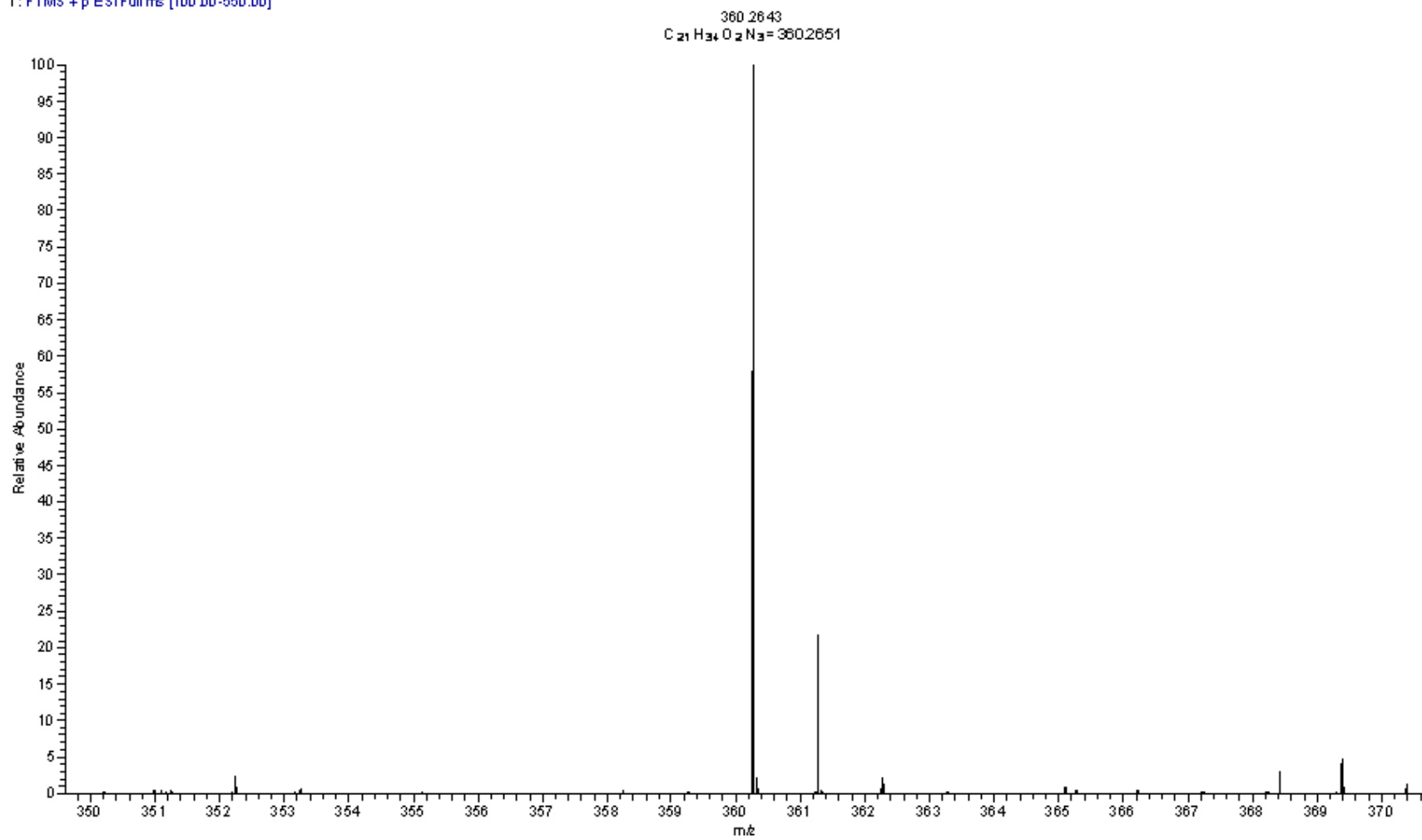


HRESIMS spectrum of actinofide (**1**) from *A. papillatus*.

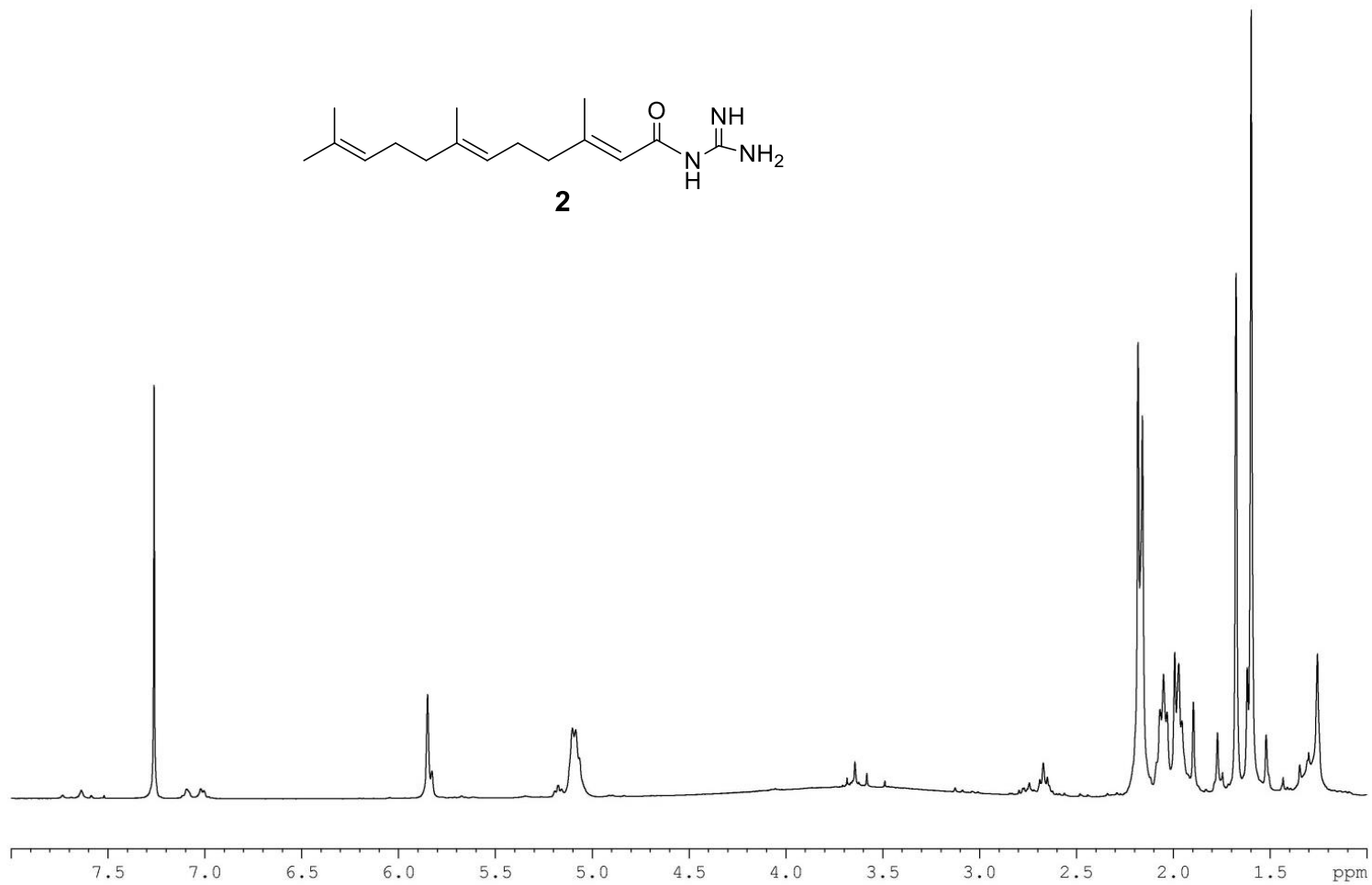
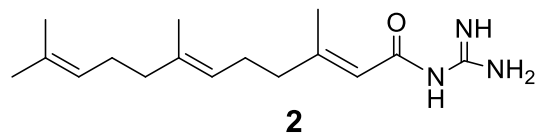


¹H NMR spectrum of synthetic actinofide (1) (CDCl₃, 400 MHz)

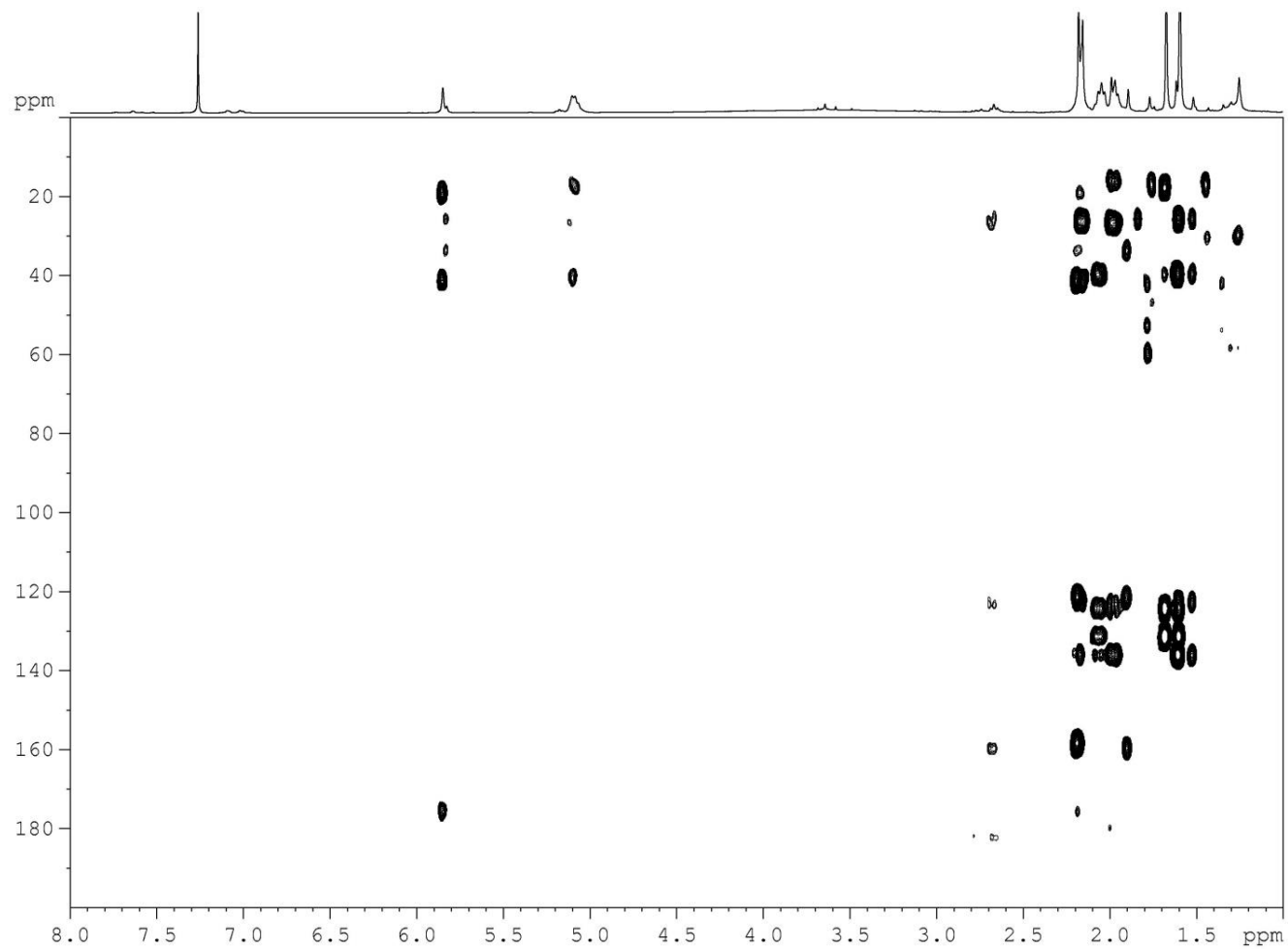
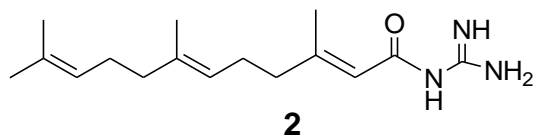
mg_wz87rea28p1bis #14-50 RT: 0.06-0.22 AM: 37 NL: 4.79 E7
T: FTMS + p ESI Full ms [100.00-550.00]



HRESIMS spectrum of synthetic actinofide (**1**)

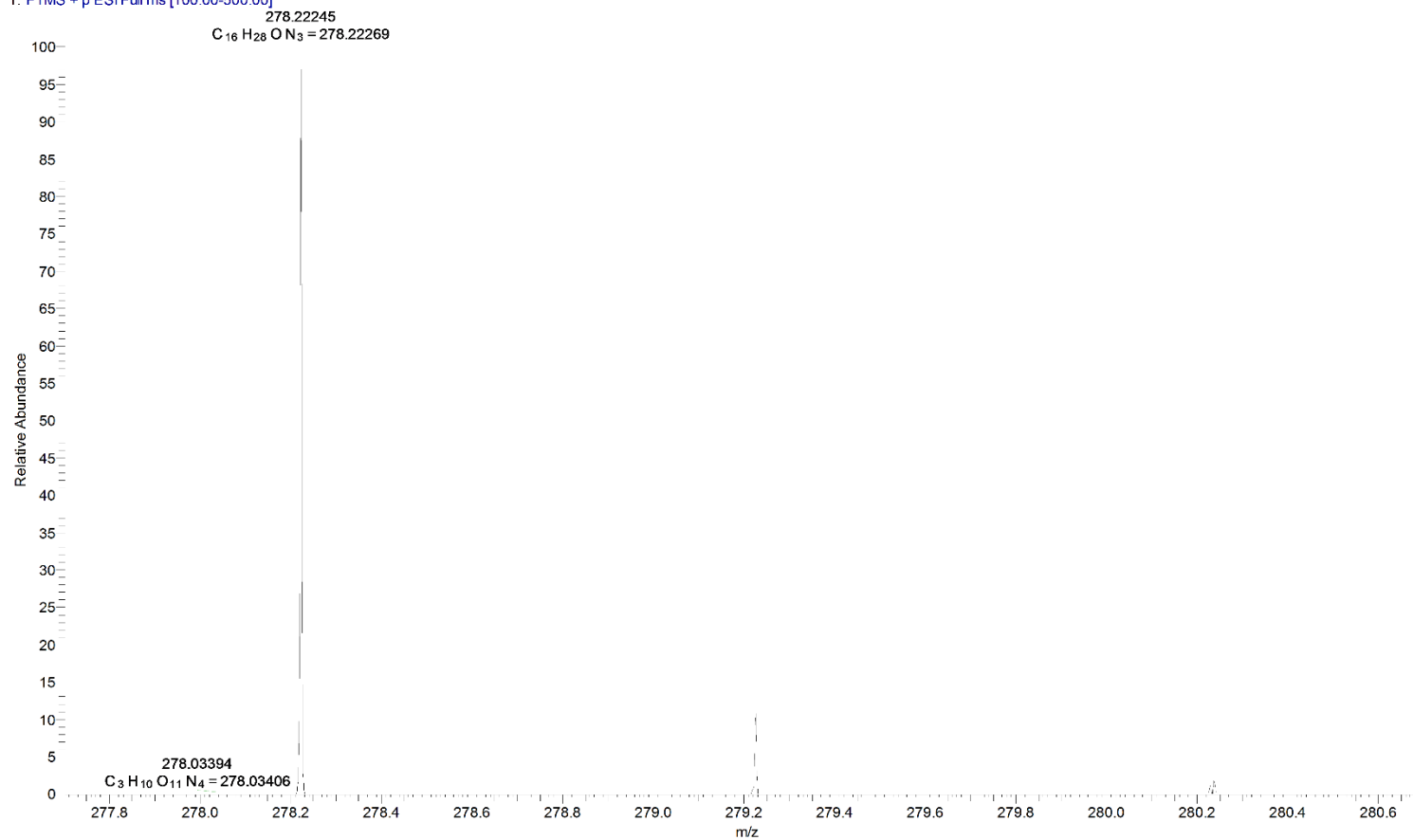


^1H NMR spectrum of farnesoyl-guanidine (**2**) (CDCl_3 , 400 MHz).

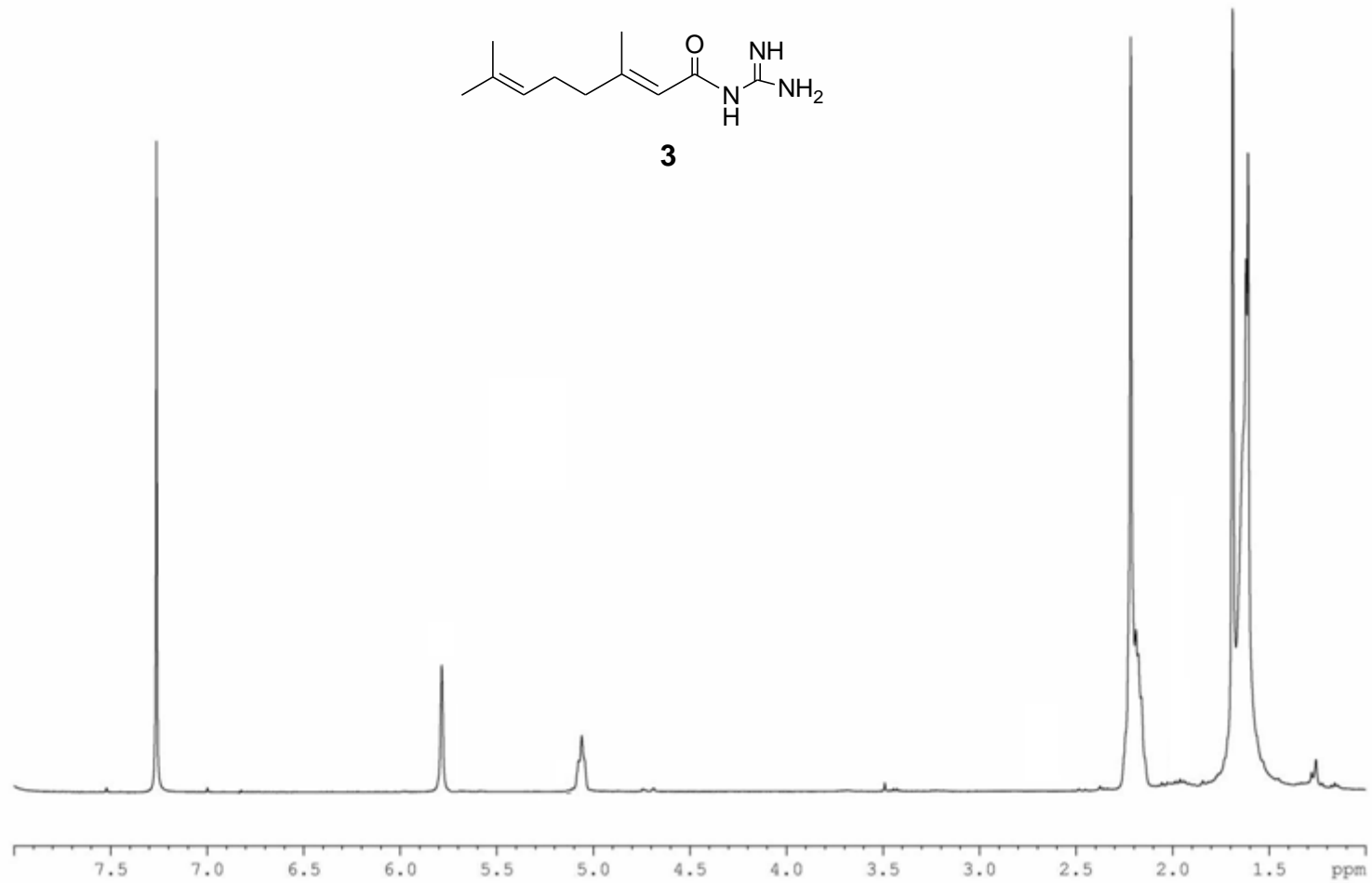
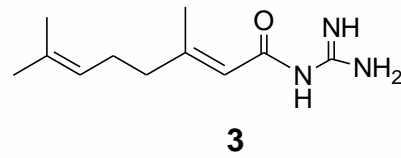


HMBC spectrum of farnesoyl-guanidine (**2**) (CDCl₃, 400 MHz, $J = 10$ Hz)

MG_wz87afg #109-135 RT: 0.51-0.62 AV: 27 NL: 1.75E8
T: FTMS + p ESI Full ms [100.00-500.00]

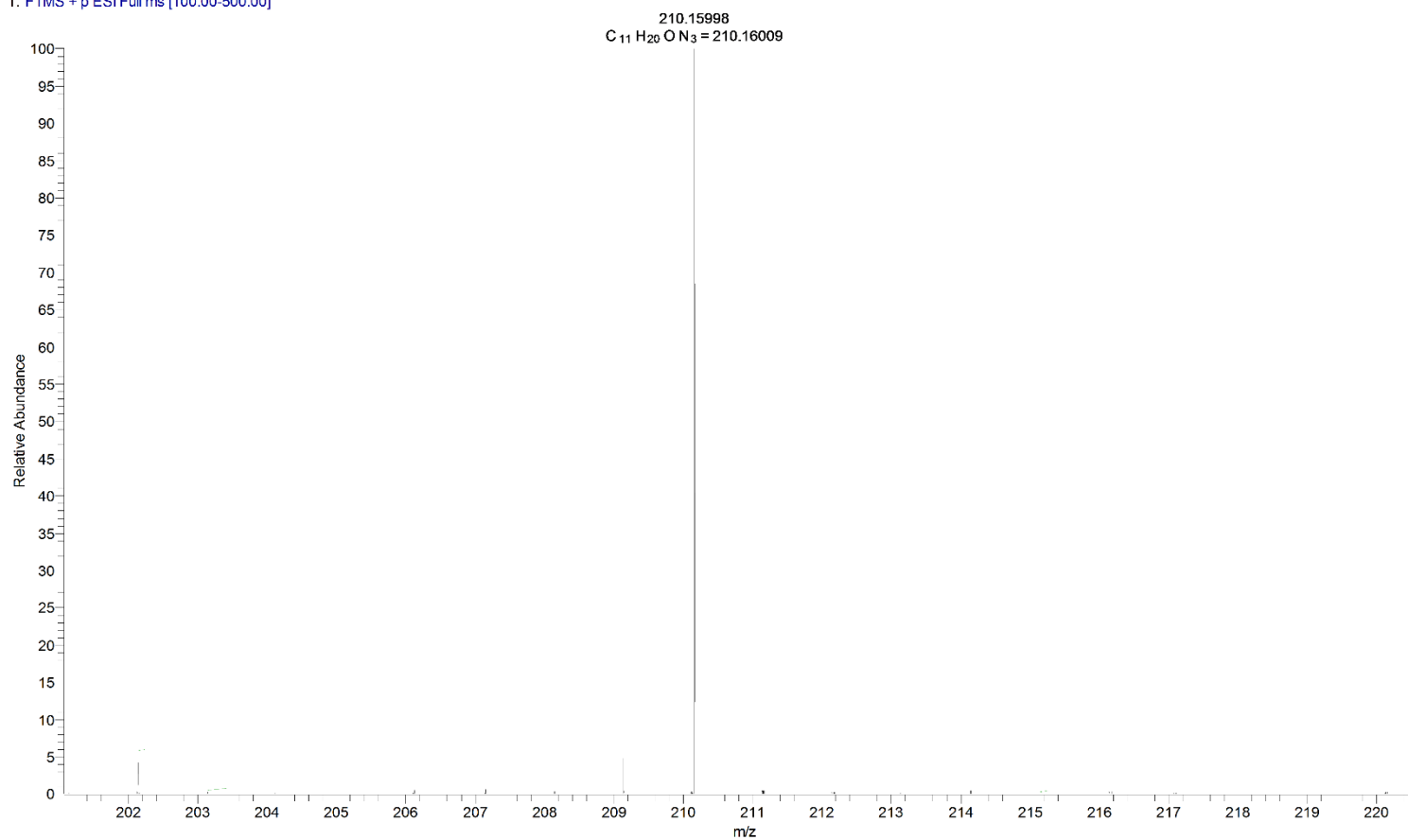


HRESIMS spectrum of farnesoyl-guanidine (2).

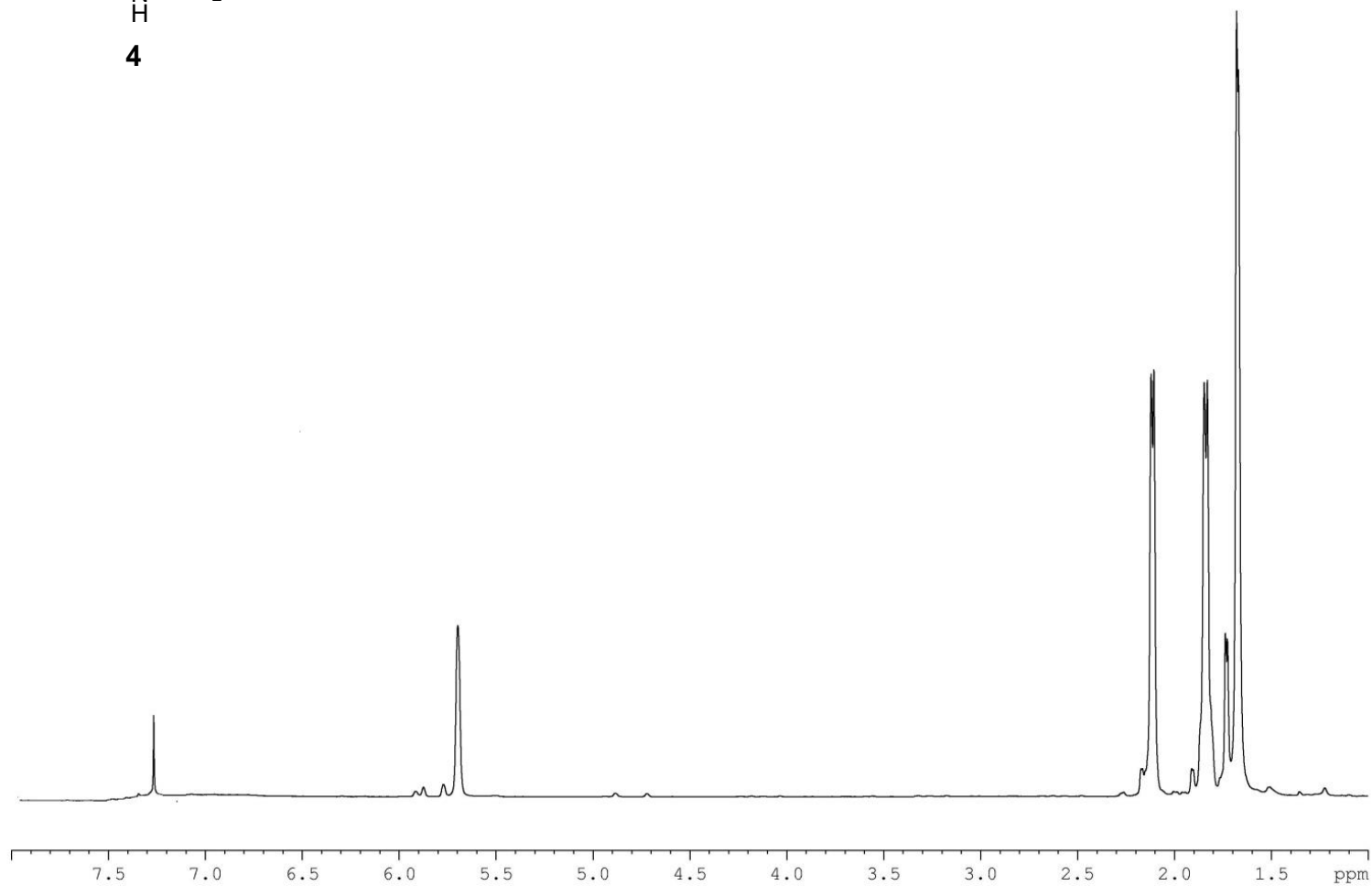
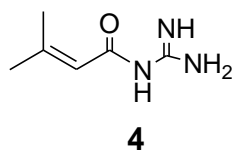


¹H NMR spectrum of geranoyl-guanidine (**3**) (CDCl₃, 400 MHz).

MG_geraguan #22-53 RT: 0.10-0.24 AV: 32 NL: 1.05E8
T: FTMS + p ESI Full ms [100.00-500.00]

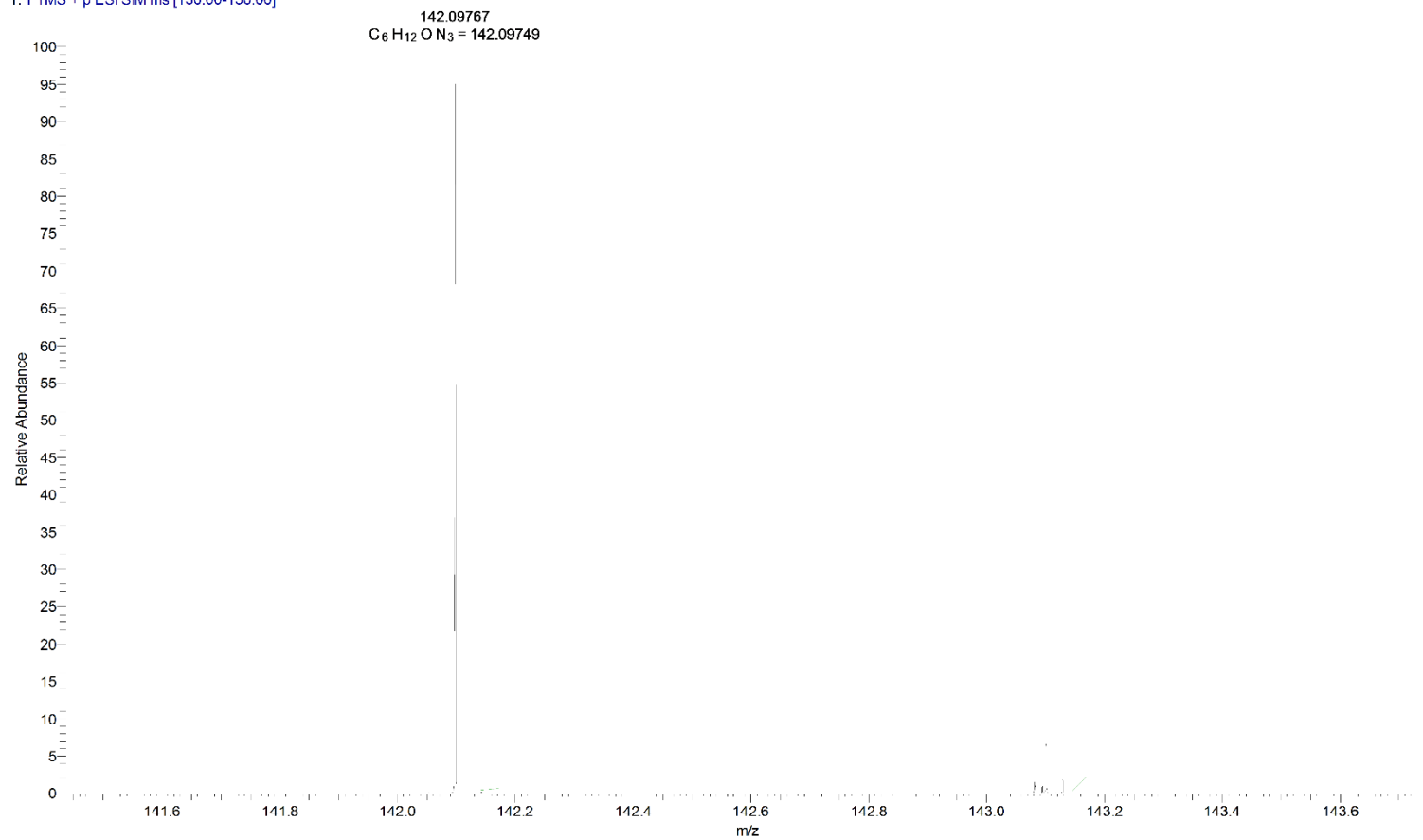


HRESIMS spectrum of geranoyl-guanidine (**3**).

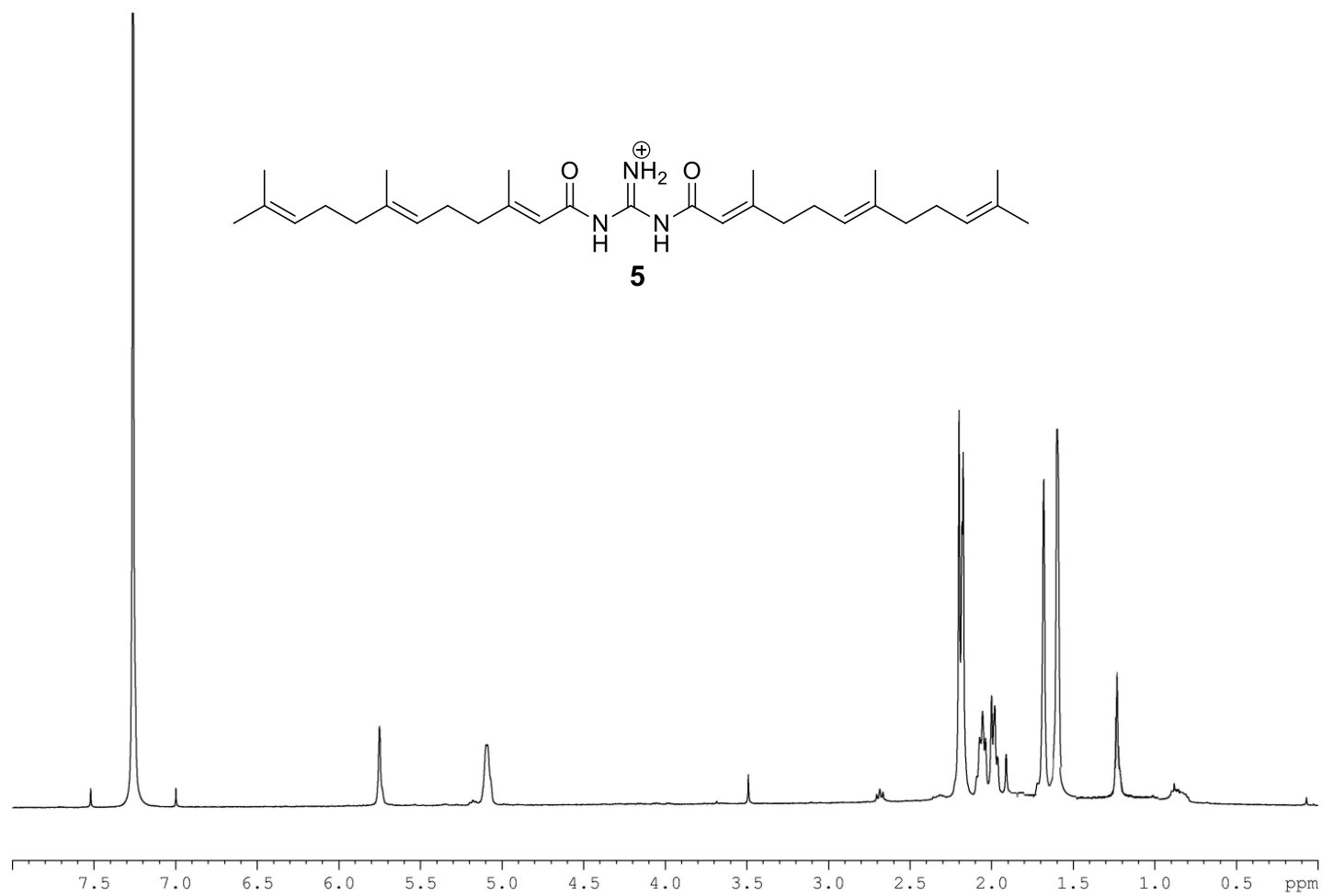


^1H NMR spectrum of seneciyl-guanidine (**4**) (CDCl_3 , 400 MHz).

MG_seneguan#57-89 RT: 0.25-0.40 AV: 33 NL: 2.39E6
T: FTMS + p ESI SIM ms [130.00-150.00]

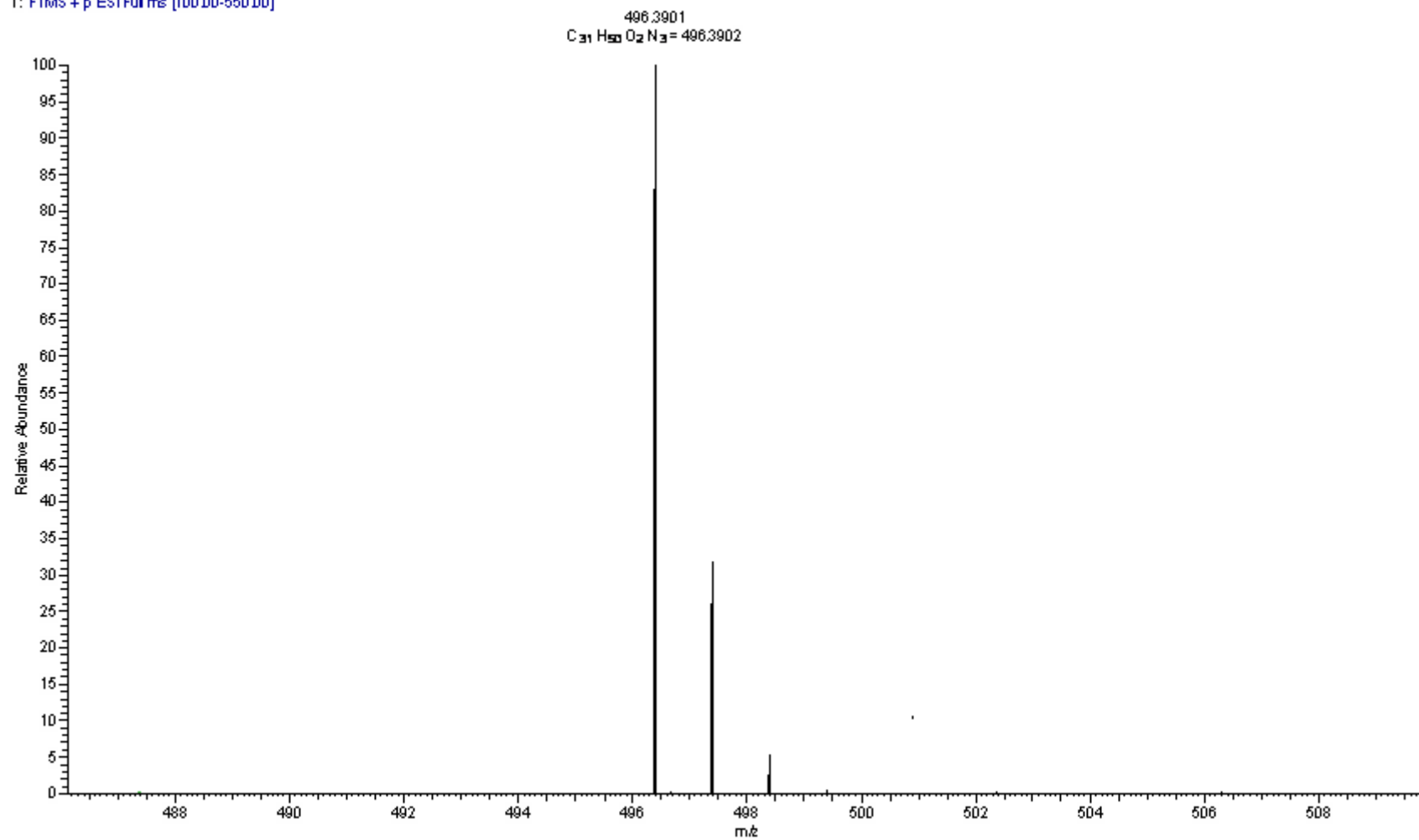


HRESIMS spectrum of senecieryl-guanidine (**4**).

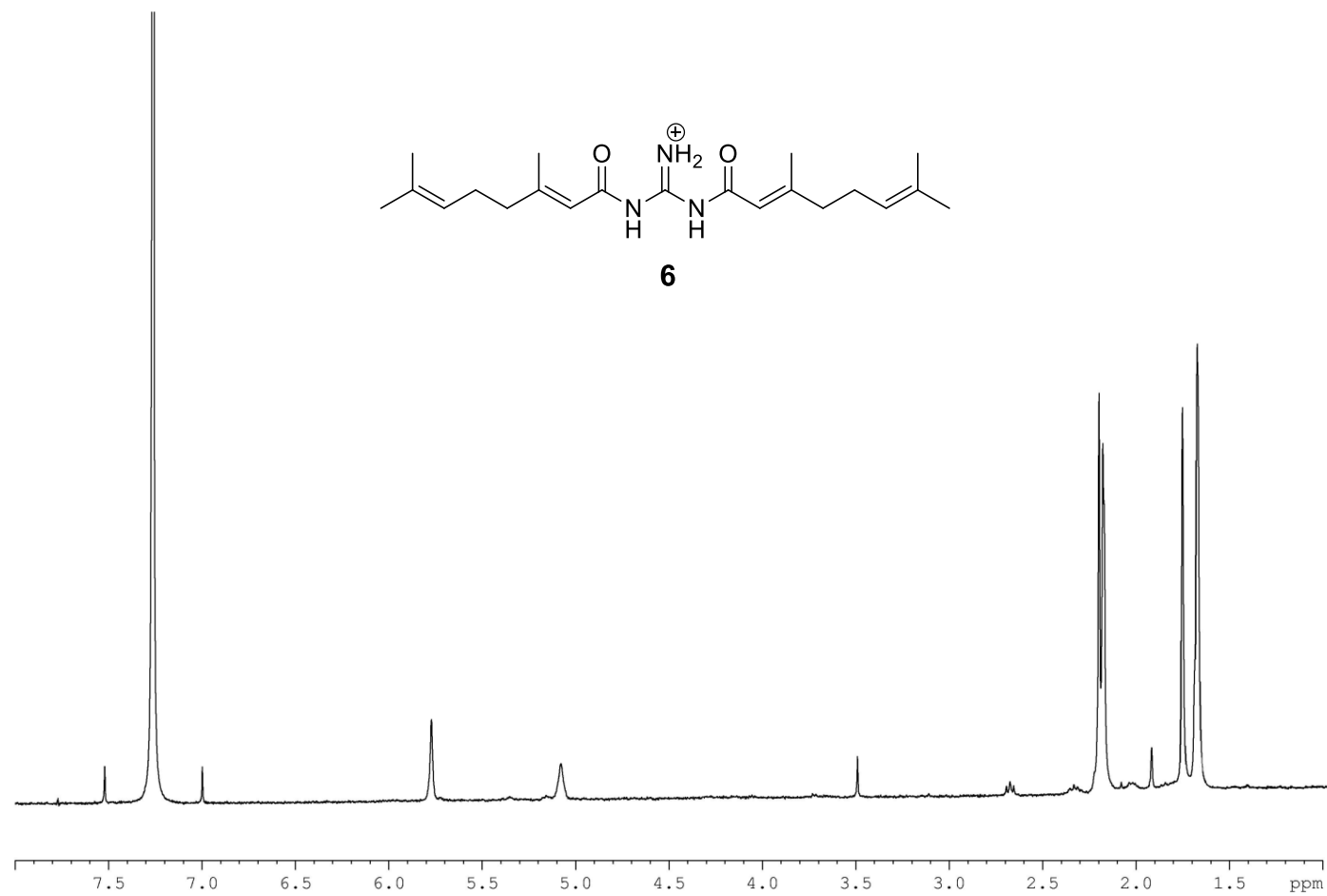


¹H NMR spectrum of *N,N'*-difarnesoyl-guanidine (**5**) (protonated form) (CDCl₃, 400 MHz).

mg_rea4a1p #59 RT: 0.26 AM: 1 NL: 6.43E7
T: FTMS + p ESI Full ms [100.00-550.00]



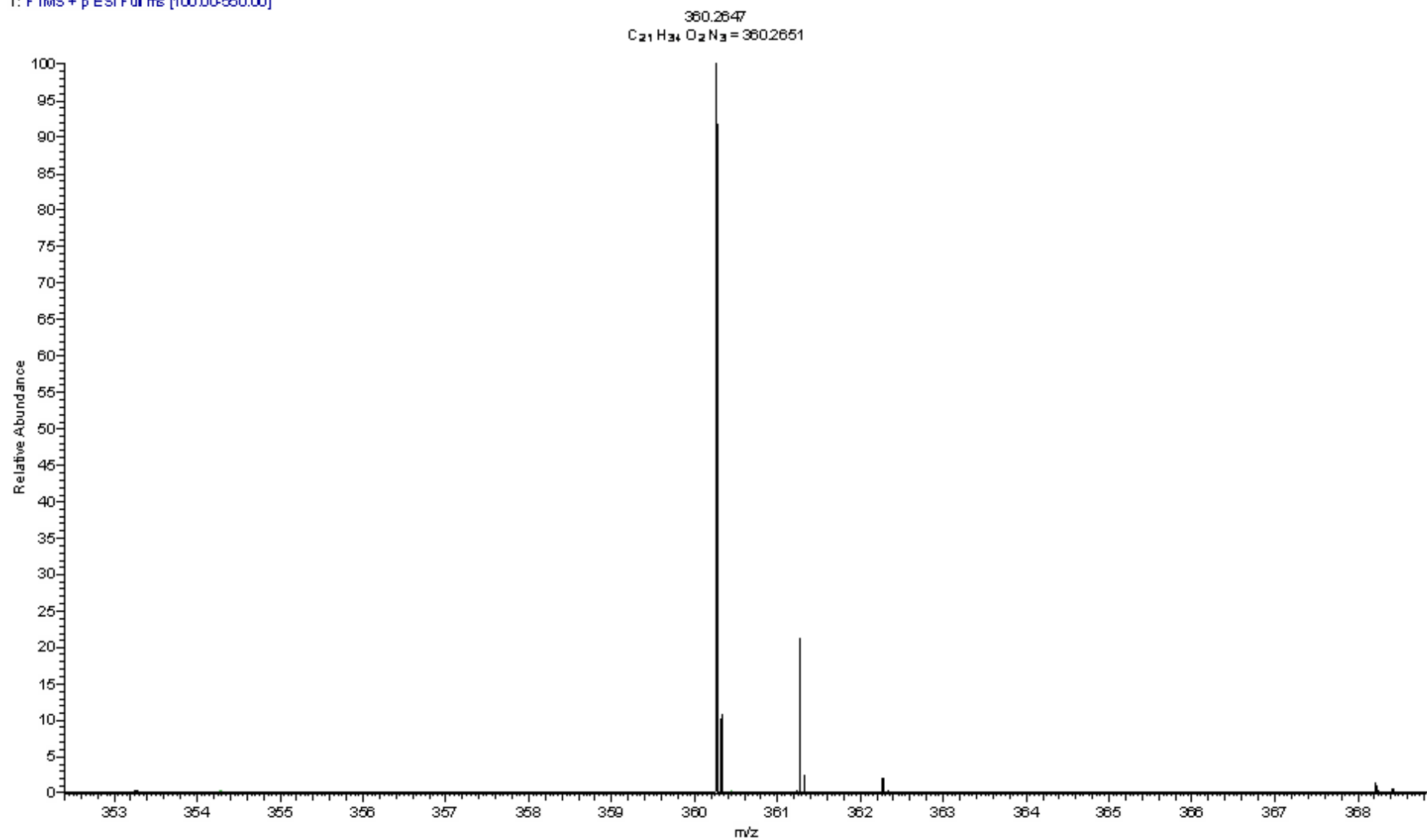
HRESIMS spectrum of *N,N'*-difarnesoyl-guanidine (**5**).



¹H NMR spectrum of *N,N'*-digeranoyl-guanidine (**6**) (protonated form) (CDCl₃, 400 MHz).

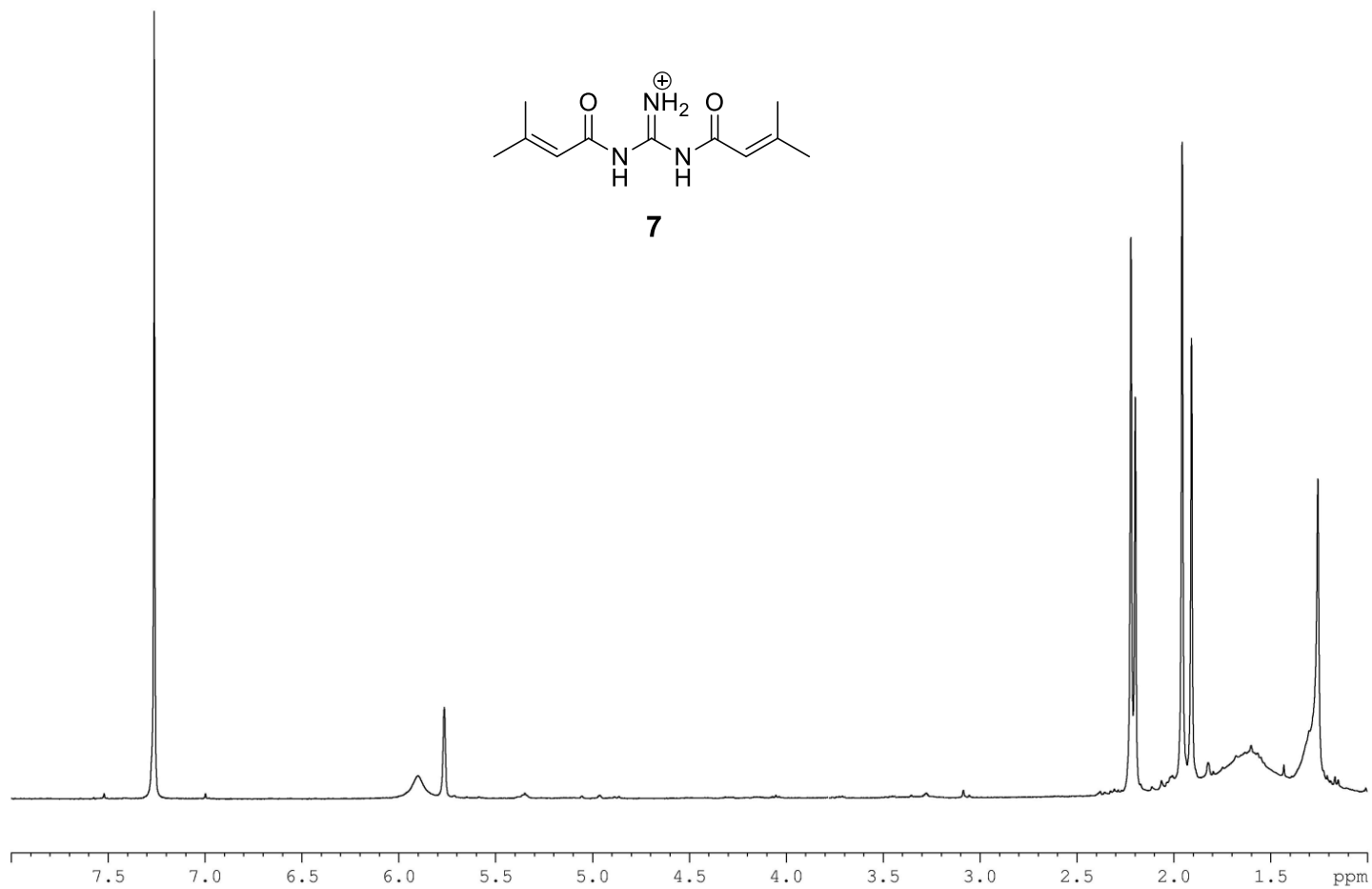
S24

mg_rez5abisP#36-67 RT: 0.16-0.30 AV: 32 NL: 8.48E7
T: FTMS + p ESI Full ms [100.00-550.00]



HRESIMS spectrum of *N,N'*-digeranoyl-guanidine (**6**).

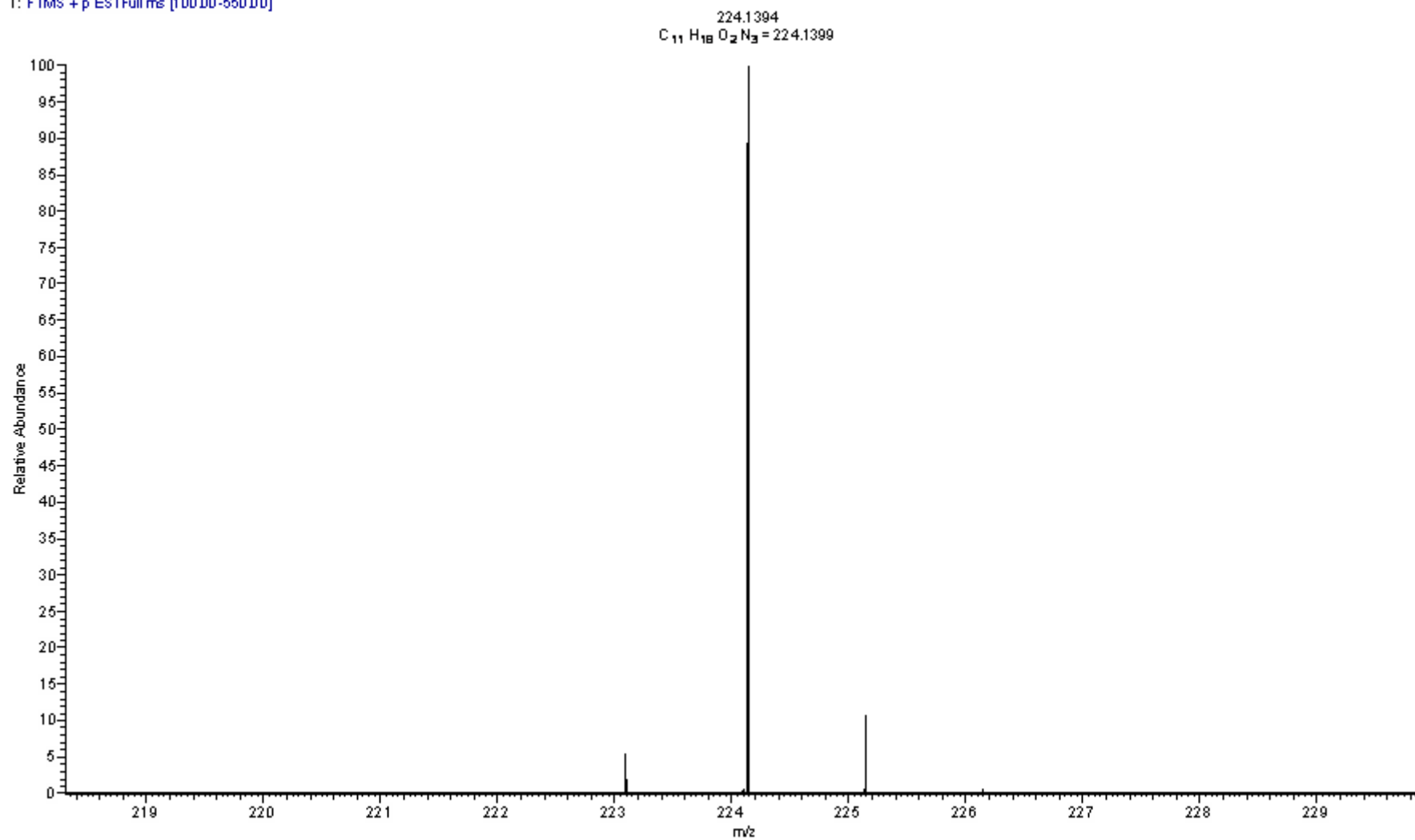
S25



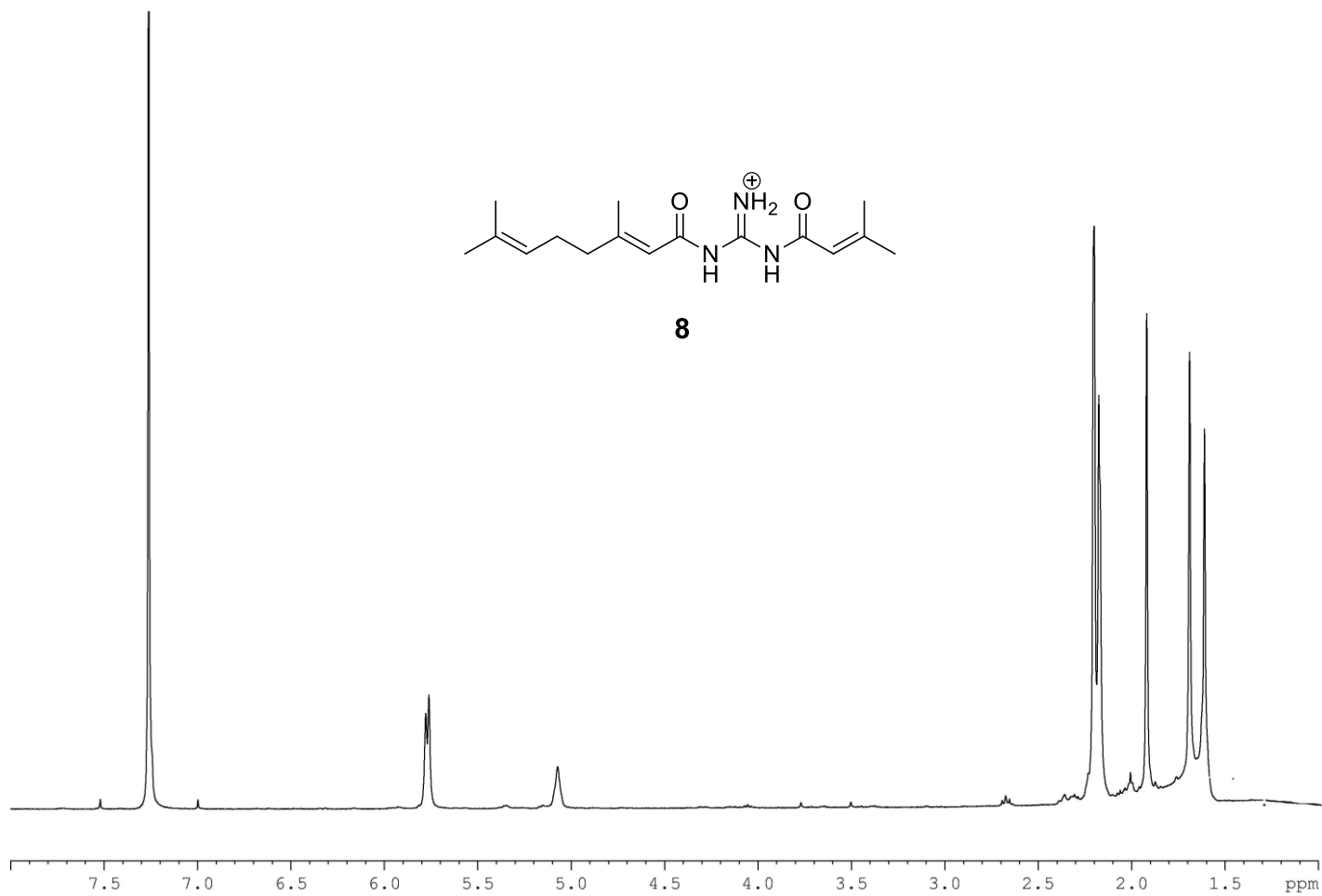
¹H NMR spectrum of *N,N'*-disenecieryl-guanidine (**7**) (protonated form) (CDCl₃, 400 MHz).

S26

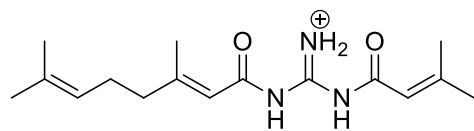
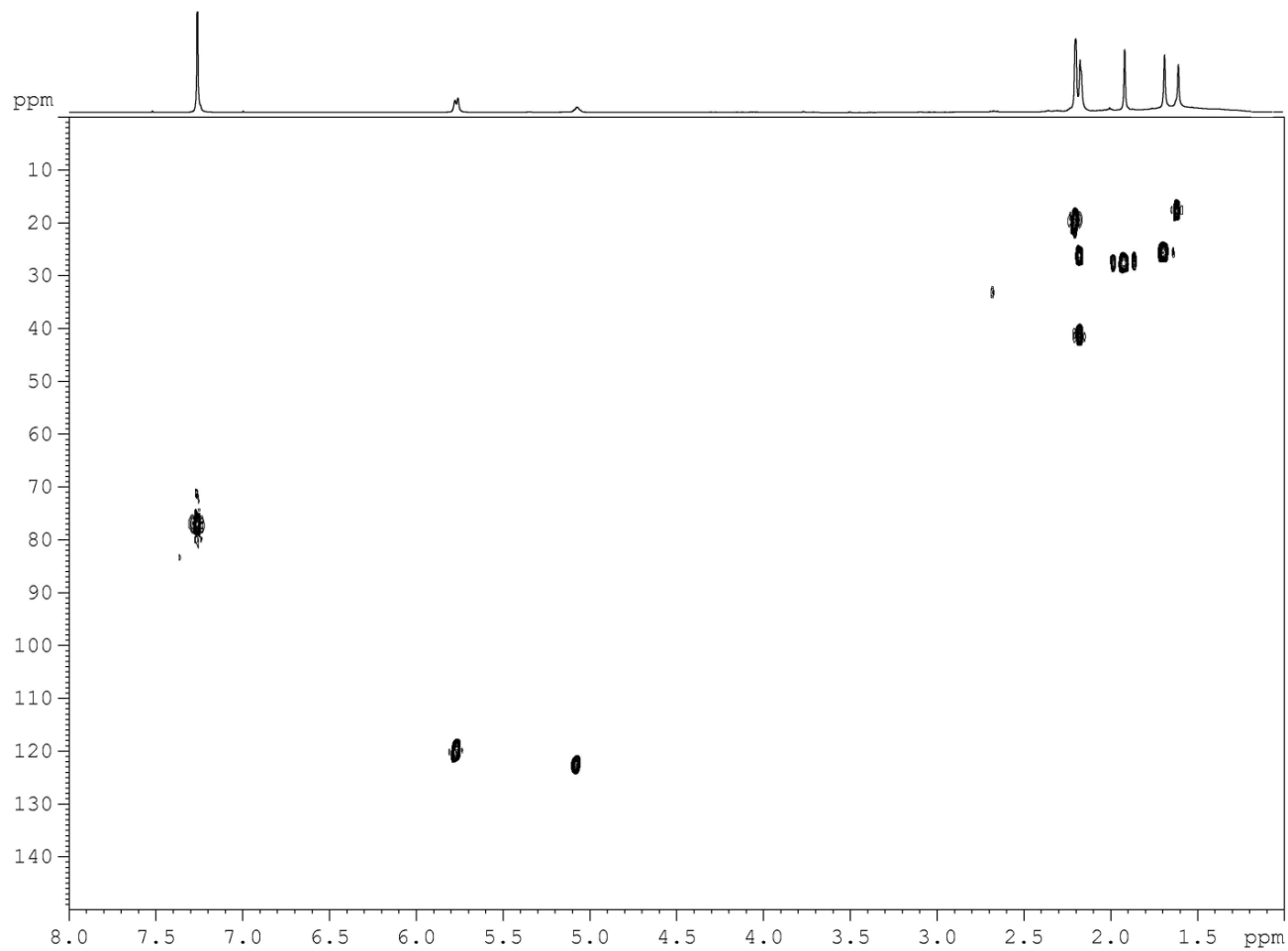
mg_rea1-3 #65 RT: 0.29 AV: 1 NL: 4.64E8
T: FTMS + p ES | Full ms [1.00.00-550.00]



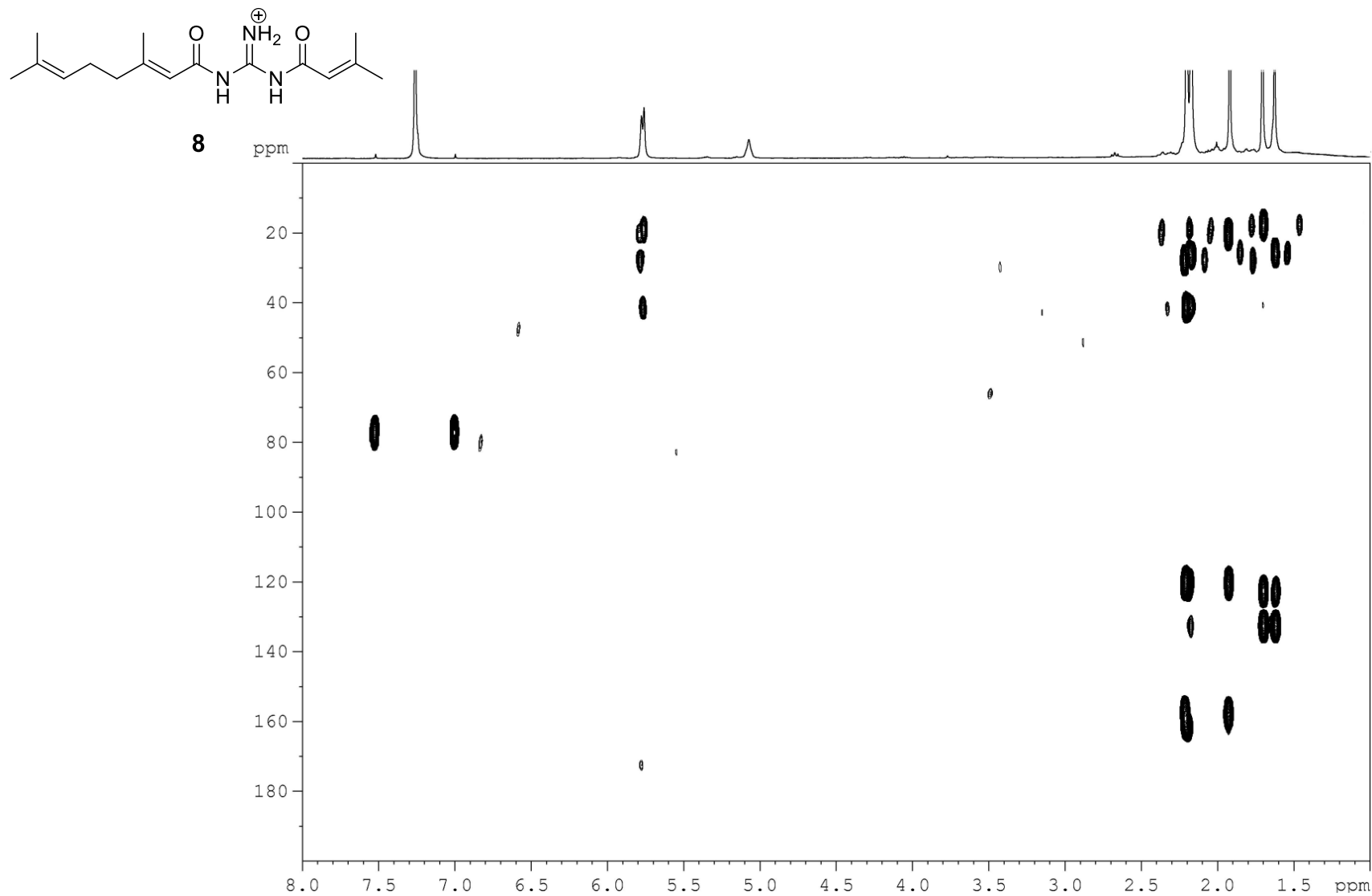
HRESIMS spectrum of *N,N'*-disenecieryl-guanidine (**7**).



¹H NMR spectrum of *N*-geranoyl-*N'*-senecioidyl-guanidine (**8**) (protonated form) (CDCl₃, 400 MHz).

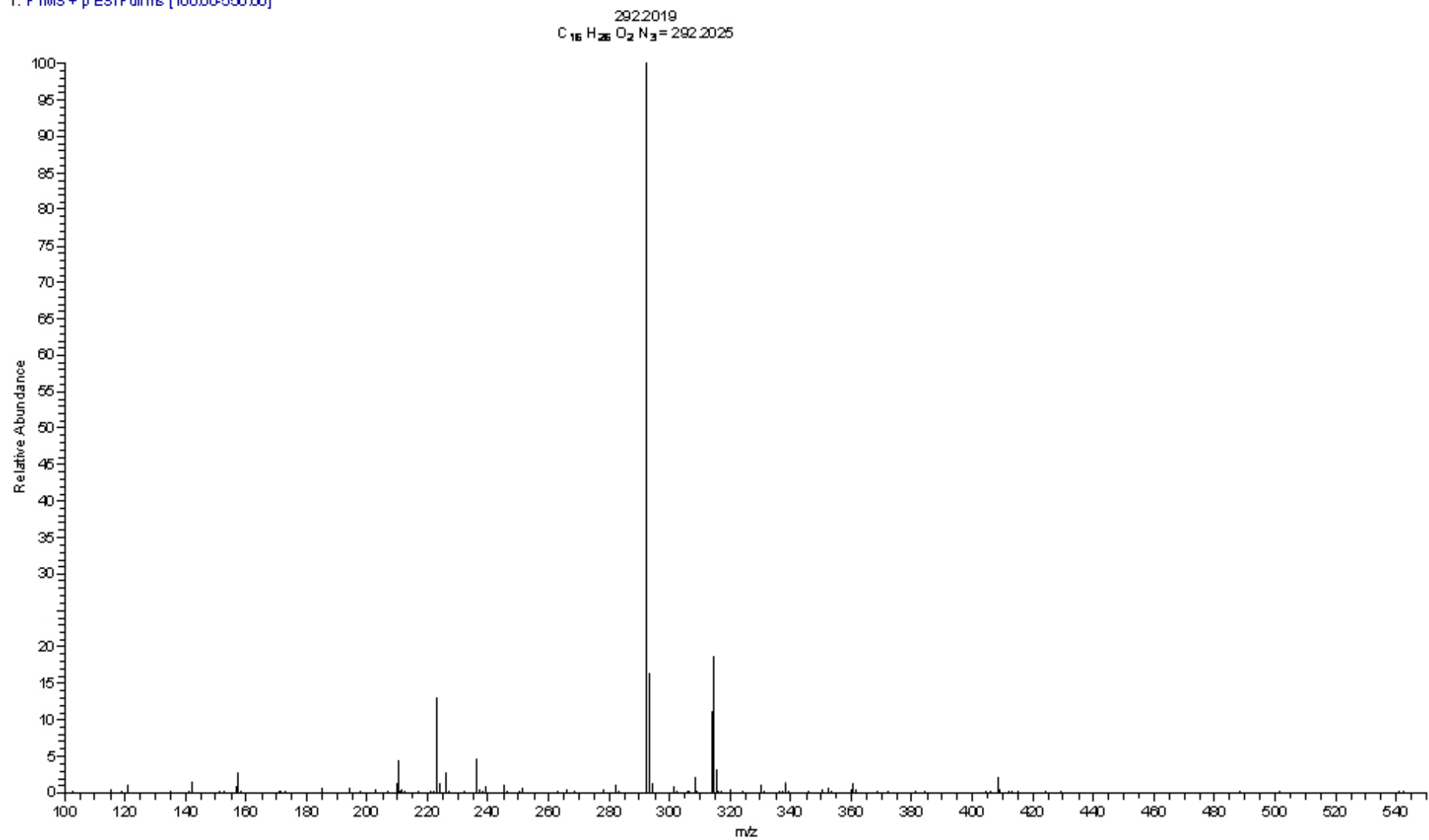
**8**

HSQC spectrum of *N*-geranoyl-*N'*-senecioidyl-guanidine (**8**) (protonated form) (CDCl₃, 400 MHz).

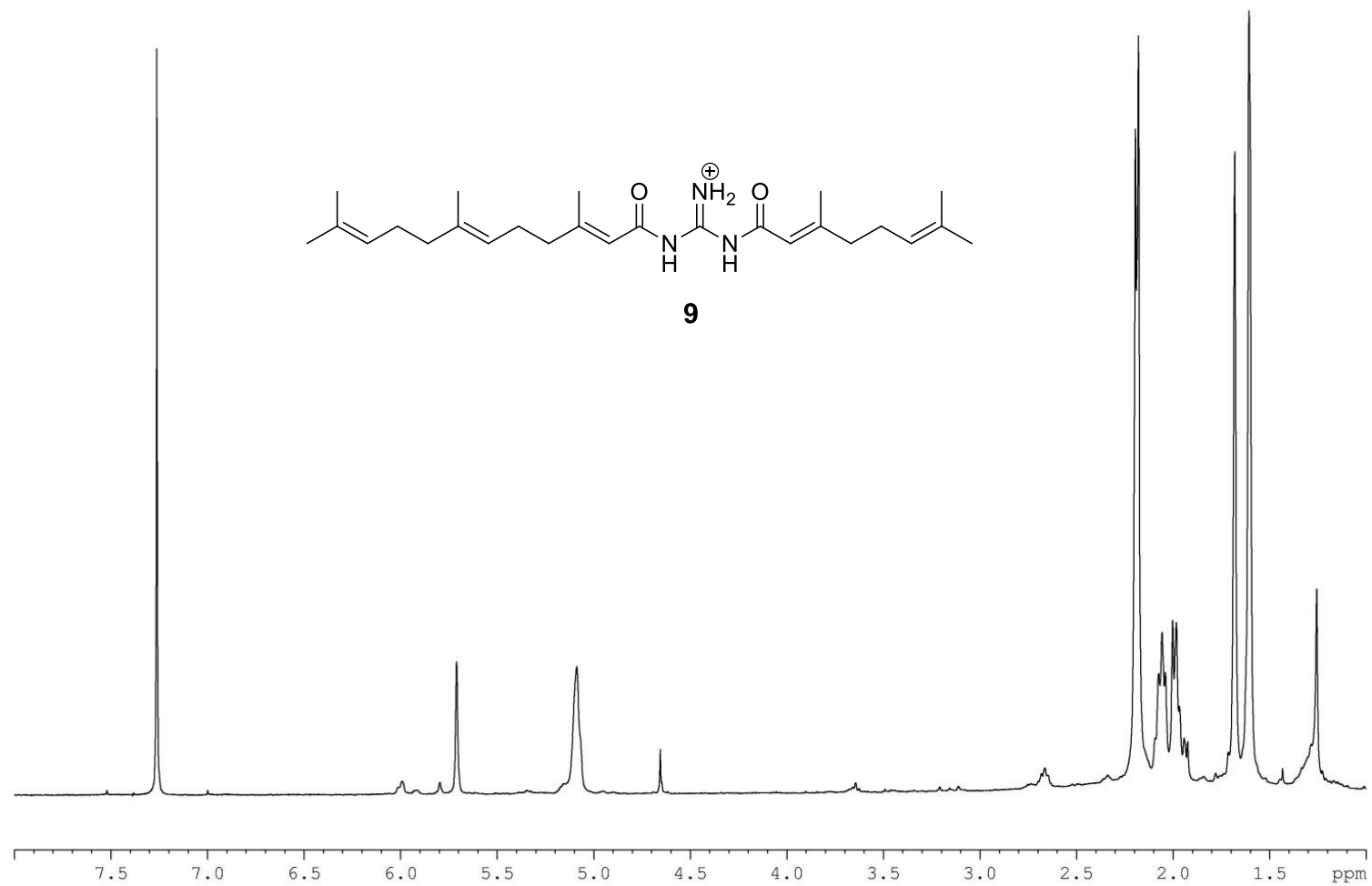


HMBC spectrum of *N*-geranoyl-*N'*-senecioidyl-guanidine (**8**) (protonated form) (CDCl₃, 400 MHz, $J = 10$ Hz).

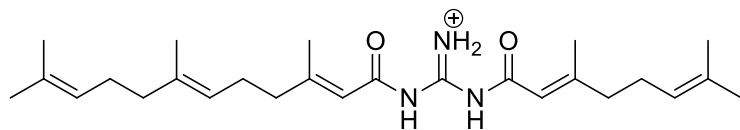
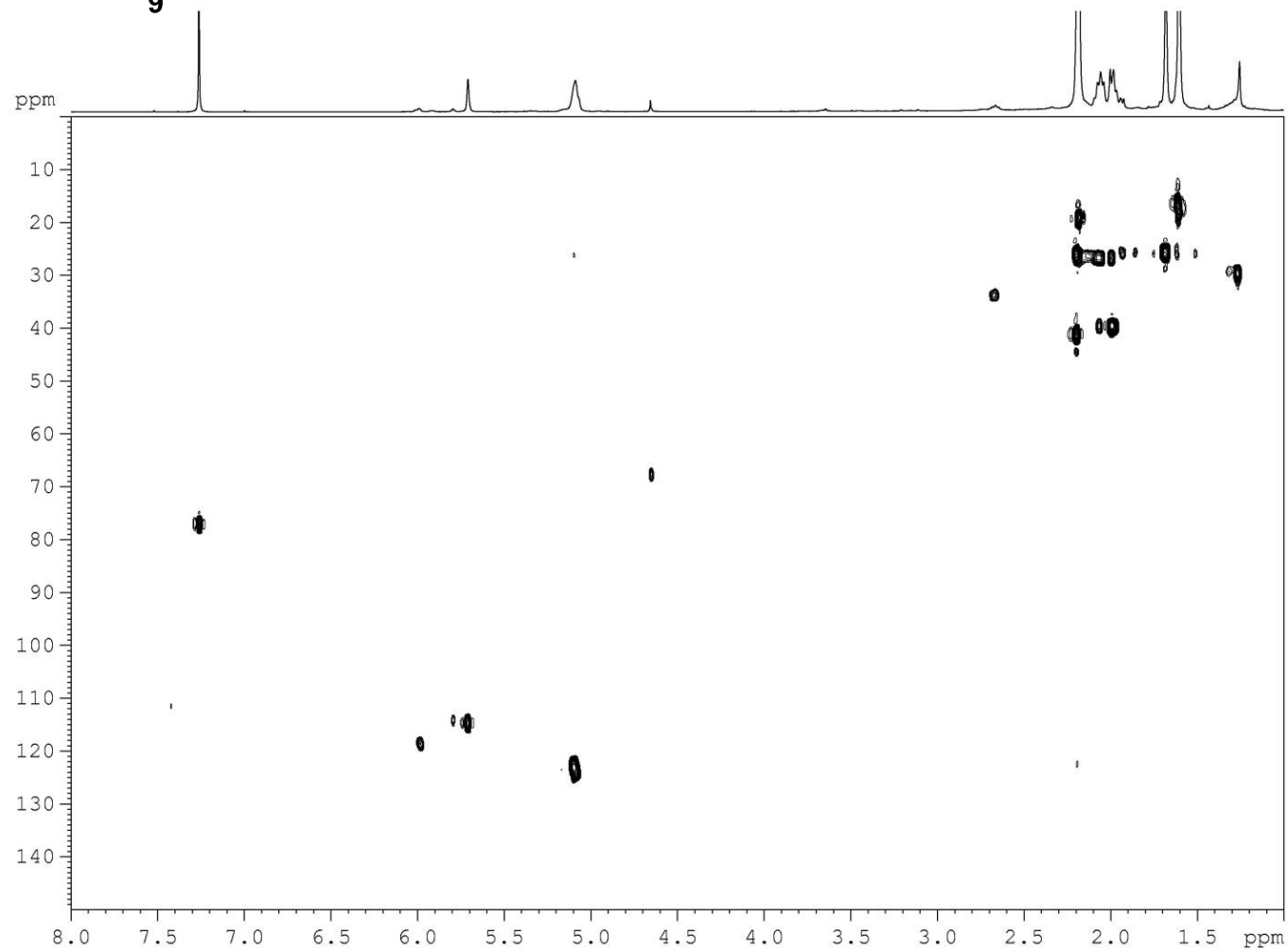
mg_wz87_rea3b1p_#90 RT: 0.40 AV: 1 NL: 2.65E8
T: FTMS + p ESI Full ms [100.00-550.00]



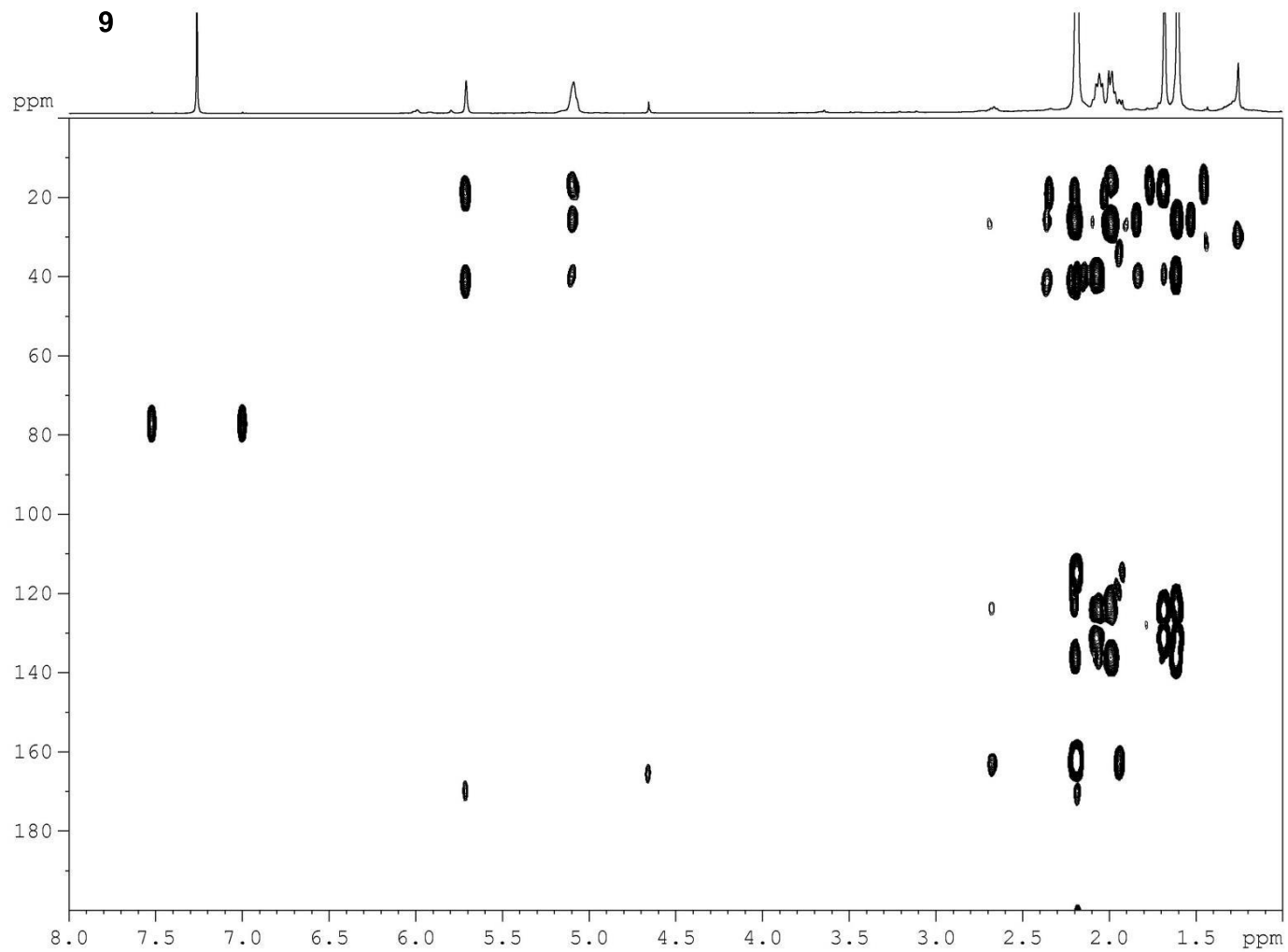
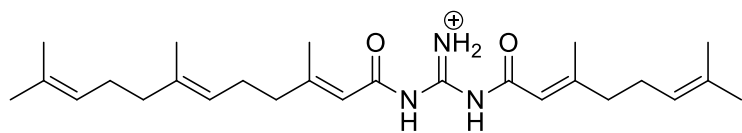
HRESIMS spectrum of *N*-geranoyl-*N'*-senecieryl-guanidine (**8**).



¹H NMR spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**) (protonated form) (CDCl₃, 400 MHz).

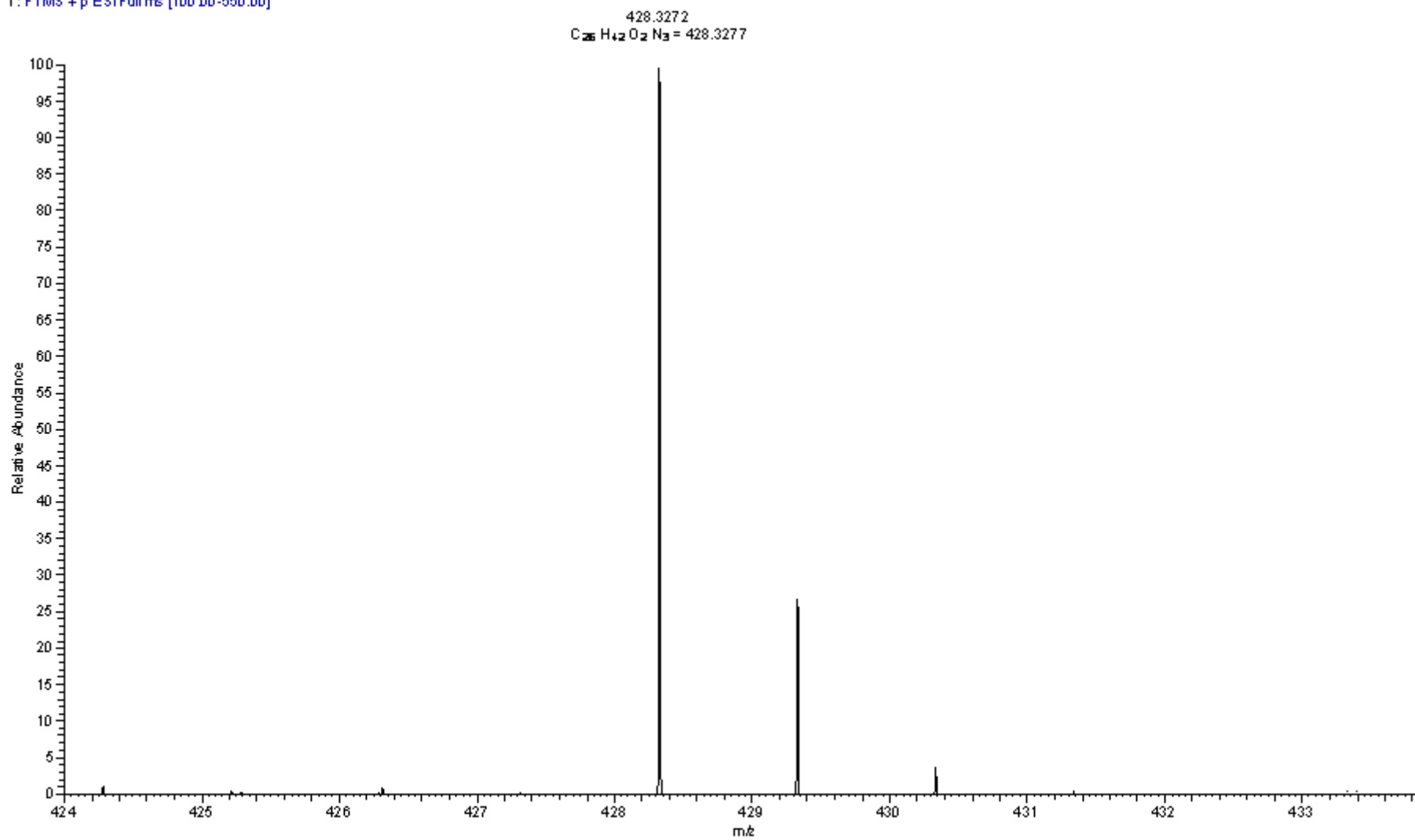
**9**

HSQC spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**) (protonated form) (CDCl₃, 400 MHz).

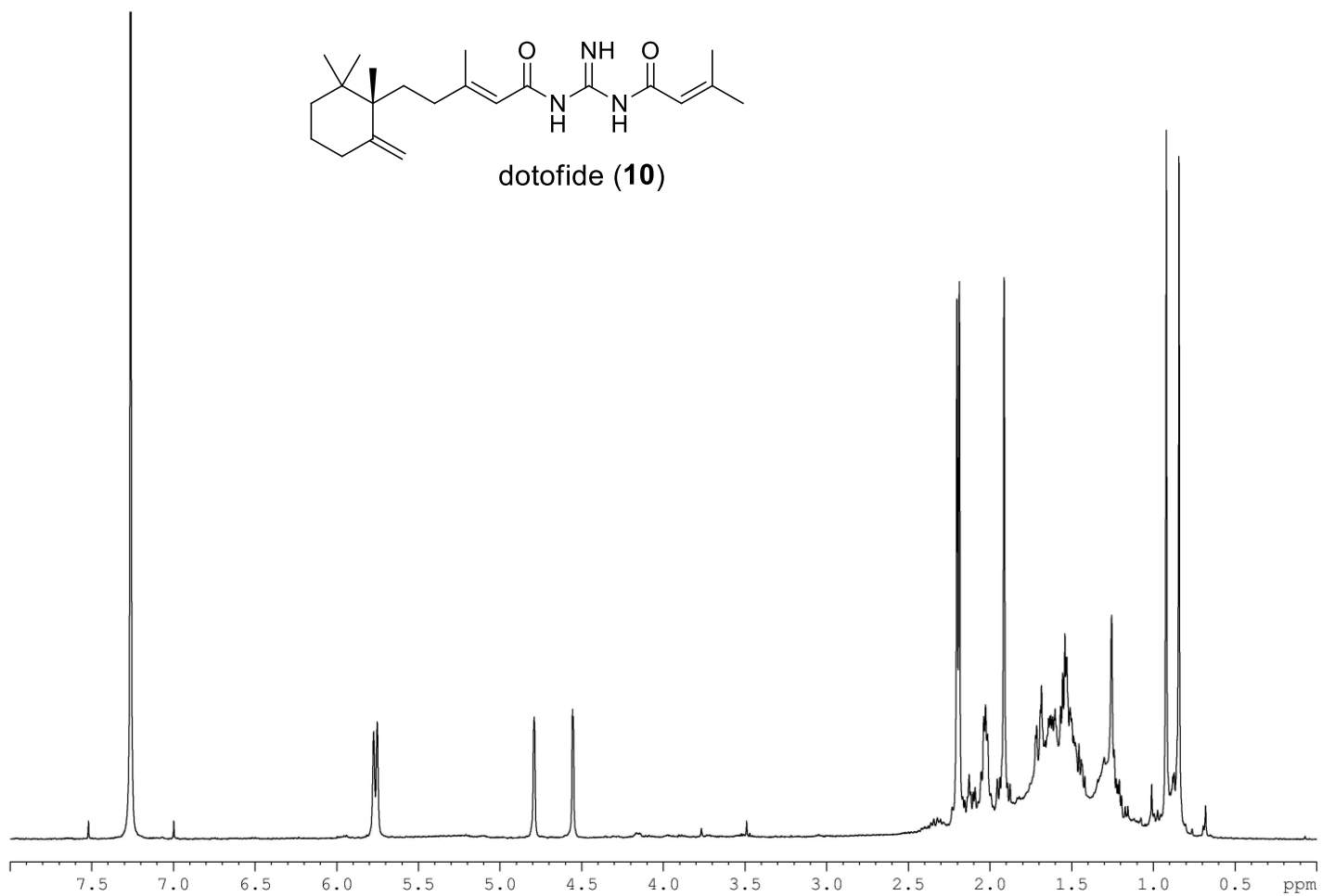


HMBC spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**) (protonated form) (CDCl₃, 400 MHz, $J = 10$ Hz).

mg_rea6bisa #35-58 RT: 0.16-0.26 AV: 24 NL: 9.15E7
T: FTMS + p ESI Full ms [100.00-550.00]

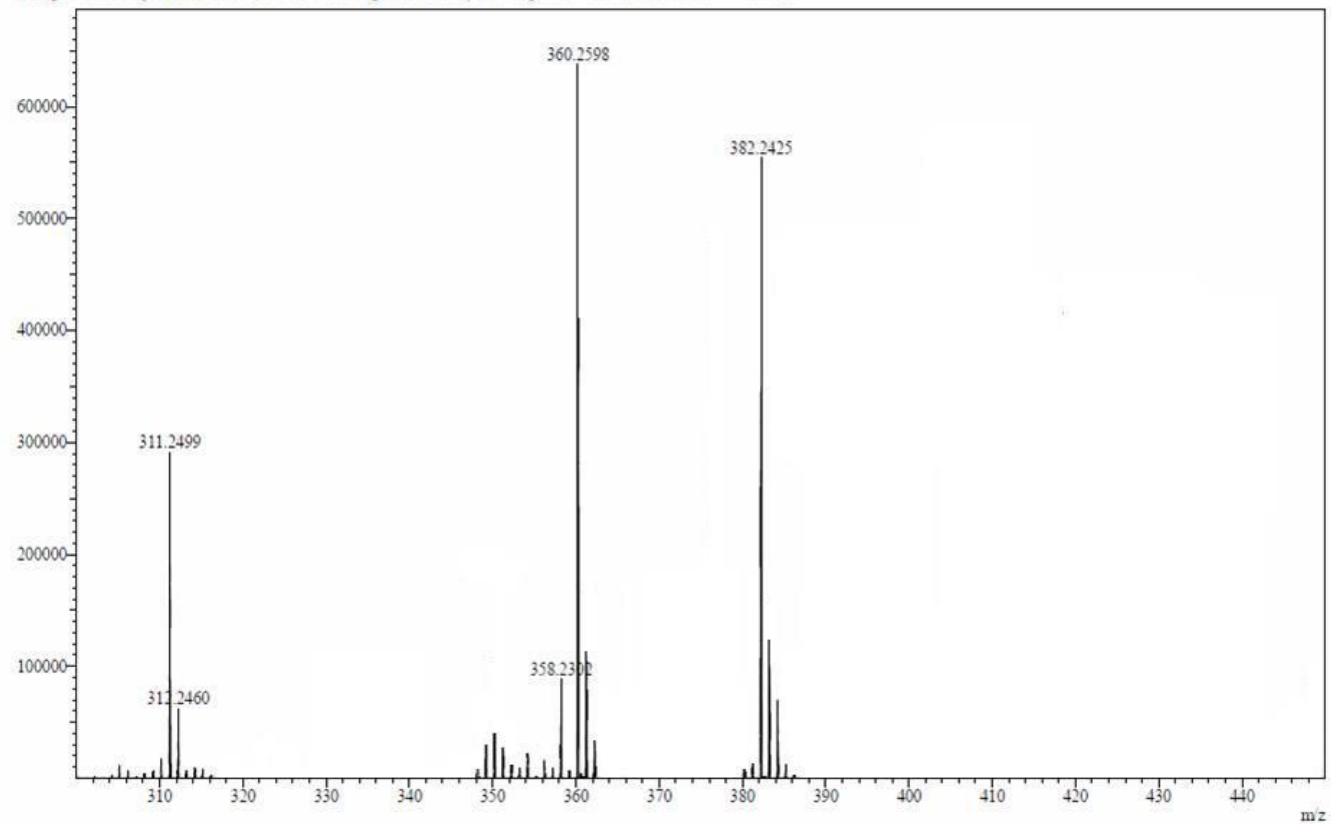


HRESIMS spectrum of *N*-farnesoyl-*N'*-geranoyl-guanidine (**9**)



¹H NMR spectrum of dotofide (**10**) from *D. pinnatifida* (CDCl₃, 400 MHz)

Retention Time: 1.520(Scan#: 457)
Max Peak: 89 Base Peak: 360.26(637500)
Spectrum: Averaged 1.277-1.767(384-531)
Background: Averaged 1.090-2.115(328-635) MS Stage: MS Polarity: Pos Segment: 1 - Event: 1 Precursor: ----- Cutoff:



HRESIMS spectrum of dotofide (**10**) from *D. pinnatifida*