

Supplementary information

Bioactive Assessment of Hexahydroquinoline Derivatives Prepared via a Biochar/ Fe₃O₄@APTMS Magnetic Catalyst: Focus on Antidiabetic and Antibacterial Properties

A. Thoume^{1,*}, I. Nait Irahah², Z. Dahib¹, A. Chbel², Z. Loukhmi¹, F. Abdou-Allah², R. Achagar³, M. Zertoubi¹, D. Benmessaoud Left¹, N. Bourhim² and A. Elmakssoudi¹.

¹*Laboratory of Organic Chemistry, Materials, Electrochemistry, and Environment, Faculty of Sciences Ain Chock, Hassan II University of Casablanca, Maarif, B.P. 2693, Casablanca 20000, Morocco.*

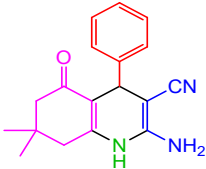
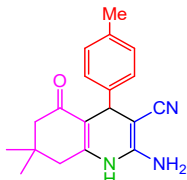
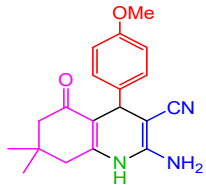
²*Laboratoire santé, environnement et biotechnologie, Faculté des Sciences Ain Chock, Université Hassan II de Casablanca, B.P 5366, Morocco.*

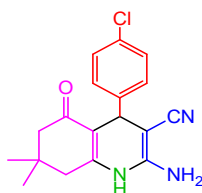
³ *Team of Biotechnology Materials, and Environment, Faculty of Sciences, Ibn Zohr University, BP 8106, Agadir, Morocco*

Corresponding author:

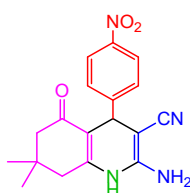
E-mail : thoumecv@gmail.com

Table SI1 : characterization of hexahydroquinoline derivatives (5a-5j)

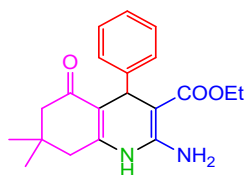
Product	NMR
	2-amino-7,7-dimethyl-5-oxo-4-phenyl-1,4,5,6,7,8-hexahydroquinoline-3-carbonitrile (5a): FT-IR (KBr) cm^{-1} : 3394-3325 (NH_2); 3215 (NH); 2200 (CN); 1660 (CO ketone). ^1H NMR (500 MHz, DMSO d_6) δ : 8.84 (s, 1H, NH), 7.25 (m, 2H, HAr), 7.11 (m, 3H, HAr), 6.96 (s, 2H, NH_2), 4.14 (s, 1H, CH), 2.07-2.22 (m, 4H, 2CH_2), 1.01 (s, 3H, CH_3), 0.91 (s, 3H, CH_3) ppm. ^{13}C NMR (126 MHz, DMSO d_6) δ : 196.21 (C5), 163.04 (C2), 159.04 (C4b), 145.30 (C1'), 128.88 (C3'), 127.70 (C2'), 127.12 (C4'), 120.29 (CN), 113.29 (C4a), 58.85 (C3), 50.51 (C6), 40.30 (C8), 36.12 (C4), 32.35 (C7), 28.95 (CH_3), 27.34 (CH_3) ppm, mp = 283–285 $^\circ\text{C}^1$.
	2-amino-7,7-dimethyl-5-oxo-4-(p-tolyl)-1,4,5,6,7,8-hexahydroquinoline-3-carbonitrile (5b): FT-IR (KBr) cm^{-1} : 3427, 3331 (NH_2); 3219 (NH); 2193 (CN); 1678 (CO ketone). ^1H NMR (500 MHz, DMSO d_6) δ : 8.81 (s, 1H, NH), 7.05 (m, 2H, HAr), 6.99 (m, 2H, HAr), 6.92 (s, 2H, NH_2), 4.10 (s, 1H, CH), 2.03-2.22 (m, 4H, 2CH_2), 2.21 (s, 3H, CH_3), 1.01 (s, 3H, CH_3), 0.92 (s, 3H, CH_3) ppm. ^{13}C NMR (126 MHz, DMSO d_6) δ : 196.18 (C5), 162.83 (C2), 158.98 (C4b), 142.32 (C1'), 136.17 (C4'), 129.43 (C3'), 127.63 (C2'), 120.31 (CN), 113.42 (C4a), 58.98 (C3), 50.53 (C6), 40.21 (C8), 35.73 (C4), 32.33 (C7), 28.97 (CH_3), 27.30 (CH_3), 21.14 (Ar CH_3) ppm, mp = 291–293 $^\circ\text{C}^1$.
	2-amino-4-(4-methoxyphenyl)-7,7-dimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carbonitrile (5c): FT-IR (KBr) cm^{-1} : 3373, 3304 (NH_2); 3203 (NH); 2198 (CN); 1662 (CO ketone). ^1H NMR (500 MHz, DMSO d_6) δ : 8.80 (s, 1H, NH), 7.01 (m, 2H, HAr), 6.92 (s, 2H, NH_2), 6.80 (m, 2H, HAr), 4.09 (s, 1H, CH), 3.67 (s, 3H, OCH_3), 2.05-2.20 (m, 4H, 2CH_2), 0.99 (s, 3H, CH_3), 0.92 (s, 3H, CH_3) ppm. ^{13}C NMR (126 MHz, DMSO d_6) δ : 196.22 (C5), 162.69 (C2), 158.96 (C4'), 158.46 (C4b), 137.40 (C1'), 128.77 (C2'), 120.36 (CN), 114.21 (C3'), 113.54 (C4a), 59.10 (C3), 55.52 (Ar OCH_3), 50.55 (C6), 40.20 (C8), 35.30 (C4), 32.32 (C7), 28.96 (CH_3), 27.30 (CH_3) ppm, mp = 283–286 $^\circ\text{C}^1$.



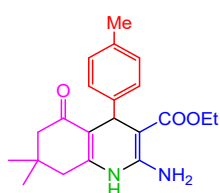
2-amino-4-(4-chlorophenyl)-7,7-dimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carbonitrile (**5d**): FT-IR (KBr) cm^{-1} : 3379, 3329 (NH_2); 3180 (NH); 2189 (CN); 1677 (CO ketone). ^1H NMR (500 MHz, DMSO d_6) δ : 8.88 (s, 1H, NH), 7.31 (m, 2H, HAr), 7.14 (m, 2H, HAr), 7.03 (s, 2H, NH_2), 4.16 (s, 1H, CH), 2.07-2.21 (m, 4H, 2CH_2), 0.99 (s, 3H, CH_3), 0.92 (s, 3H, CH_3) ppm. ^{13}C NMR (126 MHz, DMSO d_6) δ : 196.23 (C5), 163.17 (C2), 159.04 (C4b), 144.30 (C1'), 131.66 (C4'), 129.67 (C2'), 128.84 (C3'), 120.12 (CN), 112.87 (C4a), 58.30 (C3), 50.48 (C6), 40.21 (C8), 35.65 (C4), 32.34 (C7), 28.86 (CH_3), 27.39 (CH_3) ppm, mp = 287–290 $^\circ\text{C}^1$.



2-amino-7,7-dimethyl-4-(4-nitrophenyl)-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carbonitrile (**5e**): FT-IR (KBr) cm^{-1} : 3394, 3321 (NH_2); 3211 (NH); 2193 (CN); 1681 (CO ketone). ^1H NMR (500 MHz, DMSO d_6) δ : 8.99 (s, 1H, NH), 8.13 (m, 2H, HAr), 7.42 (m, 2H, HAr), 7.14 (s, 2H, NH_2), 4.34 (s, 1H, CH), 2.05-2.22 (m, 4H, 2CH_2), 1.00 (s, 3H, CH_3), 0.92 (s, 3H, CH_3) ppm. ^{13}C NMR (126 MHz, DMSO d_6) δ : 196.23 (C5), 163.64 (C2), 152.84 (C1'), 146.79 (C4b), 129.16 (C2'), 124.20 (C3'), 119.88 (CN), 112.28 (C4a), 57.53 (C3), 50.39 (C6), 40.22 (C8), 36.21 (C4), 32.34 (C7), 28.78 (CH_3), 27.45 (CH_3) ppm, mp = 291–293 $^\circ\text{C}^1$.

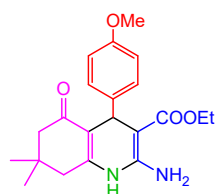


ethyl 2-amino-7,7-dimethyl-5-oxo-4-phenyl-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**5f**): FT-IR (KBr) cm^{-1} : 3402, 3286(NH_2); 3215(NH); 1693(CO ester); 1664(CO ketone); 1369, 1037(C-O). ^1H NMR (400 MHz, DMSO d_6) δ : 8.89 (s, 1H, NH), 7.55 (s, 2H, NH_2), 7.16 (m, 5H, HAr), 4.53 (s, 1H, CH), 3.96 (m, 2H, CH_2), 2.06-2.26 (m, 4H, 2CH_2), 1.07-1.11 (m, 2H, CH_2), 1.04 (s, 3H, CH_3), 0.90 (s, 3H, CH_3) ppm. ^{13}C NMR (100 MHz, DMSO d_6) δ : 196.24 (C5), 168.48 (C2), 162.58 (COOEt), 159.63 (C4b), 146.84 (C1'), 128.16 (C3'), 128.13 (C2'), 126.26 (C4'), 116.06 (C4a), 78.37 (C3), 59.24 ($\text{OCH}_2\text{-CH}_3$), 50.45 (C6), 39.76 (C8), 33.76 (C4), 32.31 (C7), 29.11 (CH_3), 26.91 (CH_3), 14.65 ($\text{OCH}_2\text{-CH}_3$) ppm, mp = 158–161 $^\circ\text{C}^2$.

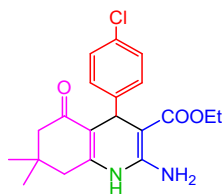


ethyl 2-amino-7,7-dimethyl-5-oxo-4-(p-tolyl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**5g**): FT-IR (KBr) cm^{-1} : 3406, 3290(NH_2); 3230(NH); 1701(CO ester); 1660(CO ketone); 1357, 1037(C-O). ^1H NMR (400 MHz, DMSO d_6) δ : 8.85 (s, 1H, NH), 7.51 (s, 2H, NH_2), 7.01 (m, 4H, HAr), 4.47 (s, 1H, CH), 3.93 (m, 2H, CH_2), 2.02-2.27 (m, 4H, 2CH_2), 2.21 (s, 3H, CH_3Ar), 1.10 (m, 3H, CH_3), 1.02 (s, 3H, CH_3), 0.91 (s, 3H, CH_3) ppm. ^{13}C

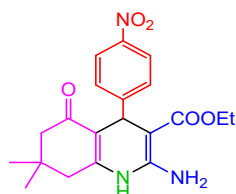
NMR (100 MHz, DMSO d_6) δ : 196.26 (C5), 168.51 (C2), 162.47 (COOEt), 159.57 (C4b), 143.87 (C1'), 135.17 (C4'), 128.73 (C3'), 128.02 (C2'), 116.16 (C4a), 78.49 (C3), 59.24 (OCH₂-CH₃), 50.46 (C6), 39.75 (C8), 33.26 (C4), 32.32 (C7), 29.14 (CH₃), 26.91 (CH₃), 21.00 (ArCH₃), 14.68 (OCH₂-CH₃) ppm, mp = 156–159 °C².



ethyl 2-amino-4-(4-methoxyphenyl)-7,7-dimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**5h**): FT-IR (KBr) cm^{-1} : 3410, 3304(NH₂); 3223(NH); 1691(CO ester); 1664(CO ketone); 1285, 1035(C-O). ¹H NMR (400 MHz, DMSO d_6) δ : 8.88 (s, 1H, NH), 7.50 (s, 2H, NH₂), 7.05 (m, 2H, HAr), 6.76 (m, 2H, HAr), 4.45 (s, 1H, CH), 3.95 (m, 2H, CH₂), 3.68 (s, 3H, CH₃-O), 2.04-2.25 (m, 4H, 2CH₂), 1.11 (m, 3H, CH₃), 1.04 (s, 3H, CH₃), 0.91 (s, 3H, CH₃) ppm. ¹³C NMR (100 MHz, DMSO d_6) δ : 196.30 (C5), 168.53 (C2), 162.34 (COOEt), 159.55 (C4b), 157.79 (C4'), 138.97 (C1'), 129.05 (C2'), 116.24 (C3'), 113.53 (C4a), 78.61 (C3), 59.23 (OCH₂-CH₃), 55.33 (ArOCH₃), 50.47 (C6), 39.75 (C8), 33.82 (C4), 32.31 (C7), 29.12 (CH₃), 26.95 (CH₃), 14.70 (OCH₂-CH₃) ppm, mp = 134–136 °C².



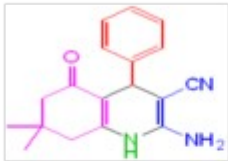
Ethyl 2-amino-4-(4-chlorophenyl)-7,7-dimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**5i**): FT-IR (KBr) cm^{-1} : 3481, 3332(NH₂); 3197(NH); 1695(CO ester); 1660(CO ketone); 1373, 1087(C-O). ¹H NMR (400 MHz, DMSO d_6) δ : 8.94 (s, 1H, NH), 7.59 (s, 2H, NH₂), 7.26 (m, 2H, HAr), 7.15 (m, 2H, HAr), 4.49 (s, 1H, CH), 3.95 (m, 2H, CH₂), 2.06-2.26 (m, 4H, 2CH₂), 1.06-1.10 (m, 2H, CH₂), 1.03 (s, 3H, CH₃), 0.88 (s, 3H, CH₃) ppm. ¹³C NMR (100 MHz, DMSO d_6) δ : 196.30 (C5), 168.31 (C2), 162.73 (COOEt), 159.58 (C4b), 145.85 (C1'), 130.74 (C4'), 130.04 (C2'), 128.12 (C3'), 115.53 (C4a), 77.76 (C3), 59.31 (OCH₂-CH₃), 50.38 (C6), 40.00 (C8), 33.45 (C4), 32.32 (C7), 29.06 (CH₃), 26.94 (CH₃), 14.65 (OCH₂-CH₃) ppm, mp = 159–161 °C².



ethyl 2-amino-4-(4-nitrophenyl)-7,7-dimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**5j**): FT-IR (KBr) cm^{-1} : 3475, 3334(NH₂); 3199(NH); 1685(CO ester); 1656(CO ketone); 1348, 1043(C-O). ¹H NMR (400 MHz, DMSO d_6) δ : 9.09 (s, 1H, NH), 8.10 (m, 2H, HAr), 7.70 (s, 2H, NH₂), 7.42 (m, 2H, HAr), 4.62 (s, 1H, CH), 3.99 (m, 2H, CH₂), 2.06-2.27 (m, 4H, 2CH₂), 1.05-1.09 (m, 2H, CH₂), 1.04 (s, 3H, CH₃), 0.88 (s, 3H, CH₃) ppm. ¹³C NMR (100 MHz, DMSO d_6) δ : 196.28 (C5), 168.11 (C2), 163.17 (COOEt), 159.60 (C1'), 154.63 (C4b), 146.16 (C4'), 129.58 (C2'), 123.50 (C3'), 114.79 (C4a), 76.99 (C3), 59.40 (OCH₂-CH₃), 50.29 (C6), 39.96 (C8), 34.36

Copies of ^{13}C -NMR and ^1H -NMR spectral





D358U22RMN02
D358U22RMN02 single pulse decoupled gated NOE

Chemical structure of compound 10b is shown in the inset. The structure is 2-amino-4-(4-methylphenyl)-6,6-dimethyl-1H-pyrimidin-5(1H)-one. The structure is color-coded: methyl groups in pink, the phenyl ring in red, the cyano group in blue, and the amino group in green.

13C NMR spectrum (ppm) of compound 10b. The spectrum shows peaks corresponding to the structure, with integration values provided for each peak.

Chemical Shift (ppm)	Integration
198.18	1.00
162.83	1.04
158.98	1.10
142.38	0.98
136.17	0.99
128.43	3.00
127.63	3.00
120.31	0.81
113.42	1.01
54.96	1.00
50.53	1.87
40.63	24.02
40.54	1.45
40.37	1.60
40.21	1.60
40.13	2.25
39.87	2.25
39.71	1.78
38.94	1.78
38.73	1.78
38.53	1.78
28.07	1.78
27.30	1.78
21.14	1.78

Fig. SI3. The ^{13}C -NMR spectrum of compound 5b

D358U22RMN02
D358U22RMN02 single_pulse

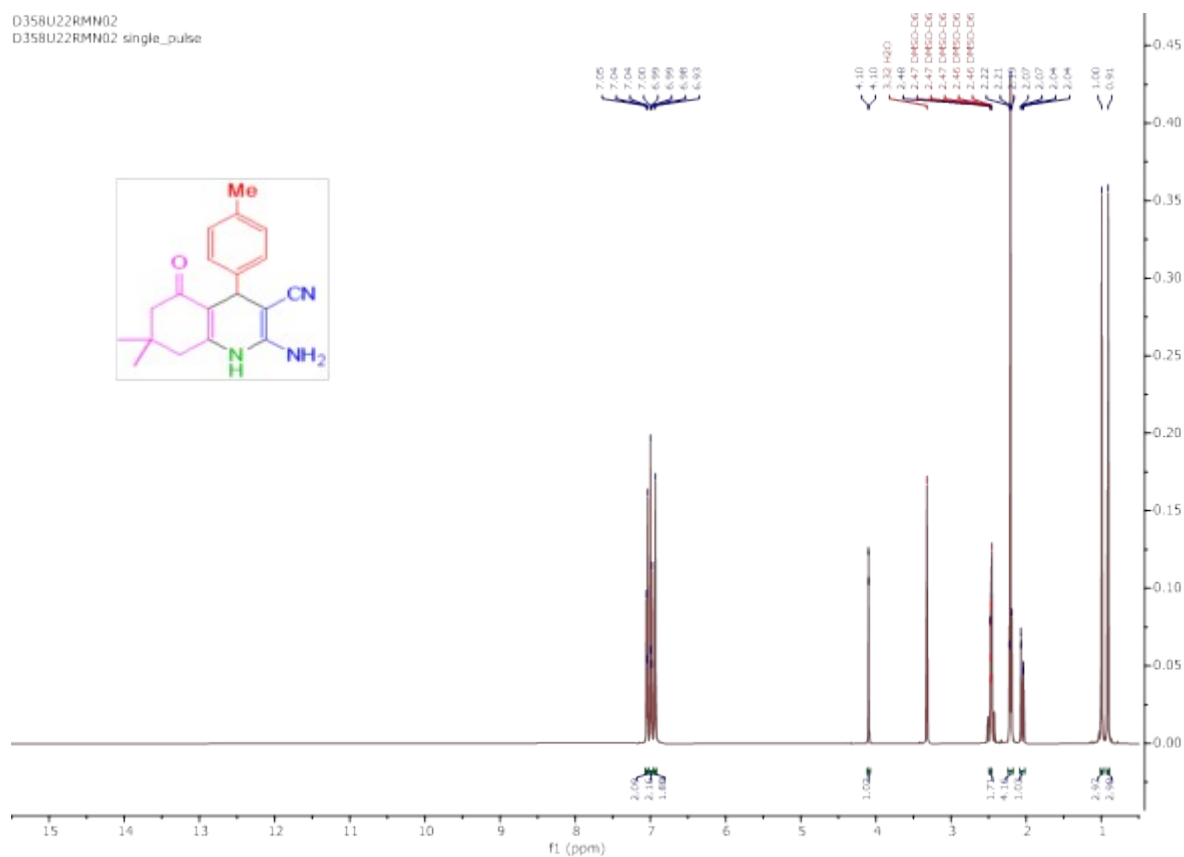


Fig. SI4. The ¹H-NMR spectrum of compound 5b

D358U22RMN03
D358U22RMN03 single pulse decoupled gated NOE

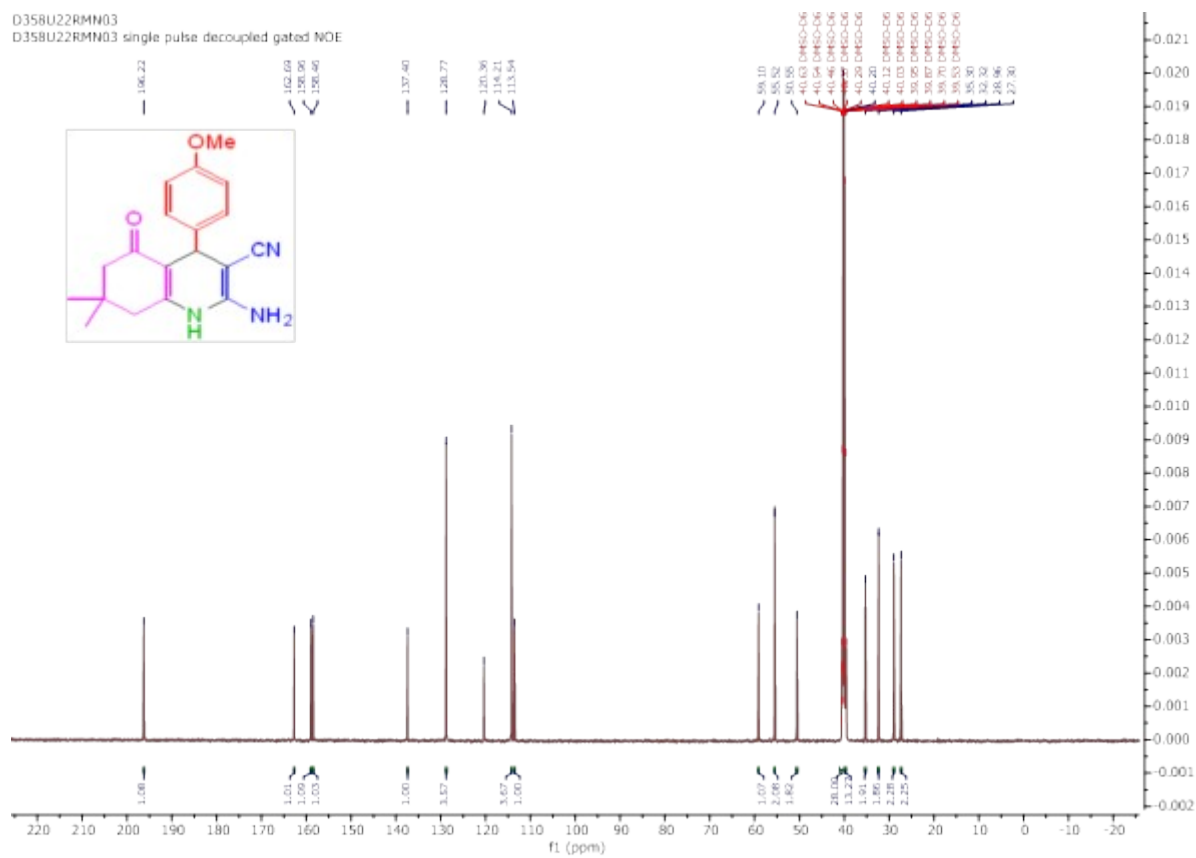


Fig. SI5. The ¹³C-NMR spectrum of compound 5c

D358U22RMN03
D358U22RMN03 single_pulse

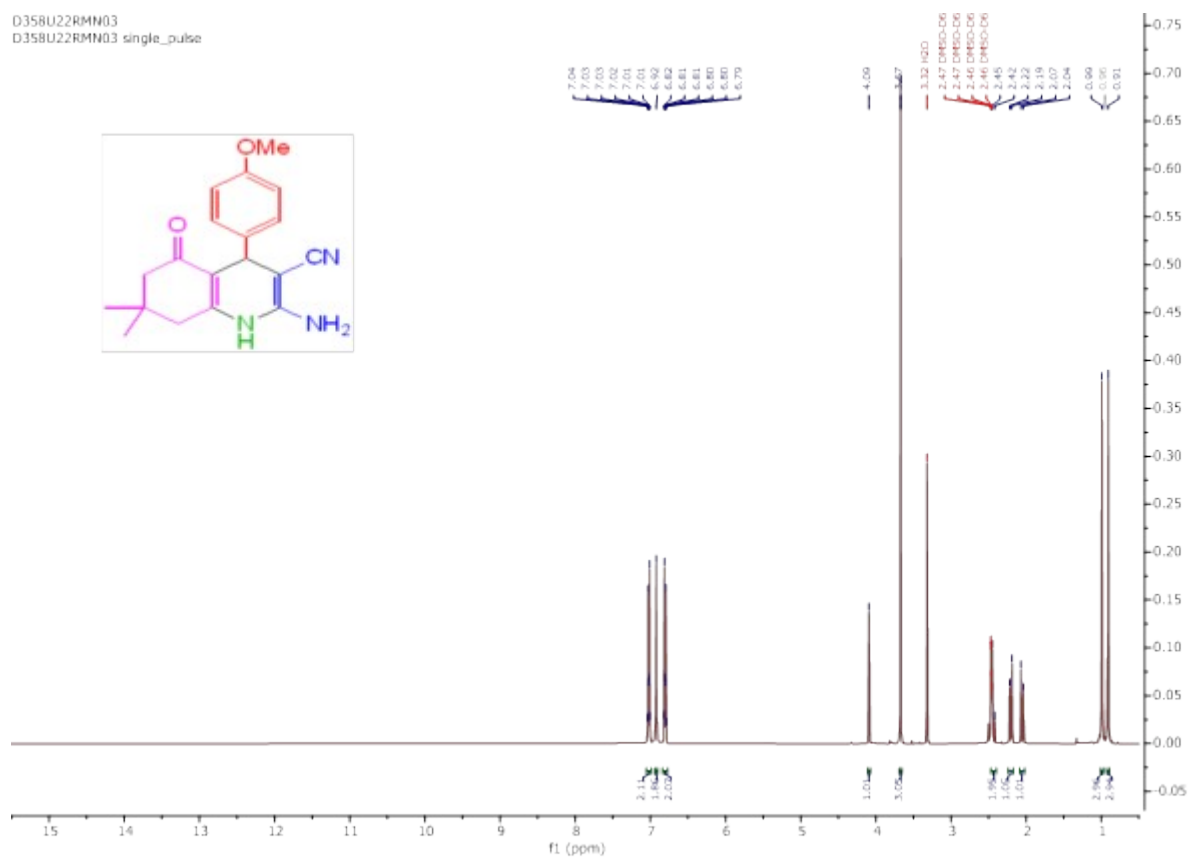


Fig. SI6. The ¹H-NMR spectrum of compound 5c

D358U22RMN04
D358U22RMN04 single pulse decoupled gated NOE

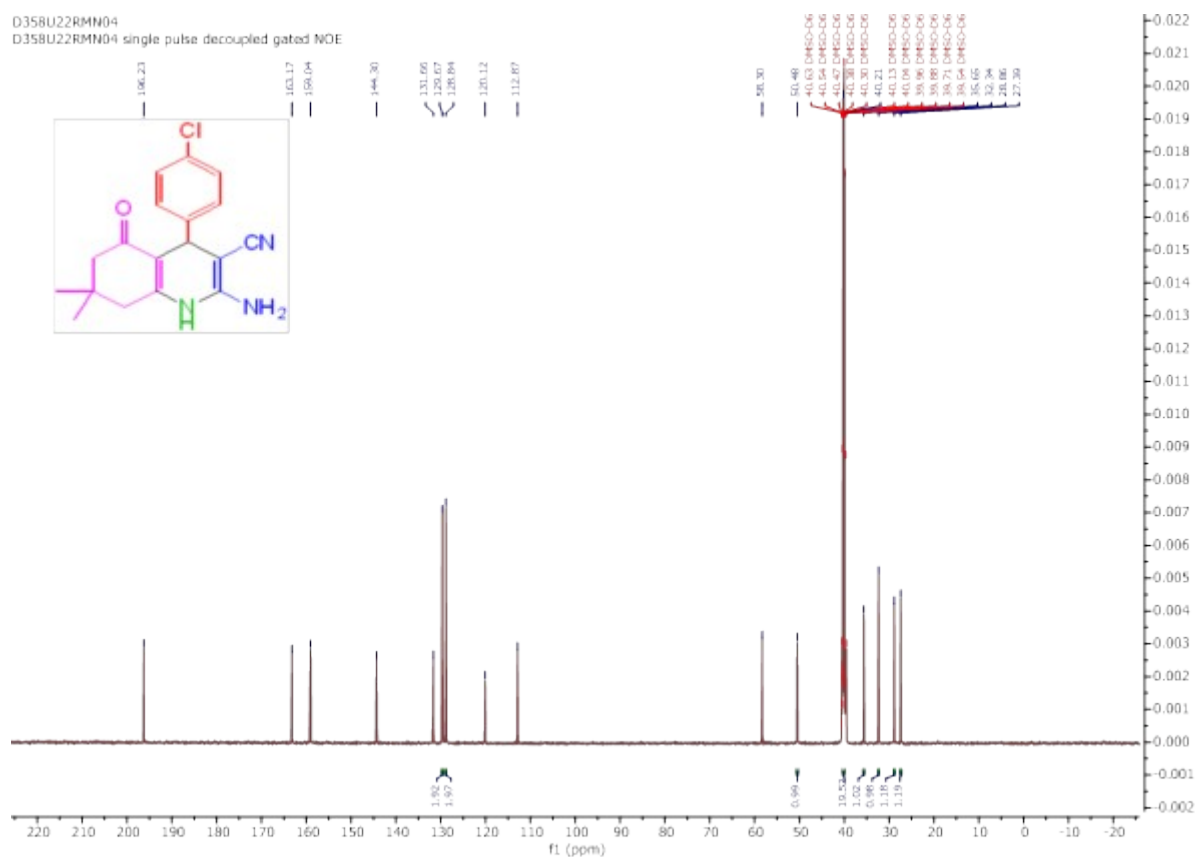


Fig. SI7. The ¹³C-NMR spectrum of compound 5d

D358U22RMN04
D358U22RMN04 single_pulse

Chemical structure of 2-(4-chlorophenyl)-4,4-dimethyl-2,6-diaminocyclohex-1-en-1-one is shown. The structure features a cyclohexenone ring with a 4-chlorophenyl group at position 2, and dimethyl and diamino substituents at position 4.

¹H NMR spectrum (ppm) data:

Chemical Shift (ppm)	Integration
7.32, 7.31, 7.30, 7.29, 7.14, 7.13, 7.12, 7.03	2.12, 2.12, 2.12, 2.12, 2.12, 2.12, 2.12, 2.12
4.16	1.00
3.31 (H ₂ O)	-
2.81, 2.51, 2.48, 2.47, 2.46, 2.45, 2.44, 2.22, 2.19, 2.08, 2.00, 1.99, 1.91	2.74, 1.04, 1.04, 2.74, 1.04, 1.04, 2.74, 1.04, 1.04, 2.74, 1.04, 1.04, 2.74, 1.04, 1.04
1.00	3.00, 3.00

Fig. SI8. The ^1H -NMR spectrum of compound 5d

D358U22RMN06
D358U22RMN06 single pulse decoupled gated NOE

Chemical structure of 2-amino-4-cyano-6-(4-nitrophenyl)-6,6-dimethyl-1,2,3,4-tetrahydropyridine is shown. The structure is labeled with atoms: C1 (green), C2 (blue), C3 (green), C4 (red), C5 (red), C6 (red), C7 (green), C8 (green), C9 (green), C10 (green), C11 (green), C12 (green), C13 (green), C14 (green), C15 (green), C16 (green), C17 (green), C18 (green), C19 (green), C20 (green), C21 (green), C22 (green), C23 (green), C24 (green), C25 (green), C26 (green), C27 (green), C28 (green), C29 (green), C30 (green), C31 (green), C32 (green), C33 (green), C34 (green), C35 (green), C36 (green), C37 (green), C38 (green), C39 (green), C40 (green), C41 (green), C42 (green), C43 (green), C44 (green), C45 (green), C46 (green), C47 (green), C48 (green), C49 (green), C50 (green), C51 (green), C52 (green), C53 (green), C54 (green), C55 (green), C56 (green), C57 (green), C58 (green), C59 (green), C60 (green), C61 (green), C62 (green), C63 (green), C64 (green), C65 (green), C66 (green), C67 (green), C68 (green), C69 (green), C70 (green), C71 (green), C72 (green), C73 (green), C74 (green), C75 (green), C76 (green), C77 (green), C78 (green), C79 (green), C80 (green), C81 (green), C82 (green), C83 (green), C84 (green), C85 (green), C86 (green), C87 (green), C88 (green), C89 (green), C90 (green), C91 (green), C92 (green), C93 (green), C94 (green), C95 (green), C96 (green), C97 (green), C98 (green), C99 (green), C100 (green).

13C NMR spectrum (ppm) showing peaks at 200.23, 163.64, 159.14, 152.84, 146.79, 129.16, 128.20, 119.88, 112.28, 57.53, 50.39, 46.60, 46.51, 46.49, 46.47, 46.45, 46.43, 46.41, 46.39, 46.37, 46.35, 46.33, 46.31, 46.29, 46.27, 46.25, 46.23, 46.21, 46.19, 46.17, 46.15, 46.13, 46.11, 46.09, 46.07, 46.05, 46.03, 46.01, 45.99, 45.97, 45.95, 45.93, 45.91, 45.89, 45.87, 45.85, 45.83, 45.81, 45.79, 45.77, 45.75, 45.73, 45.71, 45.69, 45.67, 45.65, 45.63, 45.61, 45.59, 45.57, 45.55, 45.53, 45.51, 45.49, 45.47, 45.45, 45.43, 45.41, 45.39, 45.37, 45.35, 45.33, 45.31, 45.29, 45.27, 45.25, 45.23, 45.21, 45.19, 45.17, 45.15, 45.13, 45.11, 45.09, 45.07, 45.05, 45.03, 45.01, 44.99, 44.97, 44.95, 44.93, 44.91, 44.89, 44.87, 44.85, 44.83, 44.81, 44.79, 44.77, 44.75, 44.73, 44.71, 44.69, 44.67, 44.65, 44.63, 44.61, 44.59, 44.57, 44.55, 44.53, 44.51, 44.49, 44.47, 44.45, 44.43, 44.41, 44.39, 44.37, 44.35, 44.33, 44.31, 44.29, 44.27, 44.25, 44.23, 44.21, 44.19, 44.17, 44.15, 44.13, 44.11, 44.09, 44.07, 44.05, 44.03, 44.01, 43.99, 43.97, 43.95, 43.93, 43.91, 43.89, 43.87, 43.85, 43.83, 43.81, 43.79, 43.77, 43.75, 43.73, 43.71, 43.69, 43.67, 43.65, 43.63, 43.61, 43.59, 43.57, 43.55, 43.53, 43.51, 43.49, 43.47, 43.45, 43.43, 43.41, 43.39, 43.37, 43.35, 43.33, 43.31, 43.29, 43.27, 43.25, 43.23, 43.21, 43.19, 43.17, 43.15, 43.13, 43.11, 43.09, 43.07, 43.05, 43.03, 43.01, 42.99, 42.97, 42.95, 42.93, 42.91, 42.89, 42.87, 42.85, 42.83, 42.81, 42.79, 42.77, 42.75, 42.73, 42.71, 42.69, 42.67, 42.65, 42.63, 42.61, 42.59, 42.57, 42.55, 42.53, 42.51, 42.49, 42.47, 42.45, 42.43, 42.41, 42.39, 42.37, 42.35, 42.33, 42.31, 42.29, 42.27, 42.25, 42.23, 42.21, 42.19, 42.17, 42.15, 42.13, 42.11, 42.09, 42.07, 42.05, 42.03, 42.01, 41.99, 41.97, 41.95, 41.93, 41.91, 41.89, 41.87, 41.85, 41.83, 41.81, 41.79, 41.77, 41.75, 41.73, 41.71, 41.69, 41.67, 41.65, 41.63, 41.61, 41.59, 41.57, 41.55, 41.53, 41.51, 41.49, 41.47, 41.45, 41.43, 41.41, 41.39, 41.37, 41.35, 41.33, 41.31, 41.29, 41.27, 41.25, 41.23, 41.21, 41.19, 41.17, 41.15, 41.13, 41.11, 41.09, 41.07, 41.05, 41.03, 41.01, 40.99, 40.97, 40.95, 40.93, 40.91, 40.89, 40.87, 40.85, 40.83, 40.81, 40.79, 40.77, 40.75, 40.73, 40.71, 40.69, 40.67, 40.65, 40.63, 40.61, 40.59, 40.57, 40.55, 40.53, 40.51, 40.49, 40.47, 40.45, 40.43, 40.41, 40.39, 40.37, 40.35, 40.33, 40.31, 40.29, 40.27, 40.25, 40.23, 40.21, 40.19, 40.17, 40.15, 40.13, 40.11, 40.09, 40.07, 40.05, 40.03, 40.01, 39.99, 39.97, 39.95, 39.93, 39.91, 39.89, 39.87, 39.85, 39.83, 39.81, 39.79, 39.77, 39.75, 39.73, 39.71, 39.69, 39.67, 39.65, 39.63, 39.61, 39.59, 39.57, 39.55, 39.53, 39.51, 39.49, 39.47, 39.45, 39.43, 39.41, 39.39, 39.37, 39.35, 39.33, 39.31, 39.29, 39.27, 39.25, 39.23, 39.21, 39.19, 39.17, 39.15, 39.13, 39.11, 39.09, 39.07, 39.05, 39.03, 39.01,

Fig. SI9. The ^{13}C -NMR spectrum of compound 5e

D358U22RMN06
D358U22RMN06 single_pulse

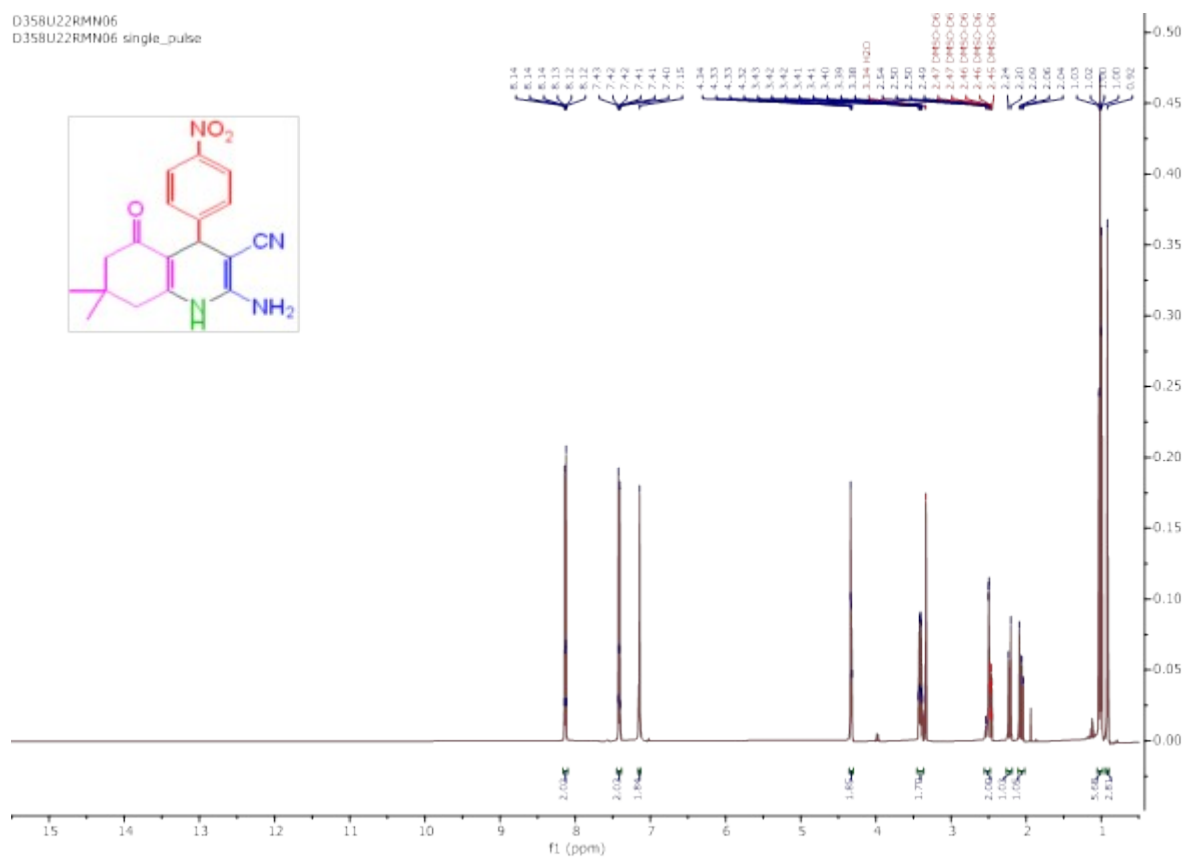


Fig. SI10. The ¹H-NMR spectrum of compound 5e

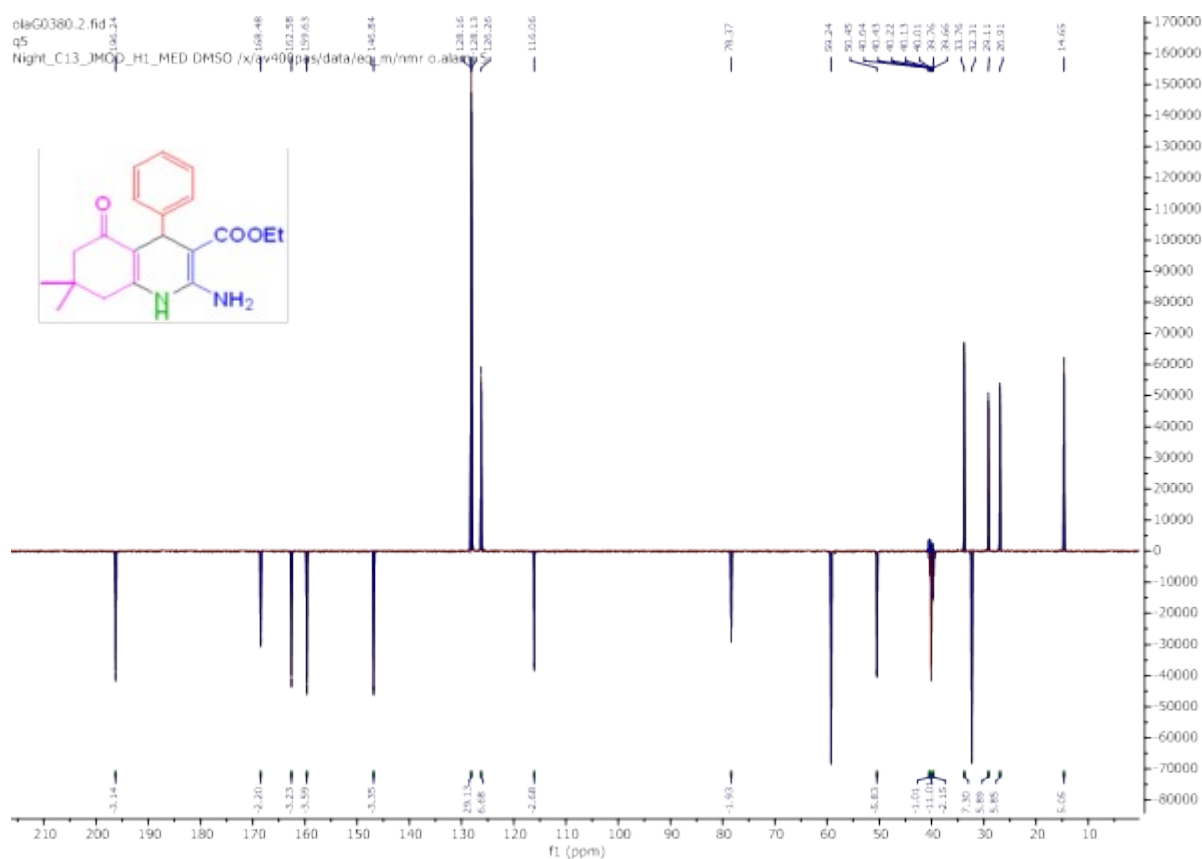
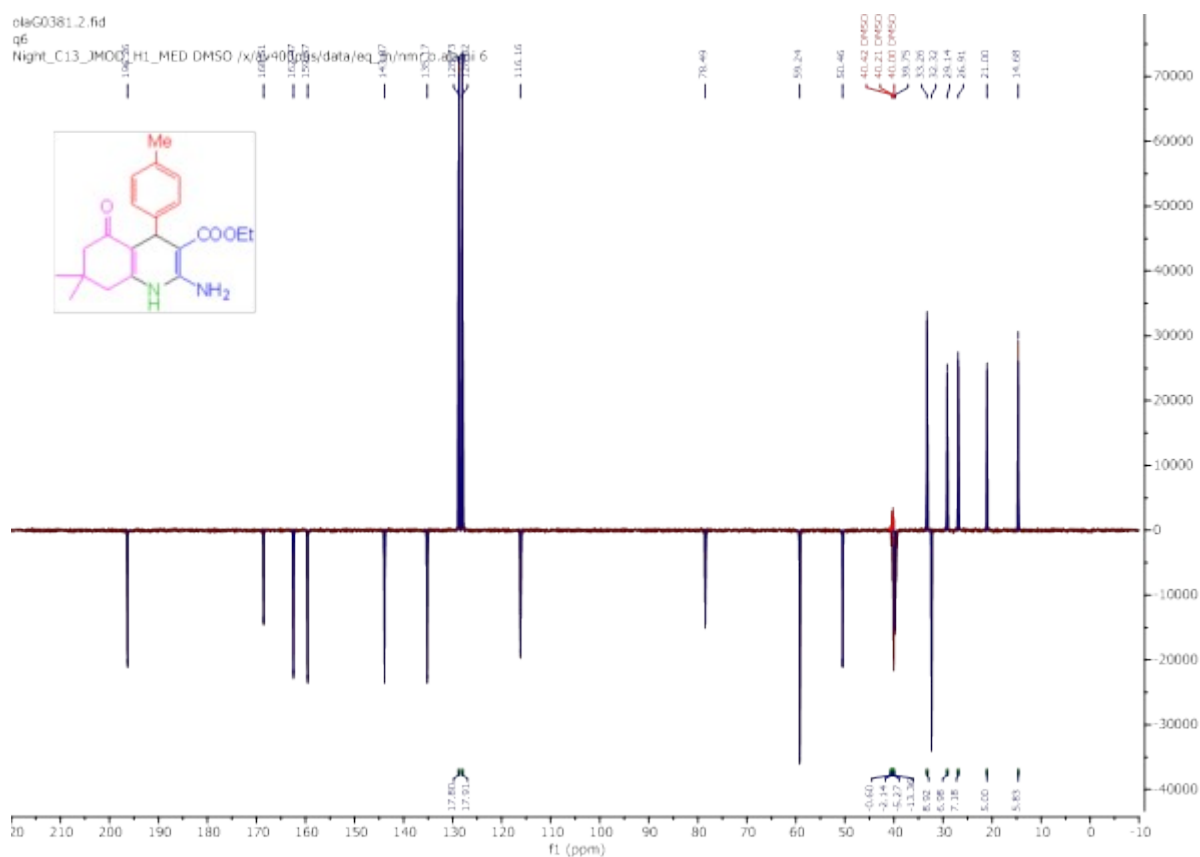
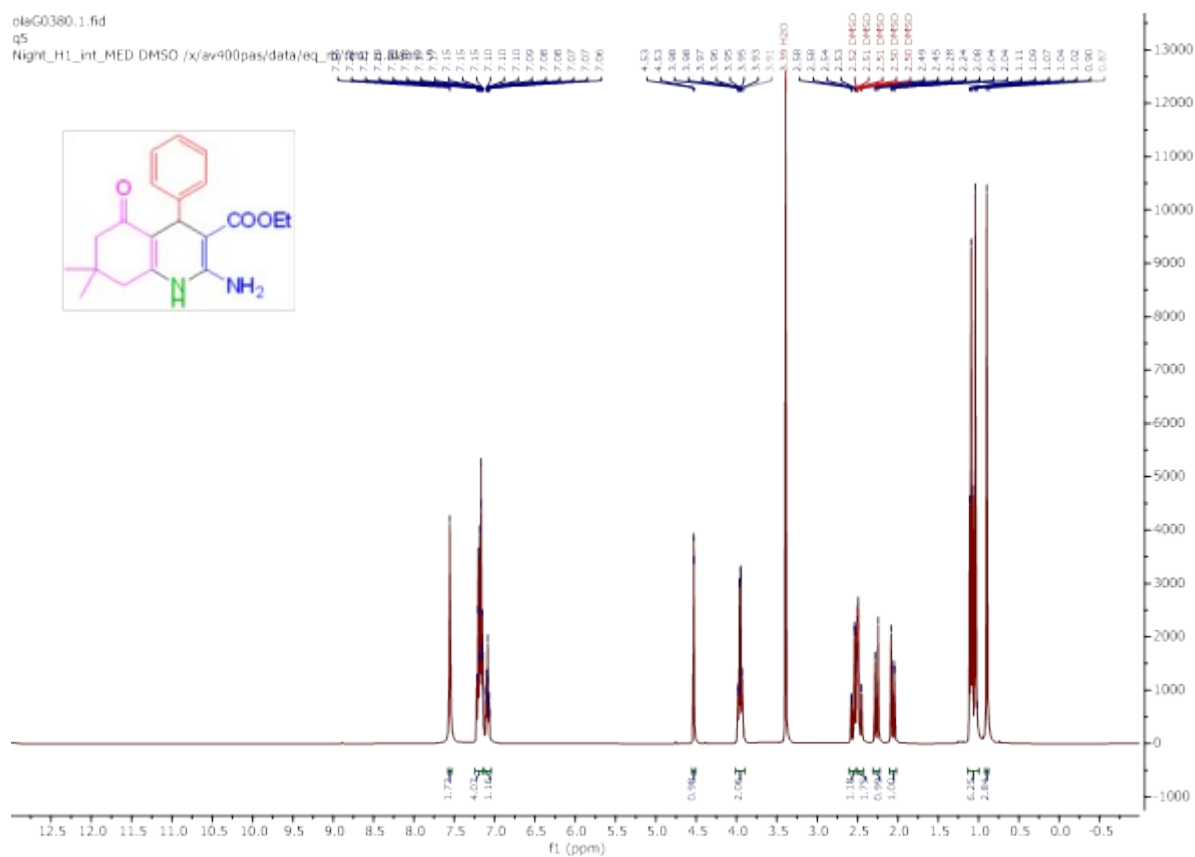


Fig. SI11. The ¹³C-NMR spectrum of compound 5f



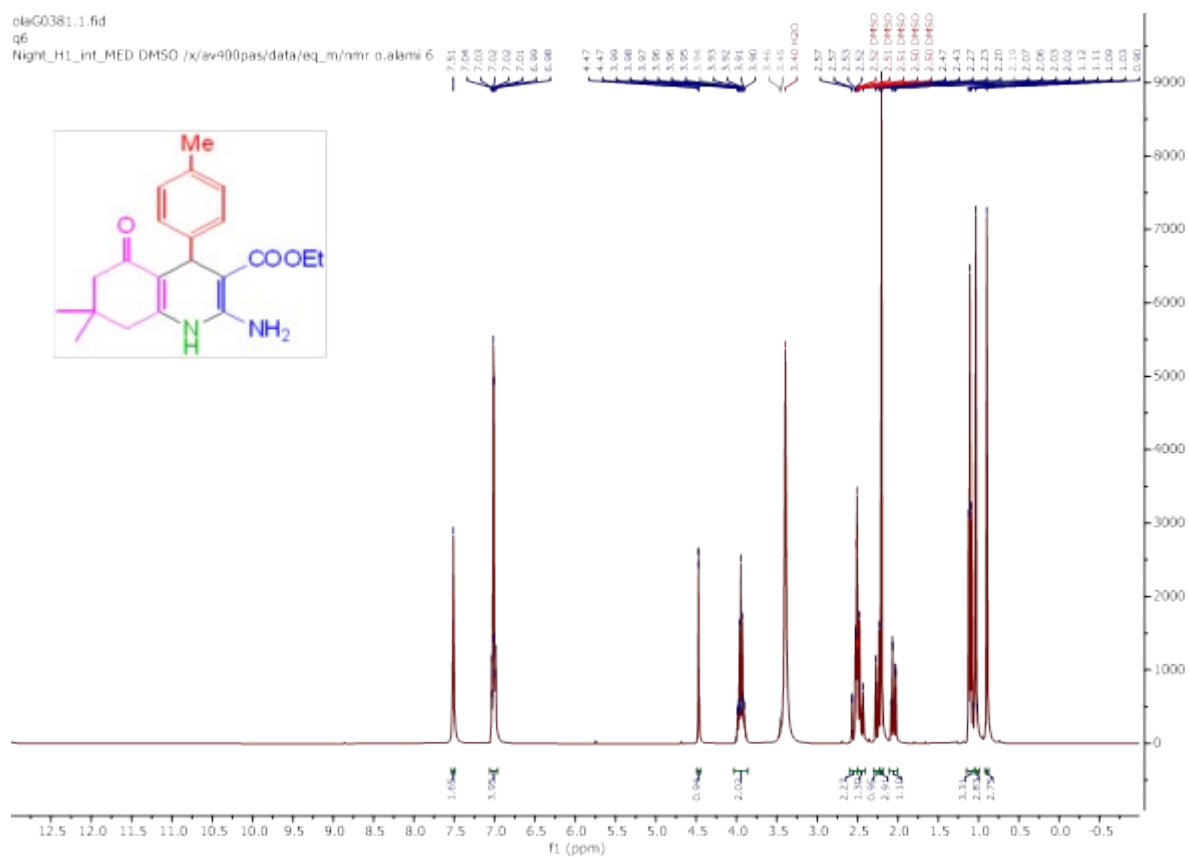


Fig. SI14. The ¹H-NMR spectrum of compound 5g

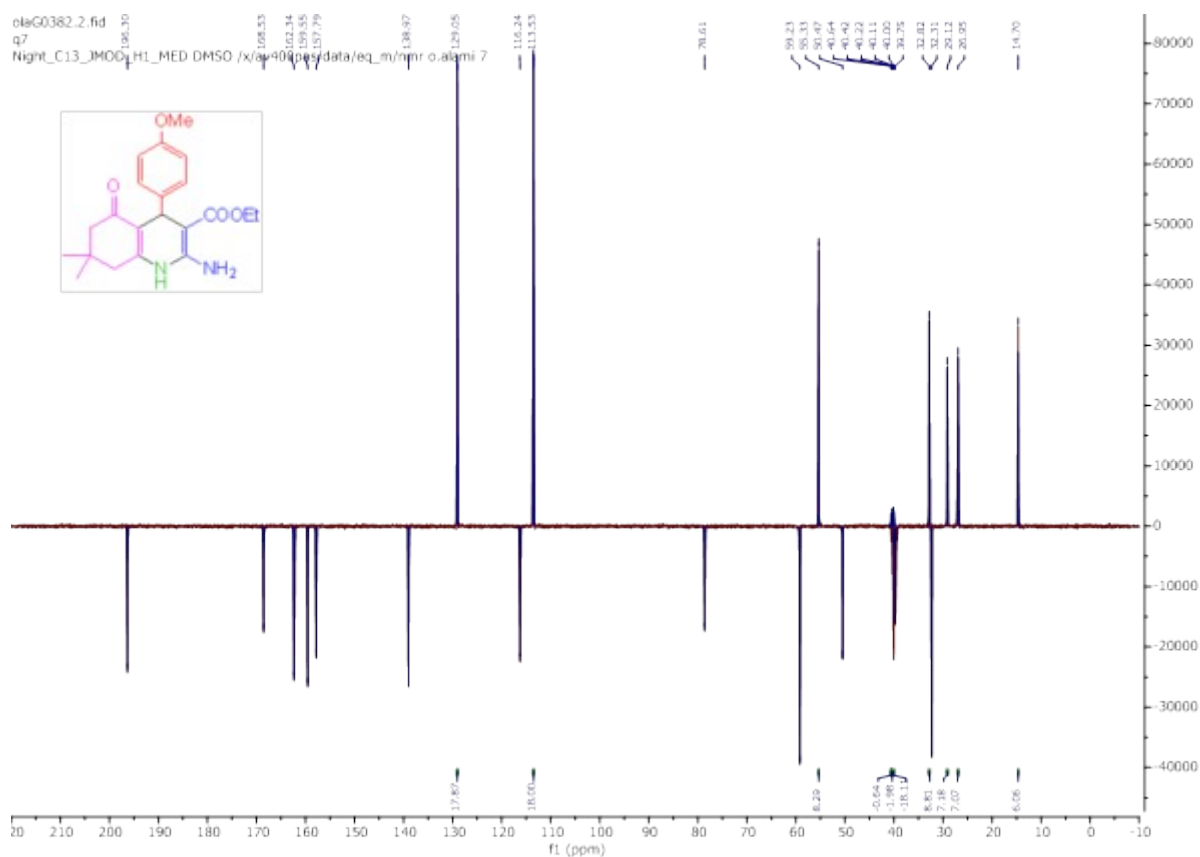


Fig. SI15. The ¹³C-NMR spectrum of compound 5h

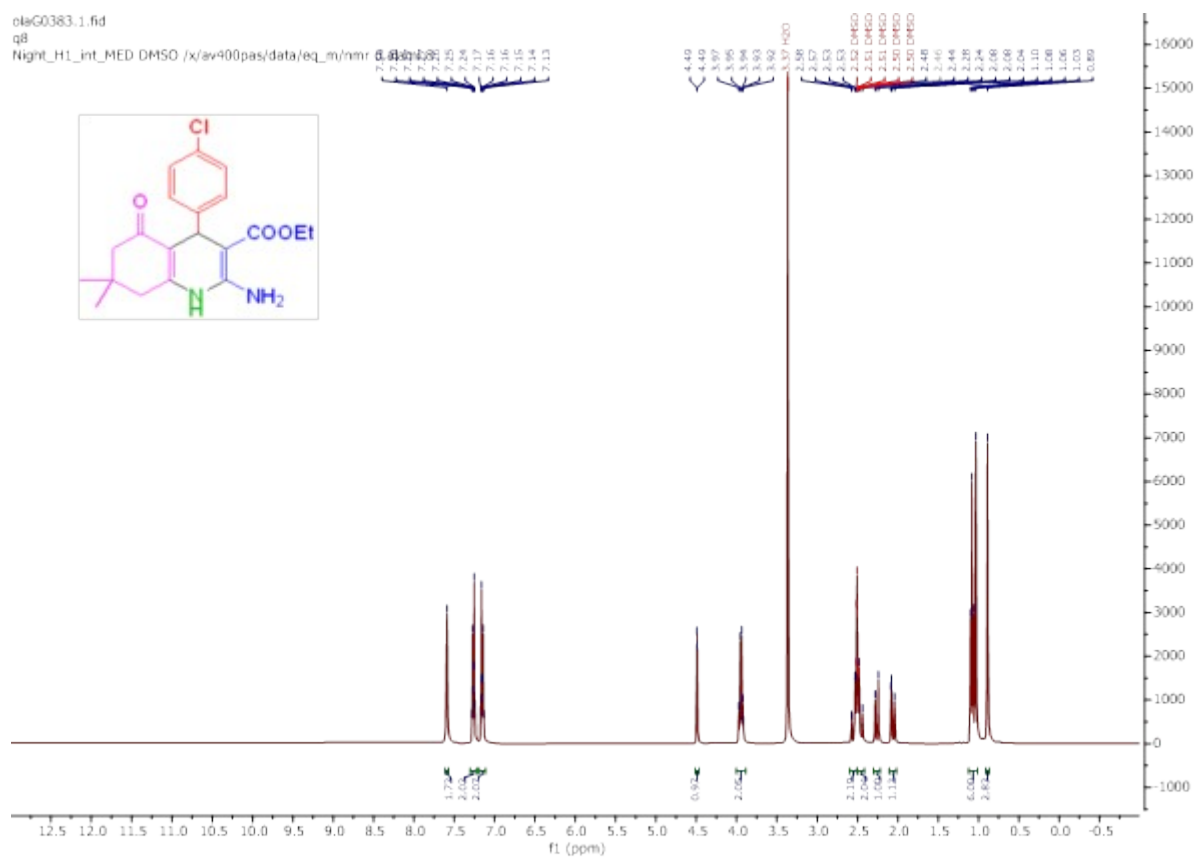


Fig. S118. The ^1H -NMR spectrum of compound 5i

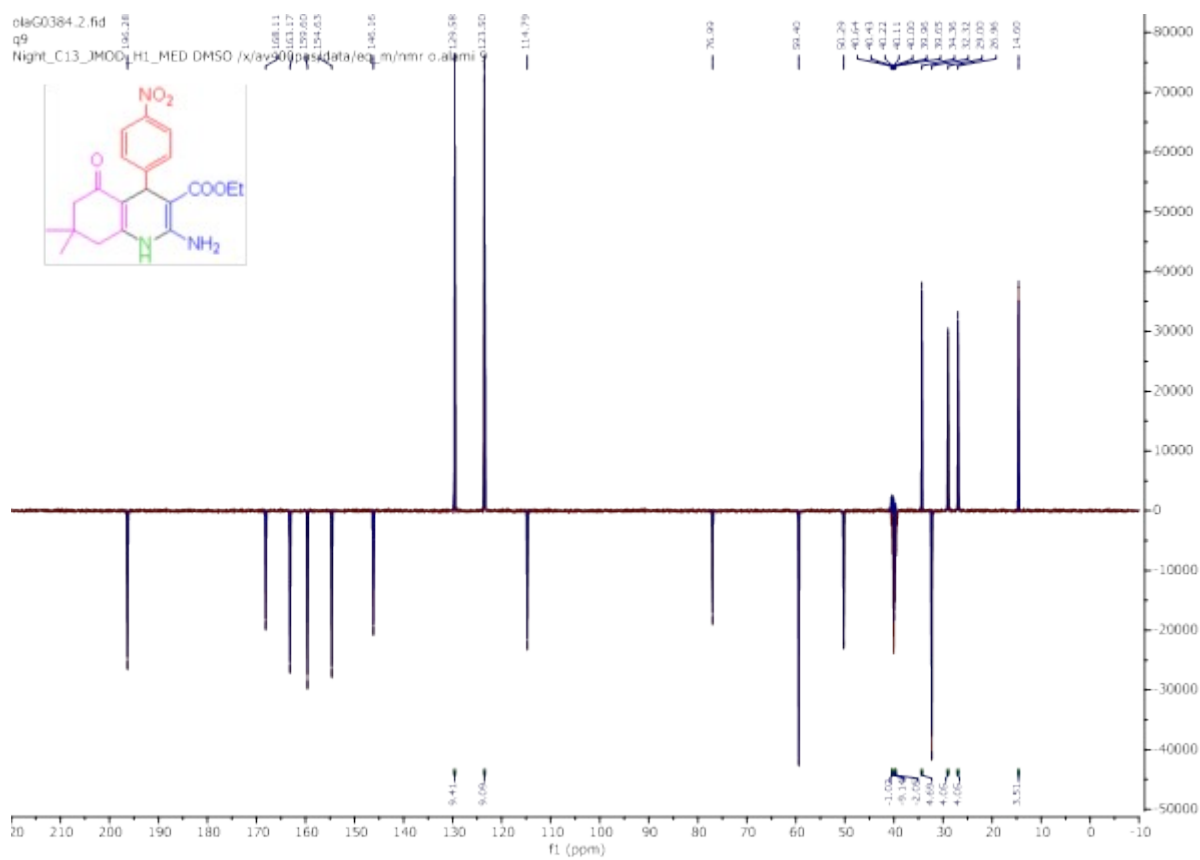


Fig. S119. The ^{13}C -NMR spectrum of compound 5j

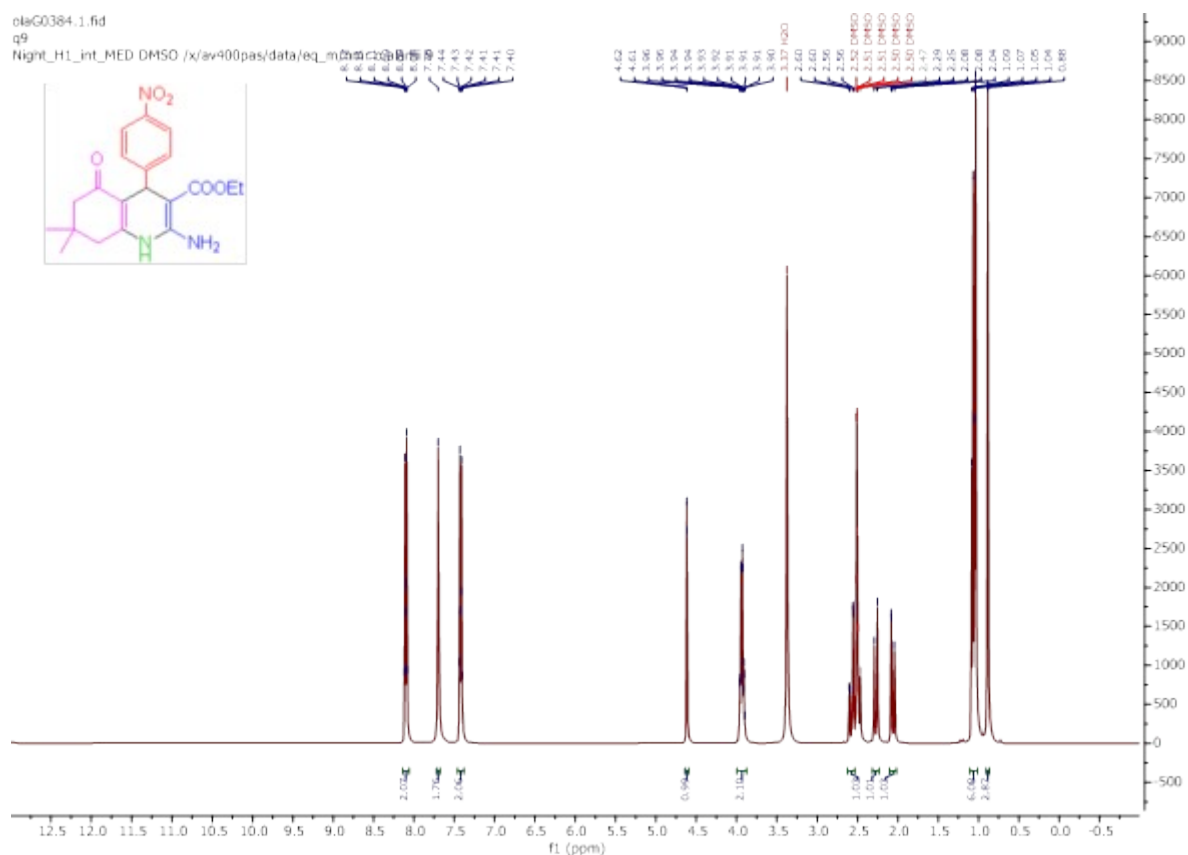


Fig. S120. The ^1H -NMR spectrum of compound **5j**

References

- 1 D. Patil, D. Chandam, A. Mulik, S. Jagdale, P. Patil and M. Deshmukh, *J. Saudi Chem. Soc.*, 2017, **21**, S329–S338.
- 2 D. Aute, A. Kshirsagar, B. Uphade and A. Gadhave, *Polycycl. Aromat. Compd.*, 2022, **42**, 1375–1390.