# Supplementary Information

# Brønsted acid catalysed enantioselective Biginelli reaction

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**(*R*)-(-)-Ethyl 6-methyl-4-phenyl-2-thioxo-3,4-dihydropyrimidine-5-carboxylate (5a):**
pale grey solid (135 mg, 98% yield); mp 201–202 °C ( from EtOH; lit[17] 200–202 °C). 96.4% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.11 min (major), $t_R$= 12.54 min (minor); $[a]_D$ -65.4 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 10.24 (br s, 1H), 9.55 (br s, 1H), 7.31–7.12 (m, 5H), 5.09 (d, $J$ = 3.9 Hz, 1H), 3.92 (q, $J$ = 7.0 Hz, 2H), 2.21 (s, 3H), 1.01 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 174.9, 165.8, 145.7, 129.3, 128.3, 127.0, 101.3, 60.2, 54.7, 17.8, 14.7. MS (*m/z,* EI): 276 [$M^+$] (45), 247 (40), 199 (100). IR (neat) ν ($cm^{-1}$): 3311 (NH), 3112 (NH), 1665 (CO), 1195 (CS).

**(*R*)-(-)-Ethyl 6-methyl-4-(2-tolyl)-2-thioxo-3,4-dihydropyrimidine-5-carboxylate (5b):**
pale yellow solid (140 mg, 97% yield); mp 197–198 °C (from EtOH; lit[7b] 196–199 °C). 97.8% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.01 min (major), $t_R$= 12.47 min (minor); $[a]_D$ -71.3 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 10.15 (br s, 1H), 9.45 (br s, 1H), 7.09–7.05 (m, 4H), 5.36 (d, $J$ = 3.9 Hz, 1H), 3.82 (q, $J$ = 7.0 Hz, 2H), 2.38 (s, 3H), 2.27 (s, 3H), 0.91 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 174.1, 165.7, 145.5, 142.9, 135.7, 130.8, 128.2, 127.8, 127.3, 101.6, 60.1, 51.3, 19.2, 17.7, 14.5. MS (*m/z,* EI): 290 [$M^+$] (100), 261 (15), 217 (85), 199 (100). IR (neat) ν ($cm^{-1}$): 3320 (NH), 3095 (NH), 1660 (CO), 1194 (CS).

**(*R*)-(-)-Ethyl 6-methyl-4-(3-nitrophenyl)-2-thioxo-3,4-dihydropyrimidine-5-carboxylate (5c):**
pale orange solid (151 mg, 94% yield); mp 206–207 °C (from EtOH; lit[7b] 203–205 °C). 99.4% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 13.52 min (major), $t_R$= 14.12 min (minor); $[a]_D$ -66.3 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 10.42 (br s, 1H), 9.68 (br s, 1H), 8.11–7.99 (m, 2H), 7.71–7.58 (m, 2H), 5.26 (d, $J$ = 3.9 Hz, 1H), 3.94 (q, $J$ = 7.0 Hz, 2H), 2.24 (s, 3H), 1.03 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 175.1, 165.5, 148.7, 146.6, 146.1, 133.7, 131.1, 123.4, 121.8, 100.5, 60.4, 54.1, 17.9, 14.6. MS (*m/z,* EI): 321 [$M^+$] (30), 304 (20), 292 (15), 248 (15), 199 (100). IR (neat) ν ($cm^{-1}$): 3329 (NH), 3111 (NH), 1648 (CO), 1187 (CS).

**(*R*)-(-)-Ethyl 4-(4-methoxyphenyl)-6-methyl-2-thioxo-3,4-dihydropyrimidine-carboxylate (5d):**
pale yellow solid (138 mg, 90% yield); mp 149–150 °C (from EtOH; lit[18] 146–148 °C). 99.2% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-

methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.56 min (major), $t_R$= 13.03 min (minor); $[a]_D$ -61.9 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 10.20 (br s, 1H), 9.51 (br s, 1H), 7.05 (d, $J$ = 8.6 Hz, 2H), 6.81 (d, $J$ = 8.6 Hz, 2H), 5.03 (d, $J$ = 3.9 Hz, 1H), 3.92 (q, $J$ = 7.0 Hz, 2H), 3.64 (s, 3H), 2.21 (s, 3H), 1.02 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 174.7, 165.8, 159.4, 145.4, 136.4, 128.3, 114.5, 101.6, 60.2, 55.7, 54.1, 17.8, 14.7. MS (*m/z,* EI): 306 [$M^+$] (30), 277 (100), 233 (75), 199 (20). IR (neat) ν ($cm^{-1}$): 3307 (NH), 3120 (NH), 1669 (CO), 1201 (CS).

**(*R*)-(-)-Ethyl 4-(4-chlorophenyl)-6-methyl-2-thioxo-3,4-dihydropyrimidine-5-carboxylate (5e):** white solid (138 mg, 89% yield); mp 193–194 °C (from EtOH; lit[18] 190–192 °C). 99.1% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.24 min (major), $t_R$= 12.75min (minor); $[a]_D$ -72.2 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 10.30 (br s, 1H), 9.58 (br s, 1H), 7.35 (d, $J$ = 8.6 Hz, 2H), 7.14 (d, $J$ = 8.6 Hz, 2H), 5.09 (d, $J$ = 3.9 Hz, 1H), 3.93 (q, $J$ = 7.0 Hz, 2H), 2.21 (s, 3H), 1.02 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 174.9, 165.6, 146.0, 143.0, 132.9, 129.2, 128.9, 100.9, 60.3, 54.1, 17.8, 14.6. MS (*m/z,* EI): 310 [$M^+$] (45), 281 (50), 237 (40), 199 (20). IR (neat) ν ($cm^{-1}$): 3327 (NH), 3100 (NH), 1655 (CO), 1204 (CS).

***(R)*-(-)-Ethyl 4-(4-cianophenyl)-6-methyl-2-thioxo-3,4-dihydropyrimidine-5-carboxylate (5f):** pale yellow solid (131 mg, 87% yield); mp 241–242 °C (from EtOH; lit[19] 238–240 °C). 99.4% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.99 min (major), $t_R$= 13.58 min (minor); $[a]_D$ -64.9 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 10.37 (br s, 1H), 9.64 (br s, 1H), 7.75 (d, $J$ = 8.2 Hz, 2H), 7.32 (d, $J$ = 8.2 Hz, 2H), 5.16 (d, $J$ = 3.9 Hz, 1H), 3.92 (q, $J$ = 7.0 Hz, 2H), 2.21 (s, 3H), 1.04 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 175.1, 165.5, 162.8, 149.1, 132.9, 126.9, 121.3, 111.1, 100.4, 60.4, 54.5, 17.9, 14.6. MS (*m/z,* EI): 301 [$M^+$] (55), 272 (60), 228 (20), 199 (100). IR (neat) ν ($cm^{-1}$): 3310 (NH), 3125 (NH), 2222 (CN), 1675 (CO), 1184 (CS).

**(*R*)-(-)-Ethyl 6-methyl-4-(2-thienyl)- 2-thioxo-3,4-dihydropyrimidine-5-carboxylate (5g):** pale brown solid (132 mg, 94% yield); mp 205–206 °C (from EtOH; lit[18] 202–204 °C). 99.3% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 11.42 min (major), $t_R$= 11.89 min (minor); $[a]_D$ -64.8 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 10.37 (br s, 1H), 9.68 (br s, 1H), 7.31–7.28 (m, 1H), 6.97–6.82 (m, 2H), 5.35 (d, $J$ = 3.9 Hz, 1H), 3.98 (q, $J$ = 7.0 Hz, 2H), 2.19 (s, 3H), 1.07 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 175.3, 165.4, 147.6,

145.9, 127.4, 125.9, 124.8, 101.9, 60.4, 49.9, 17.7, 14.7. MS (*m/z,* EI): 282 [$M^+$] (100), 253 (30), 209 (80). IR (neat) ν ($cm^{-1}$): 3321 (NH), 3094 (NH), 1675 (CO), 1190 (CS).

## 2. Physical and spectroscopical data of dihydropyrimidine-2-ones 6

**(*R*)-(-)-Ethyl 6-methyl-2-oxo-4-(2-trifluoromethylphenyl)-3,4-dihydropyrimidine-5-carboxylate (6a):**

pale grey solid (150 mg, 91% yield); mp 205–206 °C (from EtOH; lit[20] 206–207 °C). 95.6% Ee (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.53 min (major), $t_R$= 13.02 min (minor); $[a]_D$ -34.1 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 9.29 (br s, 1H), 7.66–7.55 (m, 2H), 7.44–7.35 (m, 2H), 7.24 (br s, 1H), 5.51 (s, 1H), 3.76 (q, *J* = 7.0 Hz, 2H), 2.26 (s, 3H), 0.79 (t, *J* = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 165.4, 151.9, 150.3, 143.7, 133.9, 132.8, 129.1, 128.6, 127.6, 126.8, 126.3–126.2 (m,1C), 122.1, 121.3, 98.8, 59.6, 51.2, 18.3, 14.2. MS (*m/z,* EI): 328 [$M^+$] (20), 299 (30), 259 (20), 183 (100). IR (neat) ν ($cm^{-1}$): 3238 (NH), 3114 (NH), 1699 (CO), 1644 (CO). Note that the signals between 126.3–126.2 are most probably those of the C bonded to $CF_3$ group; on the other hand, the signals of the quadruplet of $CF_3$ are not easily decipherable.

***(R)*-(-)-Ethyl 4-(3-methoxyphenyl)-6-methyl-2-oxo-3,4-dihydropyrimidine-5-carboxylate (6b):**

pale brown solid (121 mg, 83% yield); mp 209–210 °C (from EtOH; lit[15] 209–211 °C). Ee 94.7 % (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.26 min (major), $t_R$= 12.72 min (minor); $[a]_D$-39.8 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 9.13 (br s, 1H),7.66 (br s, 1H), 7.20–7.13 (m, 1H), 6.77–6.72 (m, 3H). 5.06 (d, *J* = 3.2 Hz, 1H), 3.92 (q, *J* = 7.0 Hz, 2H), 3.65 (s, 3H), 2.18 (s, 3H), 1.03 (t, *J* = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 165.9, 159.8, 152.9, 149.1, 146.9, 130.1, 118.9, 113.0, 112.8, 99.8, 59.9, 55.6, 54.4, 18.4, 14.7. MS (*m/z,* EI): 290 [$M^+$] (30), 261 (25), 217 (25), 183 (100). IR (neat) ν ($cm^{-1}$): 3246 (NH), 3110 (NH), 1710 (CO), 1642 (CO).

***(R)*-(-)-Ethyl 6-methyl-2-oxo-4-(4-tolyl)-3,4-dihydropyrimidine 5-carboxylate (6c):**

pale grey solid (133 mg, 97% yield); mp 235–236 °C (from EtOH; lit[15] 235–237 °C). Ee 92.7% (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 11.84 min (major), $t_R$= 3.63 min (minor); $[a]_D$ -39.5 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 9.11 (br s, 1H), 7.67 (br s, 1H), 7.09–7.01 (m, 4H), 5.06 (d, *J* = 3.0 Hz, 1H), 3.20 (q, *J* = 7.0 Hz, 2H), 2.18 (s, 6H), 1.02 (t, *J*

= 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 166.0, 152.9, 148.8, 142.6, 137.0, 129.5, 126.8, 100.1, 59.8, 54.3, 21.2, 18.4, 14.7. MS (*m/z,* EI): 274 [$M^+$] (20), 245 (80), 201 (65), 183 (100). IR (neat) ν ($cm^{-1}$): 3254 (NH), 3110 (NH), 1704 (CO), 1638 (CO).

***(R)*-(-)-Ethyl 6-methyl-4-(4-nitrophenyl)-2-oxo-3,4-dihydropyrimidine-5-carboxylate (6d):**

yellow solid (129 mg, 85% yield); mp 205–206 °C (from EtOH; lit[17] 201–202 °C). Ee 93.5% (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.96 min (major), $t_R$= 13.48 min (minor); $[a]_D$ -37.7 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 9.30 (br s, 1H), 8.12 (d, *J* = 8.6 Hz, 2H), 7.82 (br s, 1H),7.43 (d, *J* = 8.6 Hz, 2H), 5.21 (s, 1H), 3.90 (q, *J* = 7.0 Hz, 2H), 2.19 (s, 3H), 1.02 (t, *J* = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 165.7, 152.6, 152.4, 150.0, 147.3, 128.3, 124.4, 98.8, 60.0, 54.3, 18.5, 14.6. MS (*m/z,* EI): 305 [$M^+$] (10), 276 (85), 232 (35), 183 (100). IR (neat) ν ($cm^{-1}$): 32128 (NH), 3118 (NH), 1715 (CO), 1656 (CO).

**(*R*)-(-)-Ethyl 6-methyl-2-oxo-4-(2,4,6-trimethylphenyl)-3,4-dihydropyrimidine-5-carboxylate (6e):**

pale grey solid (147 mg, 97% yield); mp 266–267 °C (from EtOH; lit[21] 262 °C). Ee 98.8% (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.58 min (major), $t_R$= 13.14 min (minor); $[a]_D$ -34.8 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 9.00 (br s, 1H), 7.24 (br s, 1H), 6.67 (s, 2H), 5.70 (s, 1H), 3.72 (q, *J* = 7.0 Hz, 2H), 2.22 (s, 6H), 2.09 (s, 3H), 2.06 (s, 3H), 0.81 (t, *J* = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 166.2, 151.4, 146.9, 137.6, 137.2, 136.2, 97.6, 59.5, 51.5, 20.9, 18.1, 14.3. MS (*m/z,* EI): 302 [$M^+$] (10), 273 (20), 229 (95), 183 (100). IR (neat) ν ($cm^{-1}$): 3246 (NH), 3094 (NH), 1695 (CO), 1659 (CO).

**(*R*)-(-)-Ethyl 6-methyl-4-(1-naphthyl)-2-oxo-3,4-dihydropyrimidine-5-carboxylate (6f):**

pale grey solid (144 mg, 93% yield); mp 236–237 °C (from EtOH; lit[15] 236–237 °C). Ee 98.5% (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 12.42 min (major), $t_R$= 12.93 min (minor); $[a]_D$ -24.9 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 9.21 (br s, 1H), 8.25 (d, *J* = 8.0 Hz, 1H) 7.88–7.71 (m, 3H), 7.55–7.35 (m, 4H), 6.09 (d, *J* = 3.0 Hz, 1H), 3.72 (q, *J* = 7.0 Hz, 2H), 2.31 (s, 3H), 0.73 (t, *J* = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 165.9, 152.4, 149.3, 141.1, 134.1, 130.8, 129.1, 128.5, 126.7, 126.3, 126.2, 124.9, 124.3, 99.8, 59.7, 50.5, 18.4, 14.4. MS (*m/z,* EI): 310 [$M^+$] (40), 281 (40), 237 (40), 183 (100). IR (neat) ν ($cm^{-1}$): 3204 (NH), 3133 (NH), 1715 (CO), 1640 (CO).

**(*R*)-(-)-Ethyl 6-methyl-4-(5-methylfuran-2-yl)-2-oxo-3,4-dihydropyrimidine-5-carboxylate (6g):**

pale grey solid (111 mg, 84% yield); mp 209–210 °C (from EtOH; lit[22] 208–210 °C). Ee 95.6% (GC connected to a J&W Scientific Cyclosil-B column; stationary phase: 30% heptakis (2,3-di-O-methyl-6-O-*t*-butyldimethylsilyl)-β-cyclodextrin in DB-1701), $t_R$= 11.57 min (major), $t_R$= 12.01 min (minor); $[a]_D$ -34.7 (c 0.1 in MeOH). $^1$H NMR (200 MHz, DMSO-$d_6$): $\delta$ = 9.13 (br s, 1H), 7.64 (br s, 1H), 5.86 (s, 2H), 5.06 (d, $J$ = 3.0 Hz, 1H), 3.94 (q, $J$ = 7.0 Hz, 2H), 2.15 (s, 3H), 2.13 (s, 3H), 1.06 (t, $J$ = 7.0 Hz, 3H); $^{13}$C NMR (50 MHz, DMSO-$d_6$): $\delta$ = 165.7, 154.8, 153.1, 151.3, 149.8, 106.9, 106.6, 97.5, 59.8, 48.4, 18.3, 14.8, 14.0. MS (*m/z,* EI): 264 [$M^+$] (80), 249 (60), 235 (60), 221 (100). IR (neat) ν ($cm^{-1}$): 3268 (NH), 3128 (NH), 1694 (CO), 1650 (CO).

## 3. Physical and spectroscopical data of adducts 18

***meso*-4,5-Diphenyl-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dione (18a):**

grey solid (192 mg, 96% yield); mp >300 °C (from EtOH; lit[23] 305–308 °C). $[a]_D$ -0.7 (c 0.1 in MeOH). $^1$H NMR (200 MHz, $CD_3OD$): $\delta$ = 7.19–7.14 (m, 2H), 7.10 –7.04 (m, 6H), 6.98–6.89 (m, 7H), 4.42 (d, $J$ = 6.0 Hz, 2H), 3.03 (t, $J$ = 6.0 Hz, 1H); $^{13}$C NMR (50 MHz, $CD_3OD$): $\delta$ =156.4, 141.0, 140.5, 128.2, 128.1, 127.9, 127.4, 126.6, 126.4, 69.3, 54.5, 28.7. IR (neat) ν ($cm^{-1}$): 3225 (NH), 1681 (CO).

***meso*-4,5-Bis-(4-chlorophenyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dione (18b):**

pale brown solid (215 mg, 92% yield); mp >300 °C (from EtOH; lit[13a] 259 °C). $[a]_D$ -1.2 (c 0.1 in MeOH). $^1$H NMR (200 MHz, $CD_3OD$): $\delta$ = 7.21–7.15 (m, 2H), 7.12–7.08 (m, 4H), 7.01–6.95 (m, 7H), 4.38 (d, $J$ = 6.0 Hz, 2H), 3.00 (t, $J$ = 6.0 Hz, 1H); IR (neat) ν ($cm^{-1}$): 3220 (NH), 1688 (CO). Owing to its very low solubility in any deuterated solvent, it was not possible to obtain a good $^{13}$C NMR spectrum.

***meso*-4,5-Bis-(4-tolyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dione (18c):**

grey solid (210 mg, 98% yield); mp >300 °C (from EtOH; lit[23] 309–314°C). $[a]_D$ -0.7 (c 0.1 in MeOH). $^1$H NMR (200 MHz, $CD_3OD$): $\delta$ = 7.17–7.12 (m, 2H), 6.95–6.81 (m, 11H), 4.37 (d, $J$ = 6.0 Hz, 2H), 2.96 (t, $J$ = 6.0 Hz, 1H), 2.16 (s, 6H); IR (neat) ν ($cm^{-1}$): 3218 (NH), 1680 (CO). Owing to its very low solubility in any deuterated solvent, it was not possible to obtain a good $^{13}$C NMR spectrum.

***meso*-4,5-Bis-(4-cianophenyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dione (18d):**

Pale brown solid (202 mg, 90% yield); mp >300°C (from EtOH). Calcd for $C_{26}H_{20}N_6O_2$: C 69.63%; H 4.49%; N 18.74%; found: C 69.53%; H 4.57%; N 18.71%. $[a]_D$ -1.1 (c 0.1 in MeOH). $^1$H NMR (200 MHz, $CD_3OD$): $\delta$ = 7.70–7.66 (m, 2H), 7.56–7.45 (m, 7H), 7.21–7.17 (m, 4H), 4.44 (d, $J$ = 6.0 Hz, 2H), 3.11 (t, $J$ = 6.0 Hz, 1H); IR (neat) ν ($cm^{-1}$): 3219 (NH), 2218 (CN), 1678 (CO). Owing to

its very low solubility in any deuterated solvent it was not possible to obtain a good $^{13}C$ NMR spectrum.

***meso*-4,5-Bis-(2-tolyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dione (18e):**

Grey solid (208 mg, 97% yield); mp >300°C (from EtOH). Calcd for $C_{26}H_{26}N_4O_2$: C 73.22%; H 6.14%; N 13.14%; found: C 73.31%; H 6.18%; N 13.04%. $[a]_D$ -0.4 (c 0.1 in MeOH). $^1H$ NMR (200 MHz, $CD_3OD$): $\delta$ = 7.21–7.16 (m, 2H), 7.09–7.06 (m, 2H), 6.95–6.88 (m, 9H), 4.71 (d, $J$ = 6.0 Hz, 2H), 3.05 (t, $J$ = 6.0 Hz, 1H), 1.91 (s, 6H); $^{13}C$ NMR (50 MHz, $CD_3OD$): $\delta$ = 156.2, 141.5, 137.8, 135.3, 132.7, 130.2, 128.2, 127.9, 127.2, 125.8, 125.7, 69.4, 51.8, 28.7, 18.1; IR (neat) ν ($cm^{-1}$): 3225 (NH), 1681 (CO).

***meso*-4,5-Bis-(3-trifluoromethylphenyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H pyrimido [4.5-d]pyrimidine-2,7-dione (18f):**

Pale green solid (248 mg, 93% yield); mp >300°C (from EtOH). Calcd for $C_{26}H_{20}F_6N_4O2$: C 58.43%; H 3.77%; N 10.48%; found: C 58.39%; H 3.78%; N 10.42%. $[a]_D$ -0.9 (c 0.1 in MeOH). $^1H$ NMR (200 MHz, $CD_3OD$): $\delta$ = 7.80–7.70 (m, 6H), 7.40–7.33 (m, 7H), 4.47 (d, $J$ = 6.0 Hz, 2H), 3.15 (t, $J$ = 6.0 Hz, 1H); IR (neat) ν ($cm^{-1}$): 3227 (NH), 1680 (CO). Owing to its very low solubility in any deuterated solvent it was not possible to obtain a good $^{13}C$ NMR spectrum.

***meso*-4,5-Diphenyl-8a-(4-tolyl)-3,4,4a,5,6,8a-hexahydro-1H,8H pyrimido [4.5-d]pyrimidine-2,7-dione (18g):**

Grey solid (191 mg, 93% yield); mp >300°C (from EtOH; lit[23] 301–303 °C). $[a]_D$ -0.6 (c 0.1 in MeOH). $^1H$ NMR (200 MHz, $CD_3OD$): $\delta$ = 7.10–7.03 (m, 7H), 6.99–6.92 (m, 4H), 6.72 (d, $J$ = 8.0 Hz, 2H), 4.41 (d, $J$ = 6.0 Hz, 2H), 2.98 (t, $J$ = 6.0 Hz, 1H), 2.07 (s, 3H); $^{13}C$ NMR (50 MHz,$CD_3OD$): $\delta$ = 156.4, 140.5, 138.1, 128.5, 128.4, 128.2, 127.2, 126.6, 126.3, 69.0, 54.5, 28.7, 19.7. IR (neat) ν ($cm^{-1}$): 3226(NH), 1683 (CO).

## 4. Physical and spectroscopical data of adducts 19

***meso*-4,5-Diphenyl-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dithione (19a):**

Grey solid (174 mg, 81% yield); mp >300°C (from EtOH). Calcd for $C_{24}H_{22}N_4S_2$: C 66.94%; H 5.15%; N 13.01%; S 14.89%; found: C 66.98%; H 5.12%; N 13.03%; S 14.87%. $[a]_D$ -0.8 (c 0.1 in MeOH). $^1$H NMR (200 MHz, $CD_3OD$): $\delta$ = 7.17–7.09 (m, 9H), 6.99–6.95 (m, 6H), 4.33 (d, $J$ = 6.0 Hz, 2H), 3.09 (t, $J$ = 6.0 Hz, 1H); IR (neat) ν ($cm^{-1}$): 3155 (NH), 1224 (CS). Owing to its very low solubility in any deuterated solvent it was not possible to obtain a good $^{13}$C NMR spectrum***meso*-4,5-Bis-(4-chlorophenyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dithione (19b):**

Grey solid (200 mg, 80% yield); mp >300°C (from EtOH). Calcd for $C_{24}H_{20}Cl_2N_4S_2$: C 57.71%; H 4.04%; Cl 14.20%; N 11.22%; S 12.84%; found: C 57.74%; H 4.01%; Cl 14.25%; N 11.24%; S 12.86%. $[a]_D$ -0.3 (c 0.1 in MeOH). $^1$H NMR (200 MHz, $CD_3OD$): $\delta$ = 7.42–7.35 (m, 4H), 7.14–7.09 (m, 5H), 7.03–6.95 (m, 4H), 4.28 (d, $J$ = 6.0 Hz, 2H), 3.09 (t, $J$ = 6.0 Hz, 1H); IR (neat) ν ($cm^{-1}$): 3150 (NH), 1218 (CS). Owing to its very low solubility in any deuterated solvent it was not possible to obtain a good $^{13}$C NMR spectrum.

***meso*-4,5-Bis-(4-tolyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dithione (19c):**

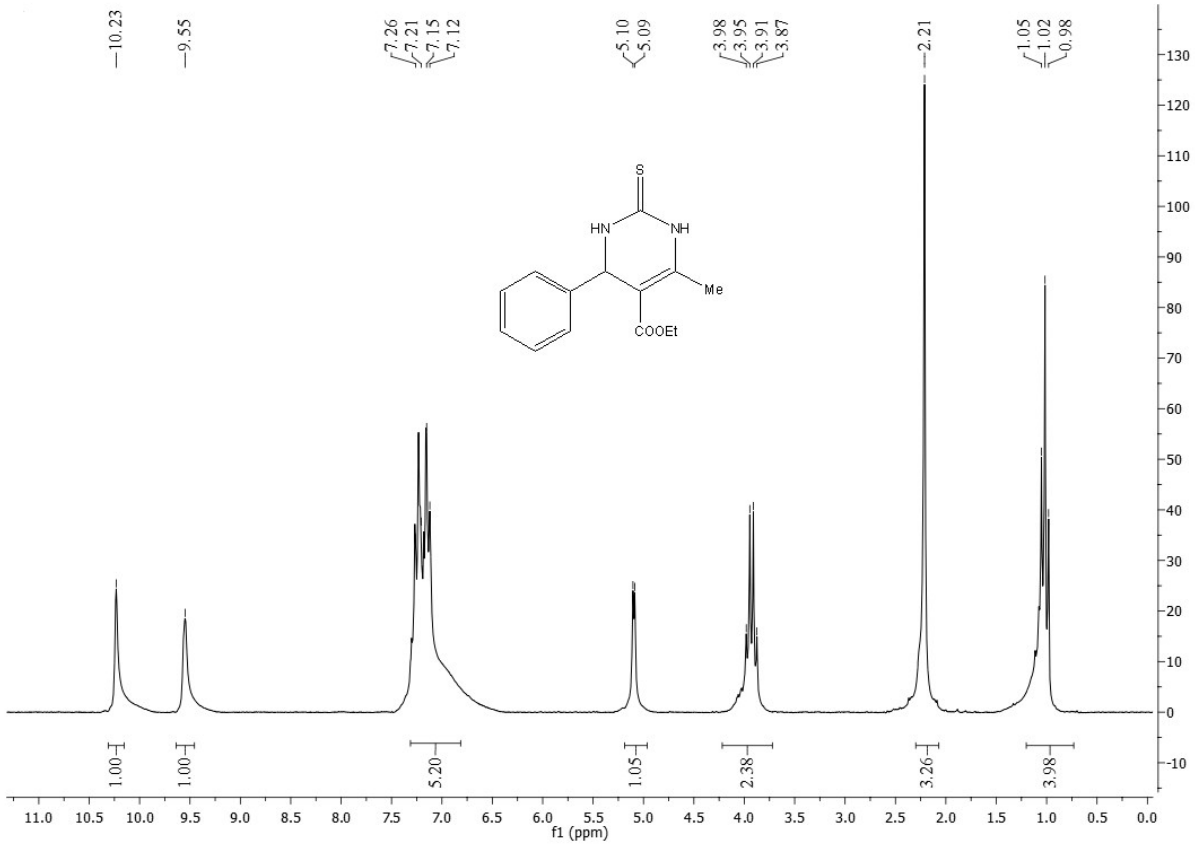
Pale brown solid (204 mg, 89% yield); mp >300°C (from EtOH). Calcd for $C_{26}H_{26}N_4S_2$: C 68.09 %; H 5.71%; N 12.22%; S 13.98%; found: C 68.12%; H 5.72%; N 12.18%; S 14.00 %; $[a]_D$ -0.4 (c 0.1 in MeOH). $^1$H NMR (200 MHz, $CD_3OD$): $\delta$ = 6.97– 6.82 (m, 13H), 4.28 (d, $J$ = 6.0 Hz, 2H), 3.09 (t, $J$ = 6.0 Hz, 1H), 2.16 (s, 6H); IR (neat) ν ($cm^{-1}$): 3188 (NH), 1211 (CS). Owing to its very low solubility in any deuterated solvent it was not possible to obtain a good $^{13}$C NMR spectrum.

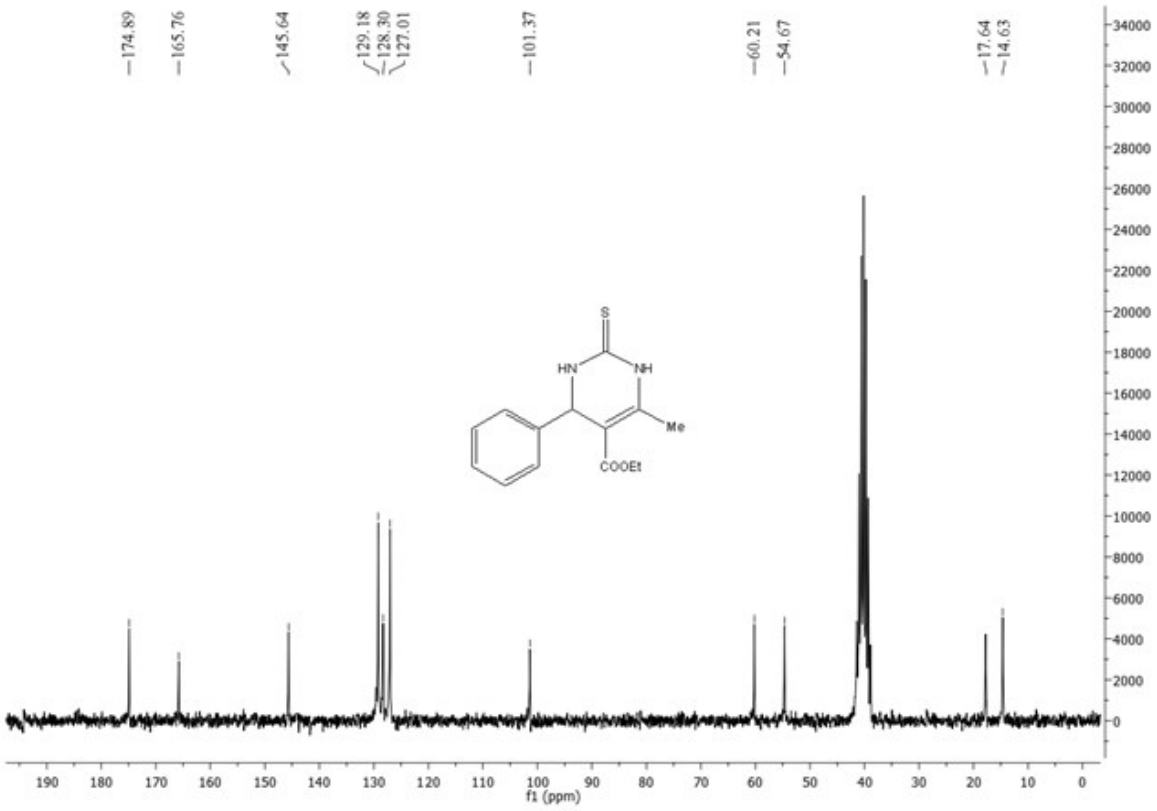
***meso*-4,5-Bis-(3-tolyl)-8a-phenyl-3,4,4a,5,6,8a-hexahydro-1H,8H-pyrimido[4.5-d]pyrimidine-2,7-dithione (19d):**

Pale brown solid (202 mg, 88% yield); mp >300°C (from EtOH). Calcd for $C_{26}H_{26}N_4S_2$: C 68.09 %; H 5.71%; N 12.22%; S 13.98%; found: C 68.03%; H 5.76%; N 12.25%; S 13.95 %; $[a]_D$ -0.6 (c

0.1 in MeOH). $^{1}$H NMR (200 MHz, $CD_3OD$): $\delta$ = 7.18–7.13 (m, 2H), 7.01–6.96 (m, 5H), 6.90–6.87 (m, 2H), 6.76–6.72 (m, 4H), 4.29 (d, $J$ = 6.0 Hz, 2H), 3.05 (t, $J$ = 6.0 Hz, 1H), 2.15 (s, 6H). IR (neat) ν ($cm^{-1}$): 3105 (NH), 1199 (CS). Owing to its very low solubility in any deuterated solvent it was not possible to obtain a good $^{13}$C NMR spectrum.

## 5. NMR spectra of 5

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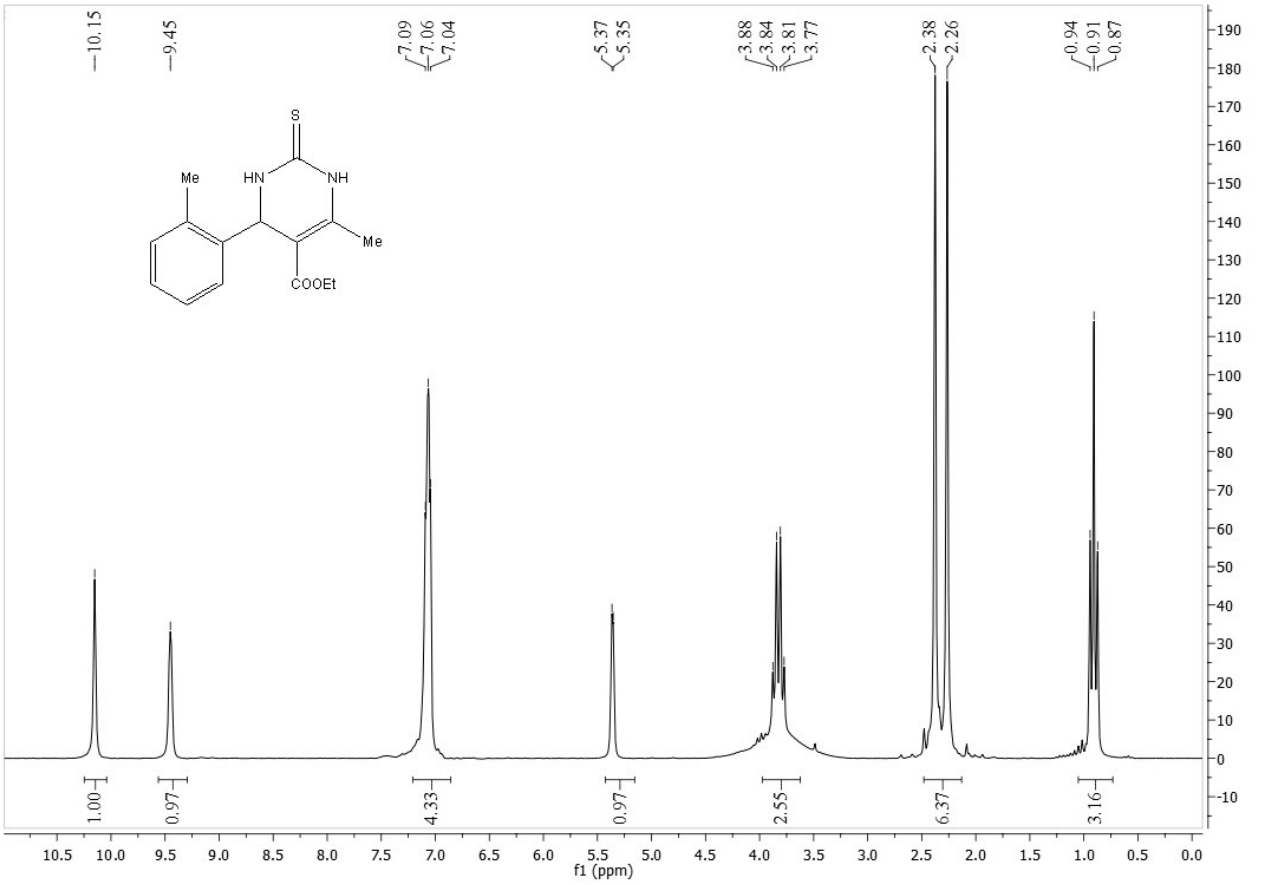
NH
Me
COOEt
f1 (ppm)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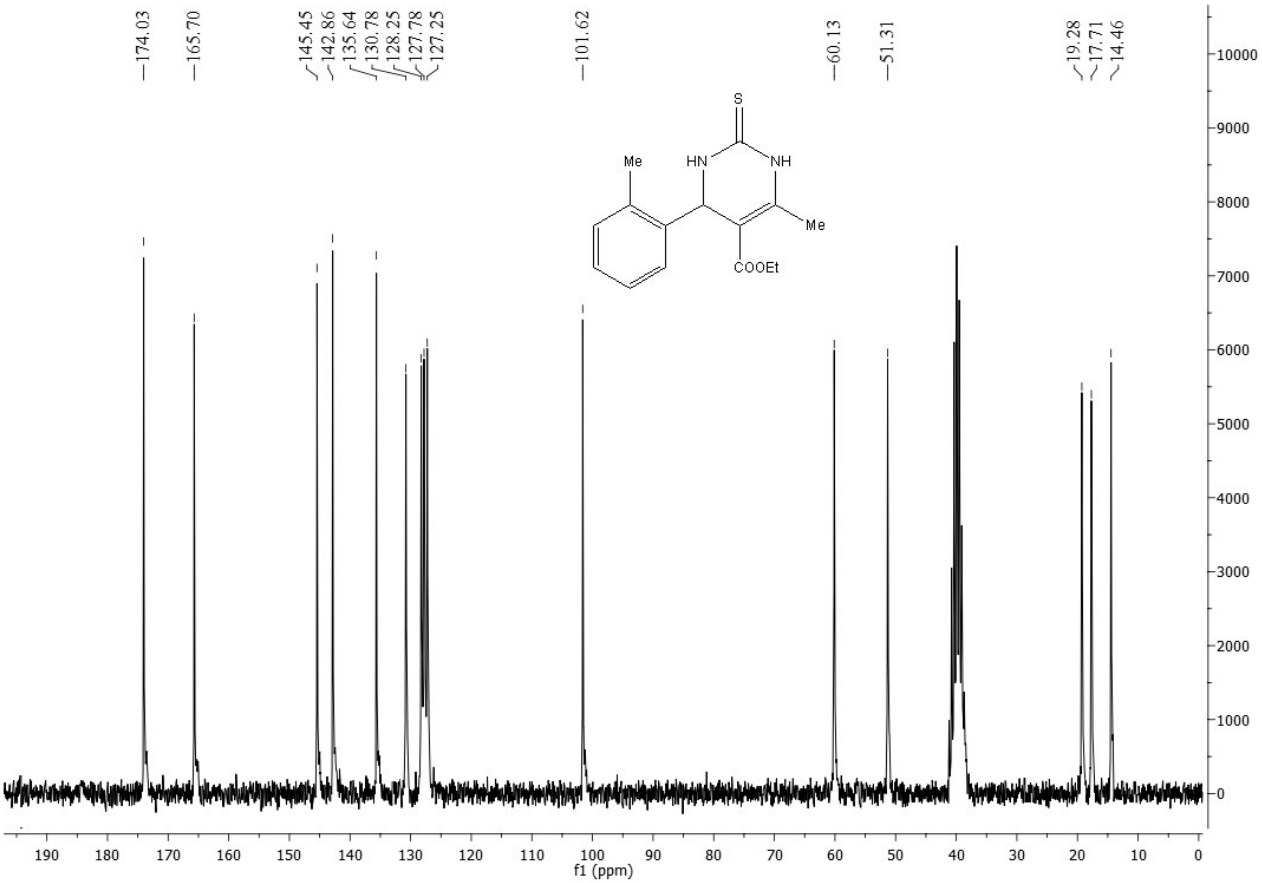
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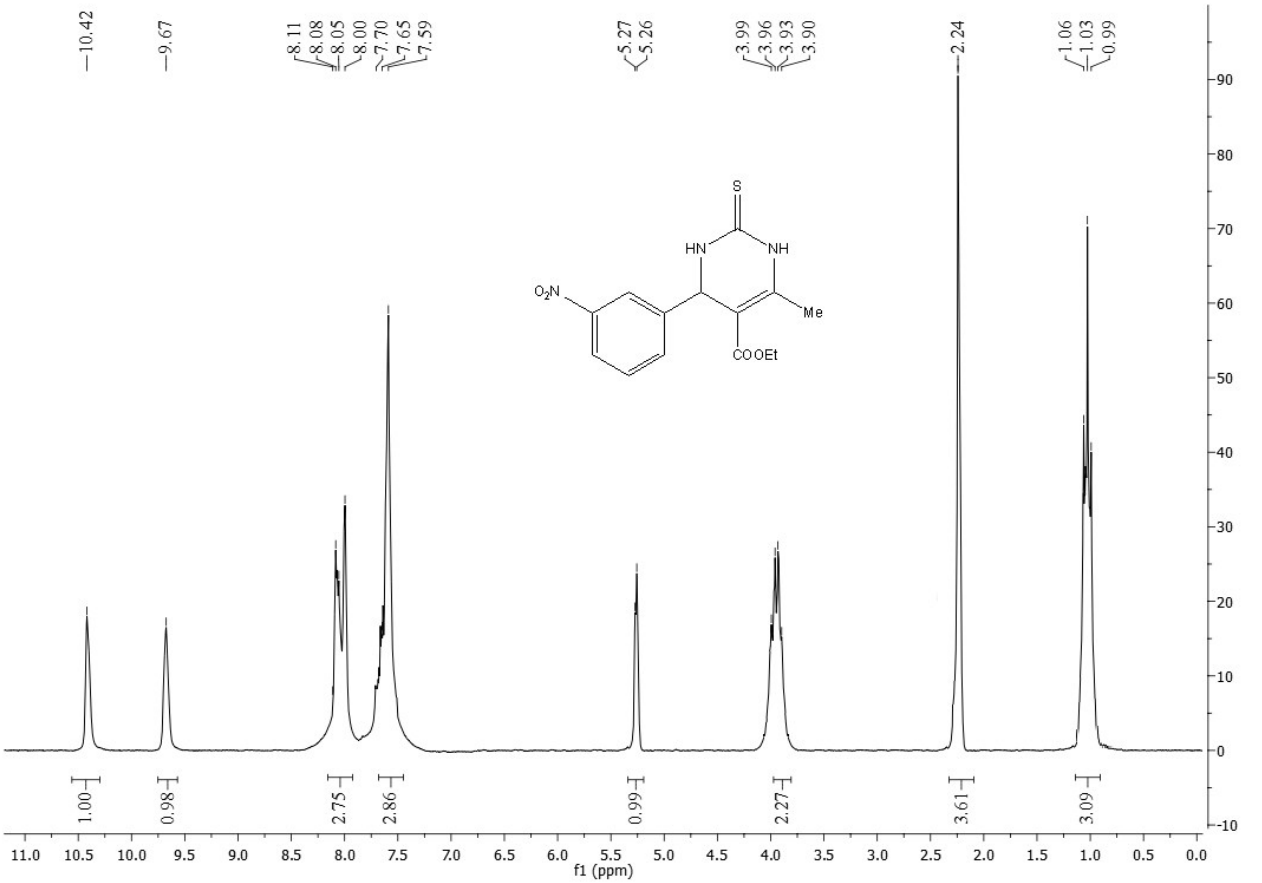
COOEt
f1 (ppm)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5.26
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3.96
3.93
3.90
2.24
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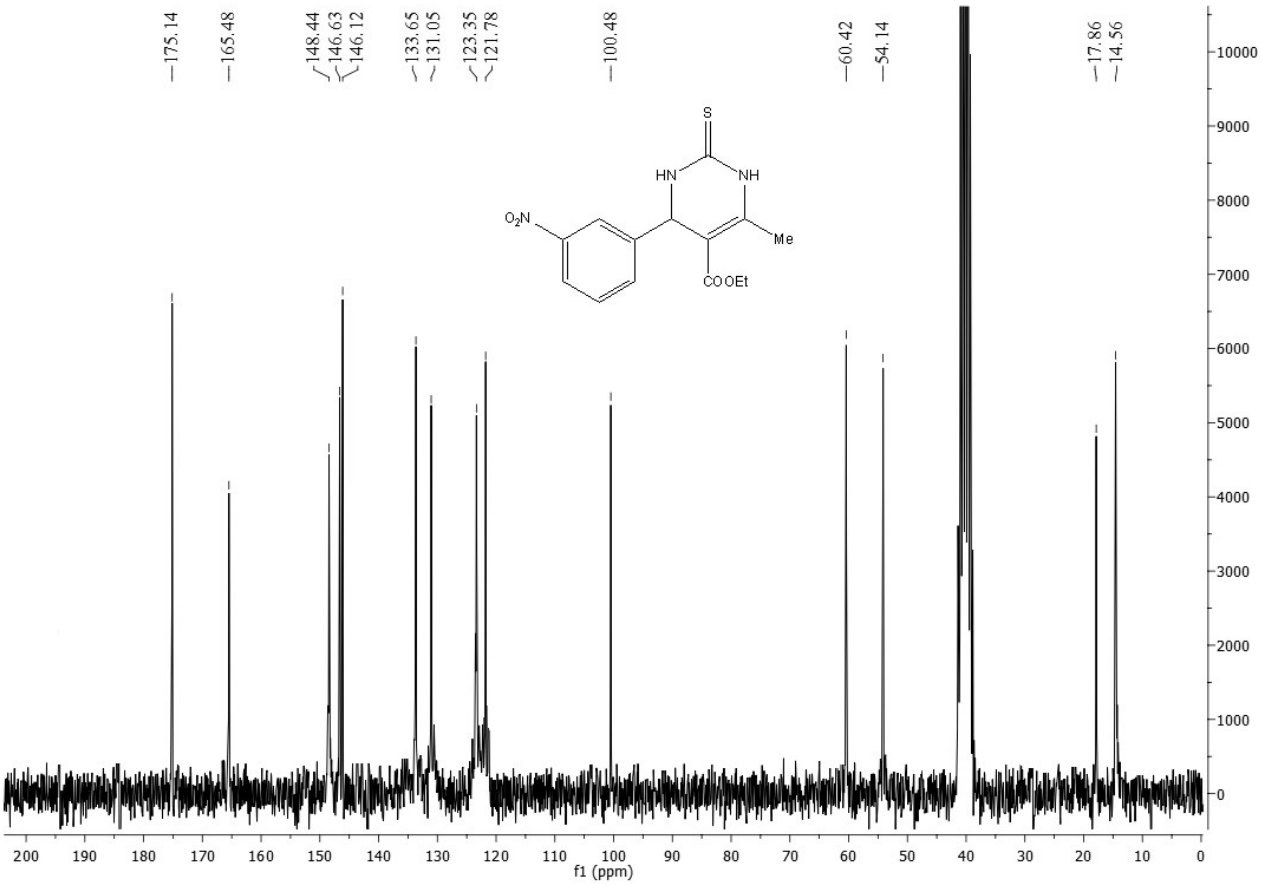
COOEt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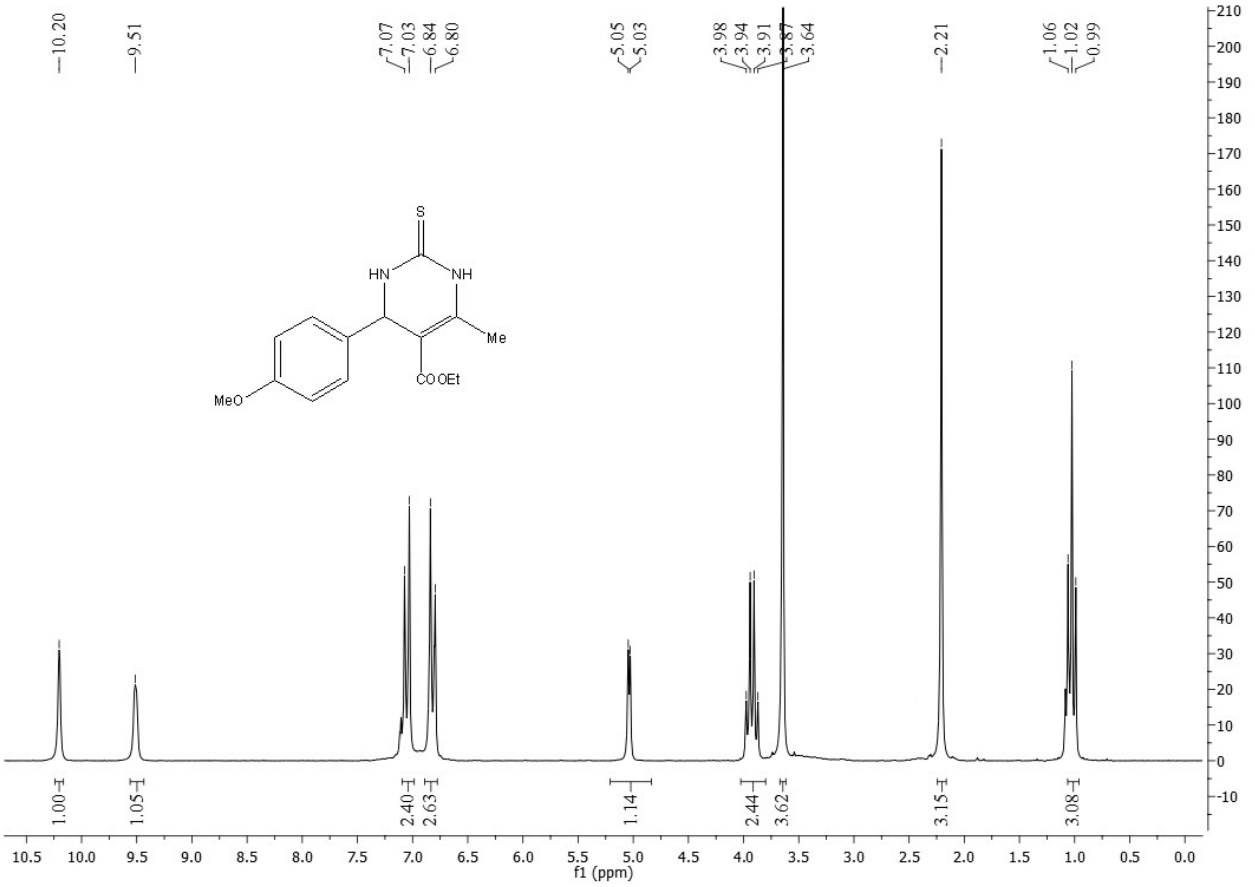
COOEt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1.00
1.05
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NH
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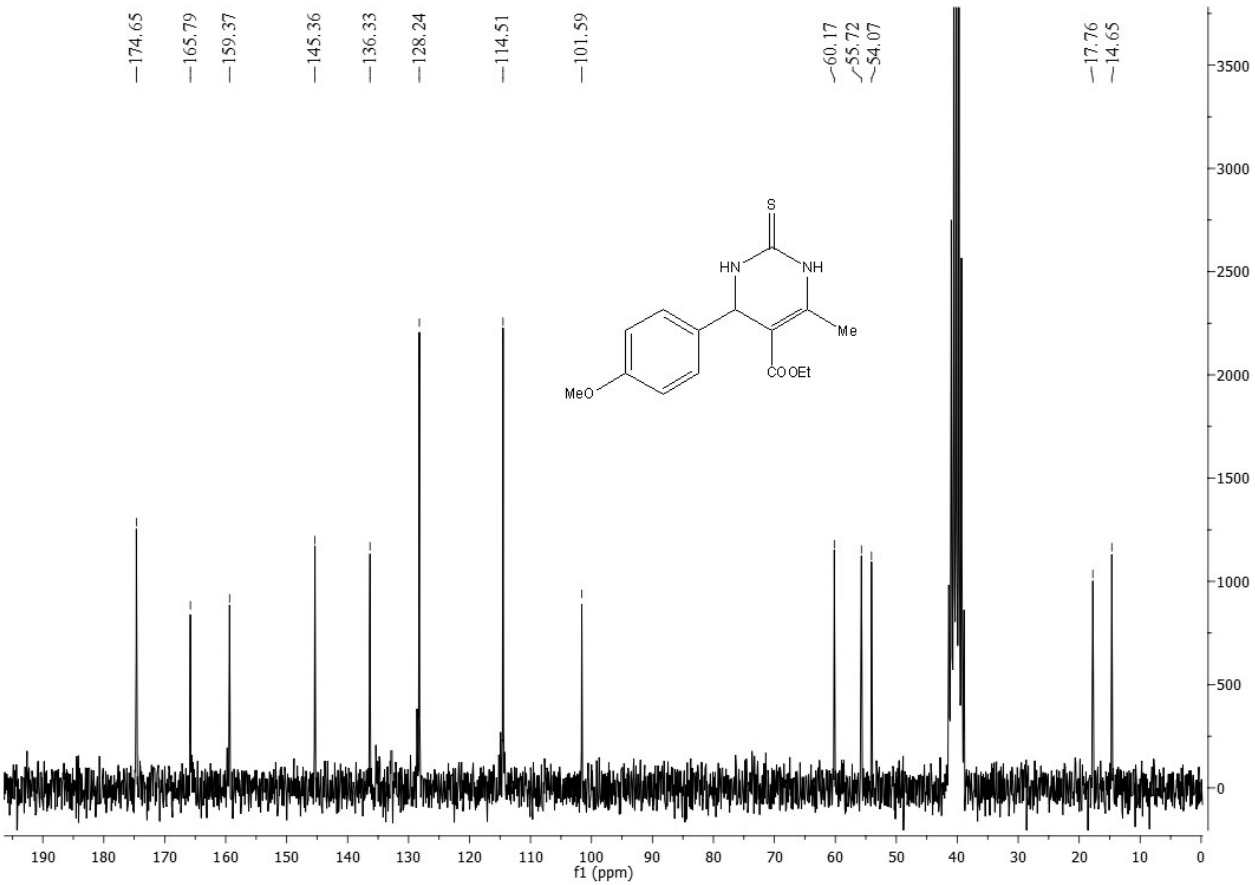
COOEt
MeO
f1 (ppm)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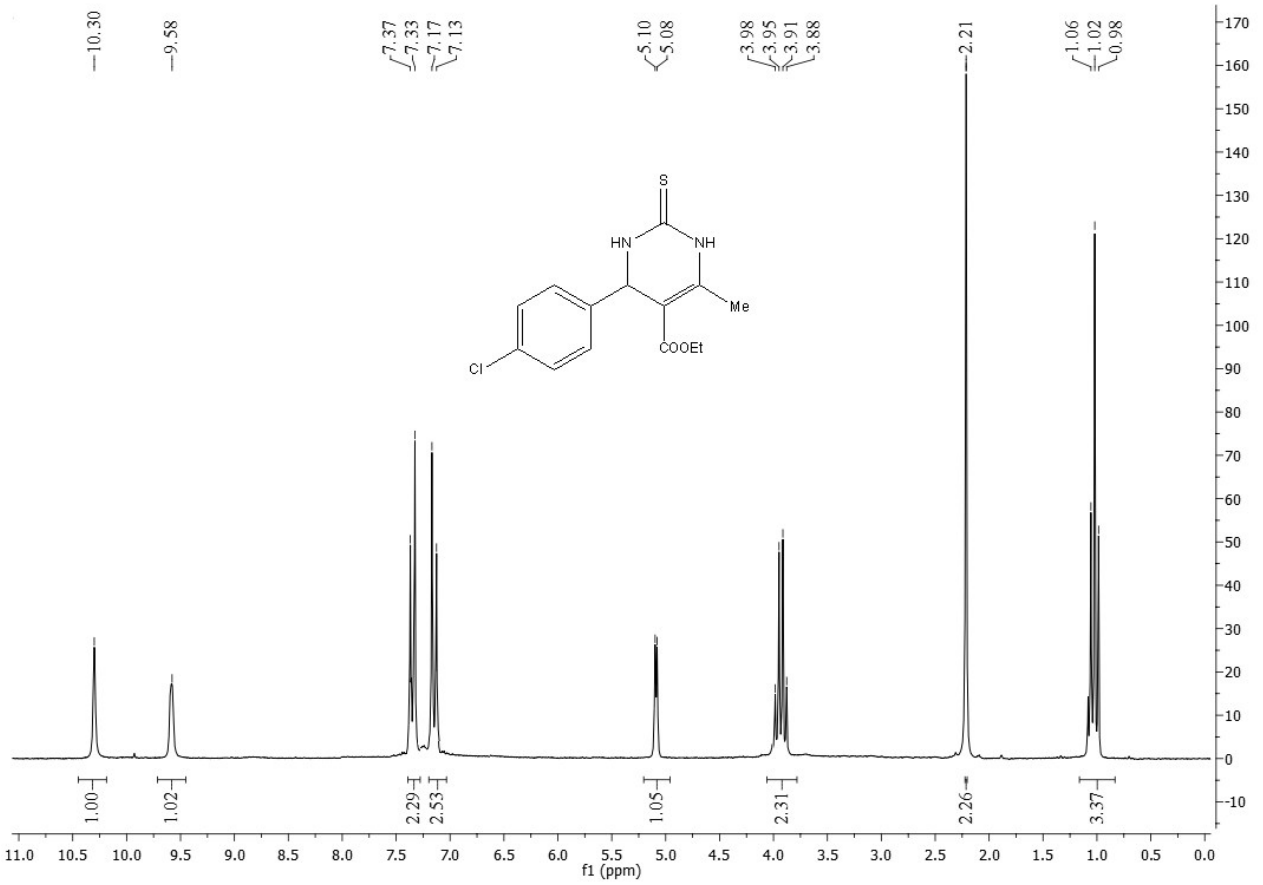
f1 (ppm)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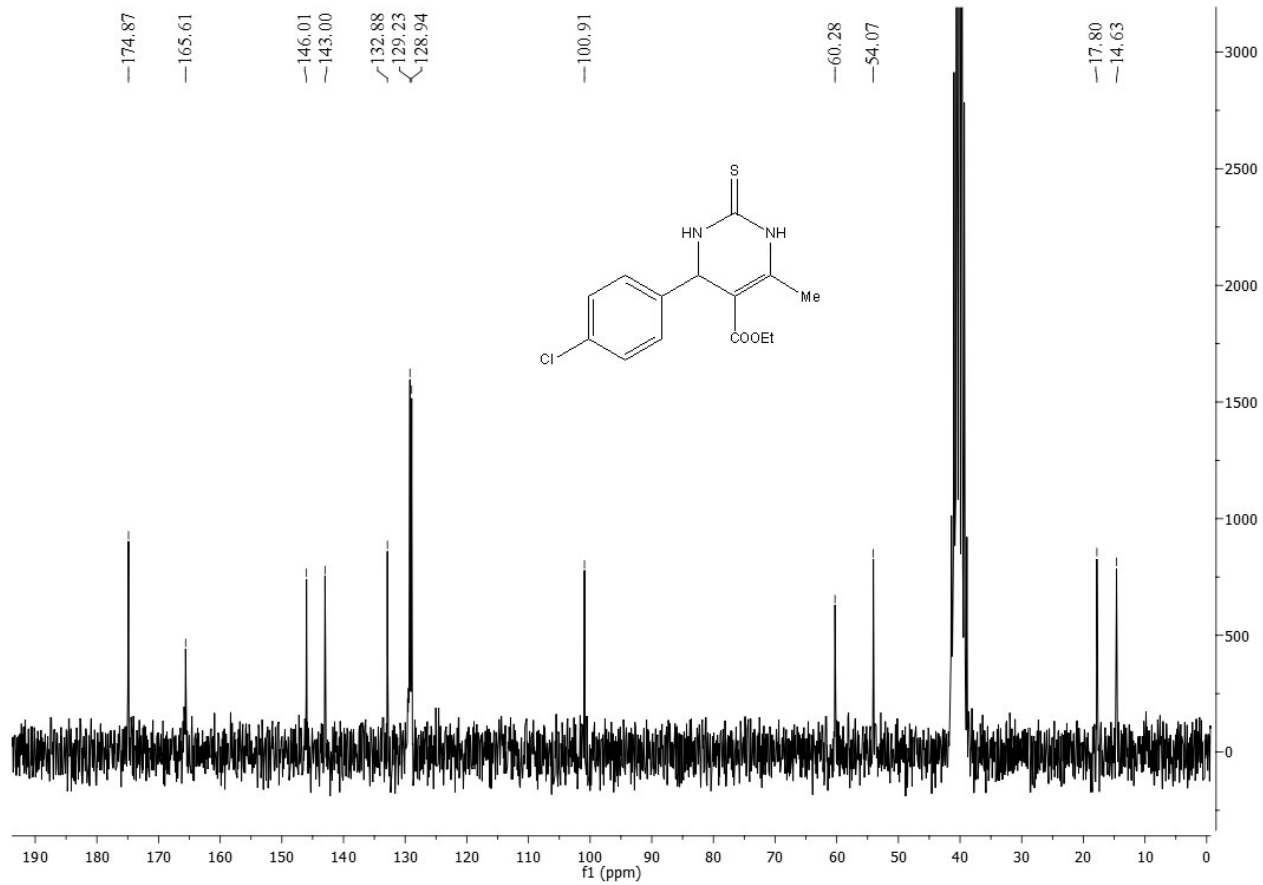
2.31
2.26
3.37
f1 (ppm)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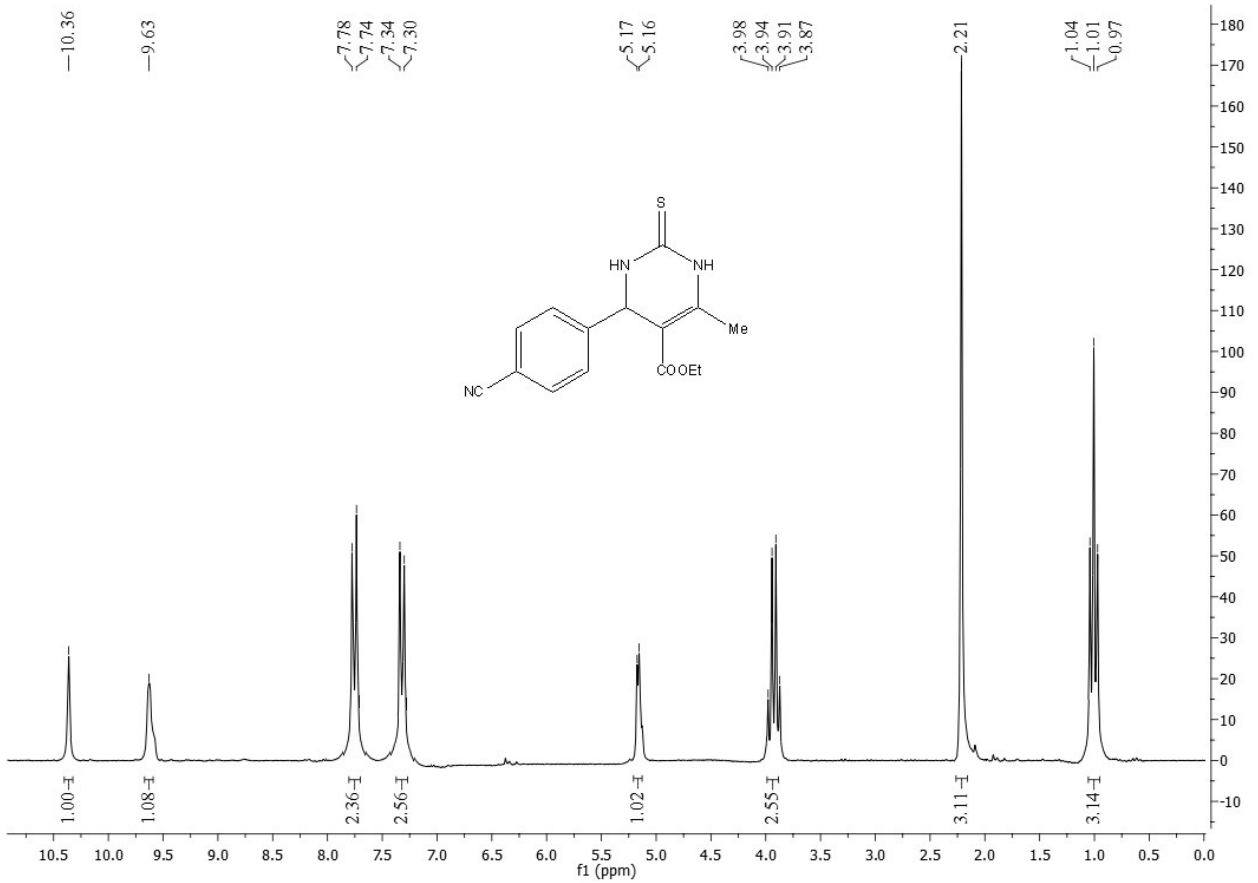
Cl
f1 (ppm)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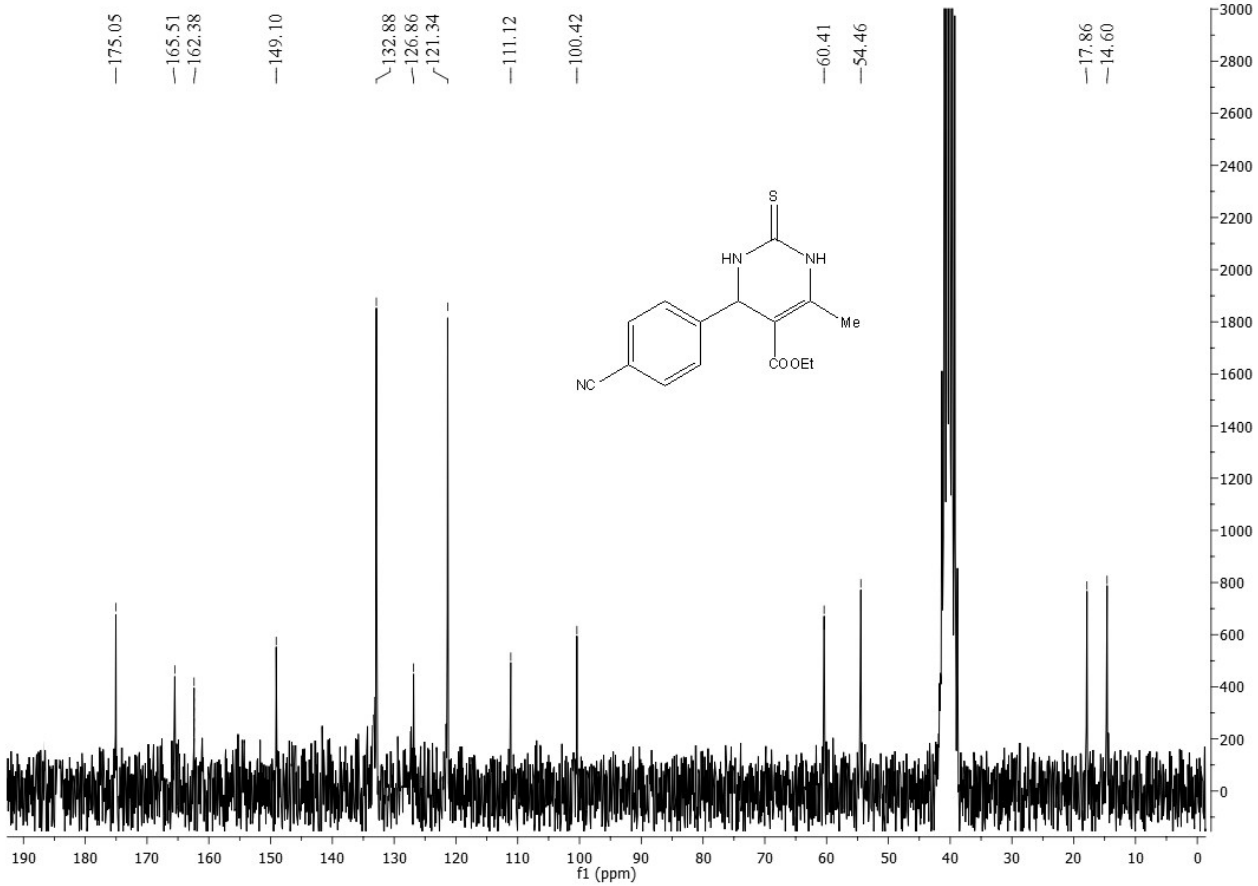
f1 (ppm)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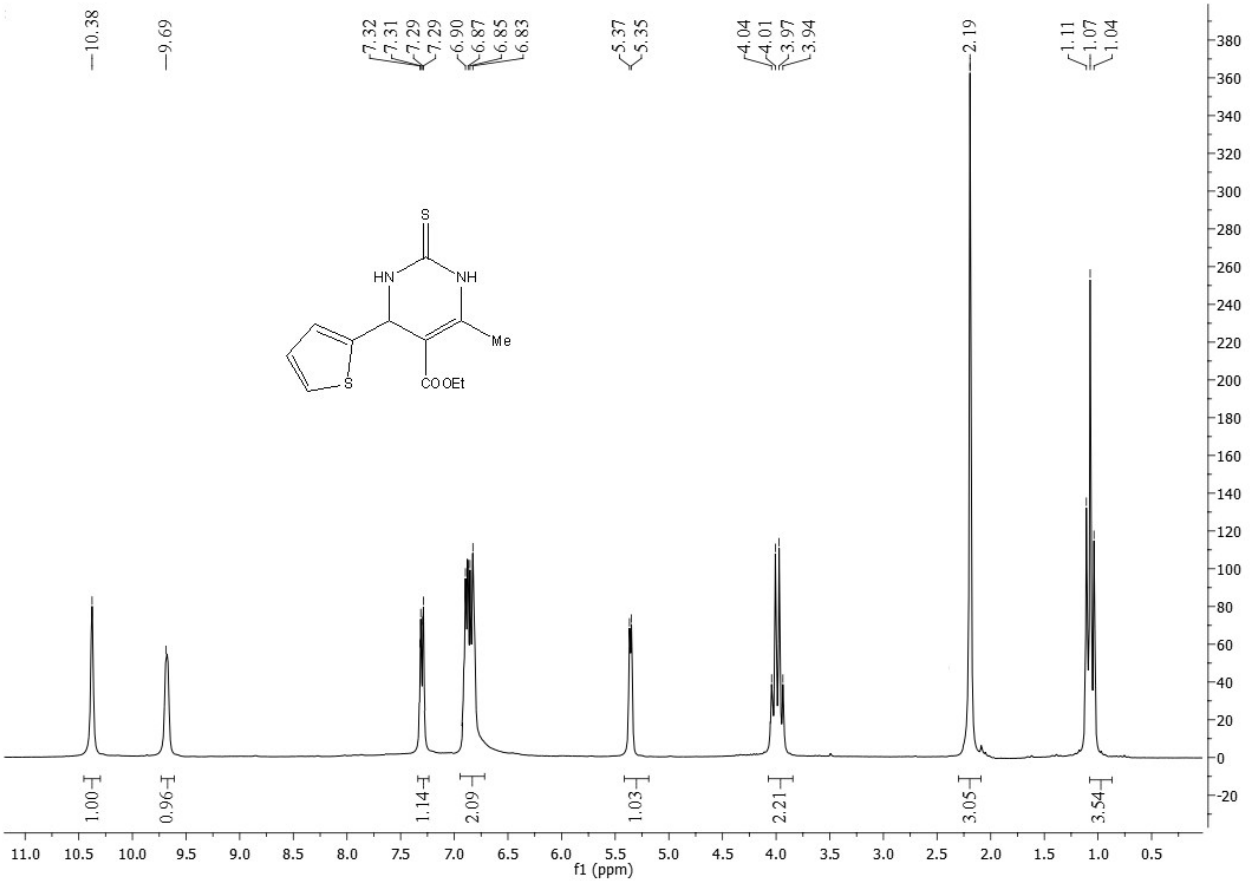
f1 (ppm)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4.01
3.97
3.94
2.19
1.11
1.07
1.04
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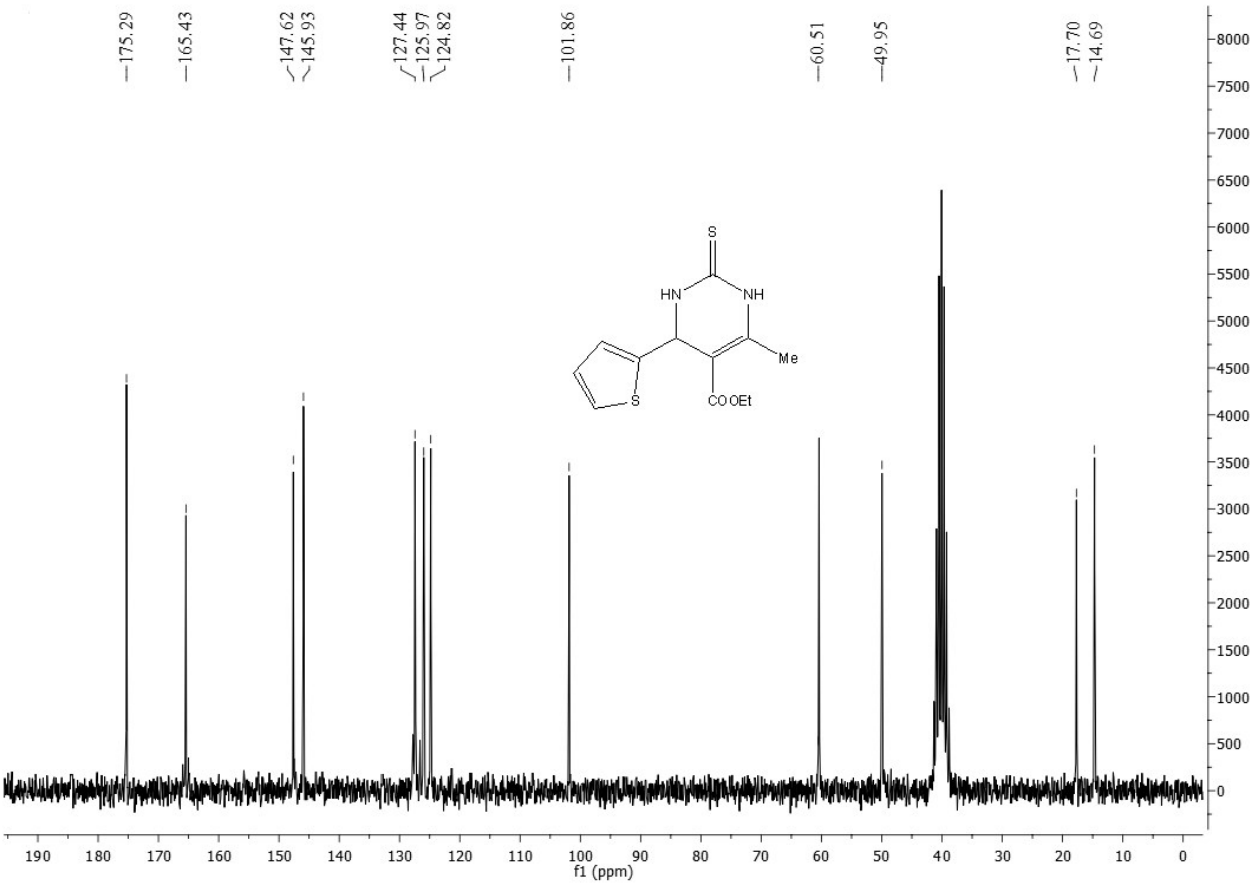
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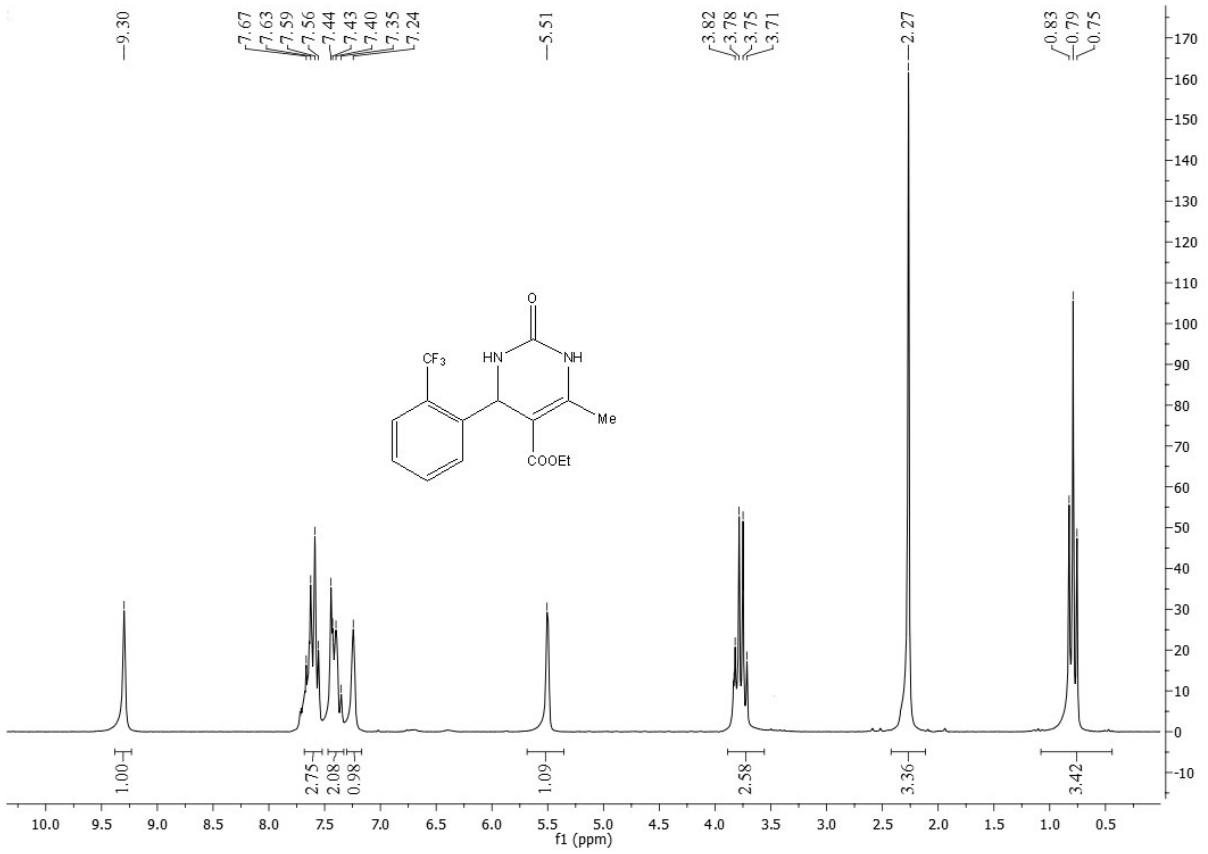
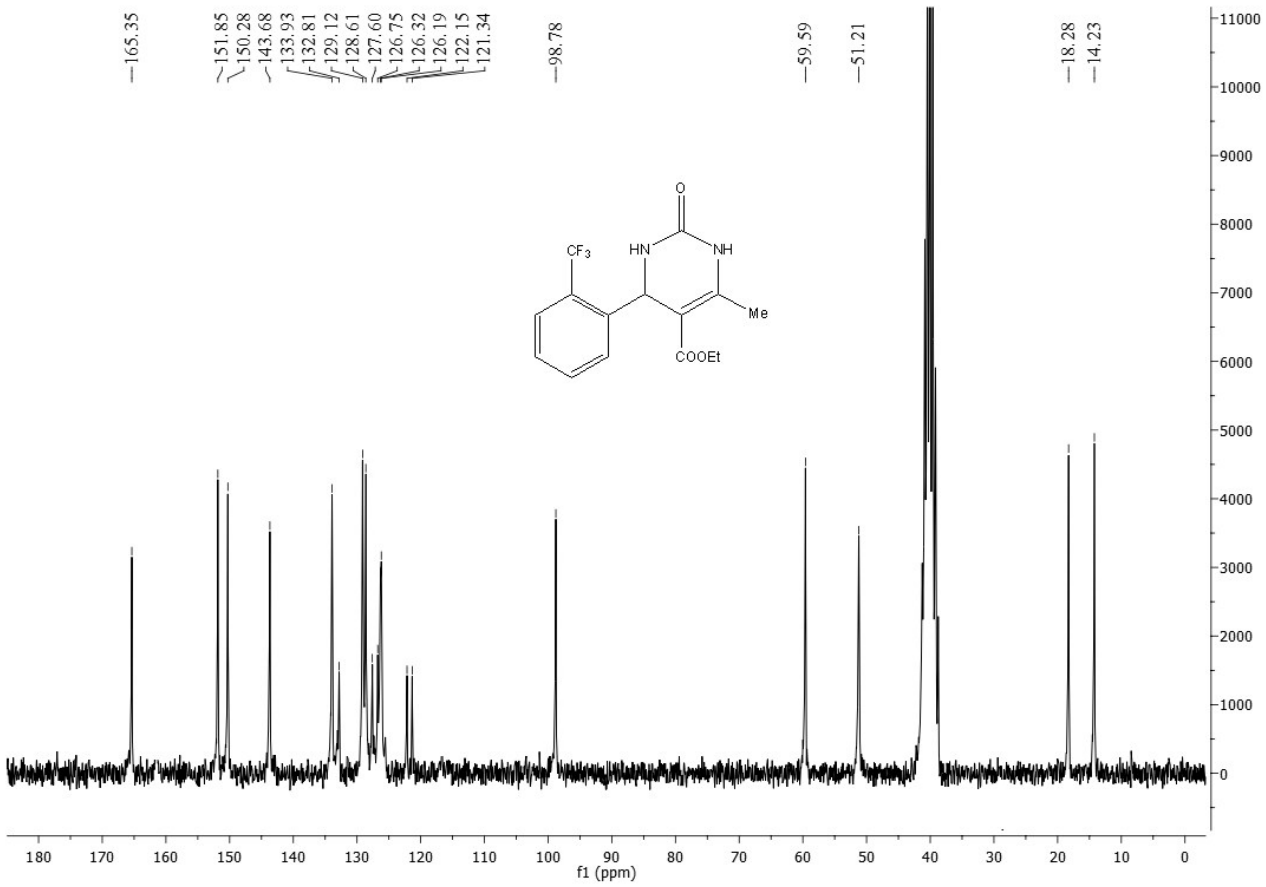
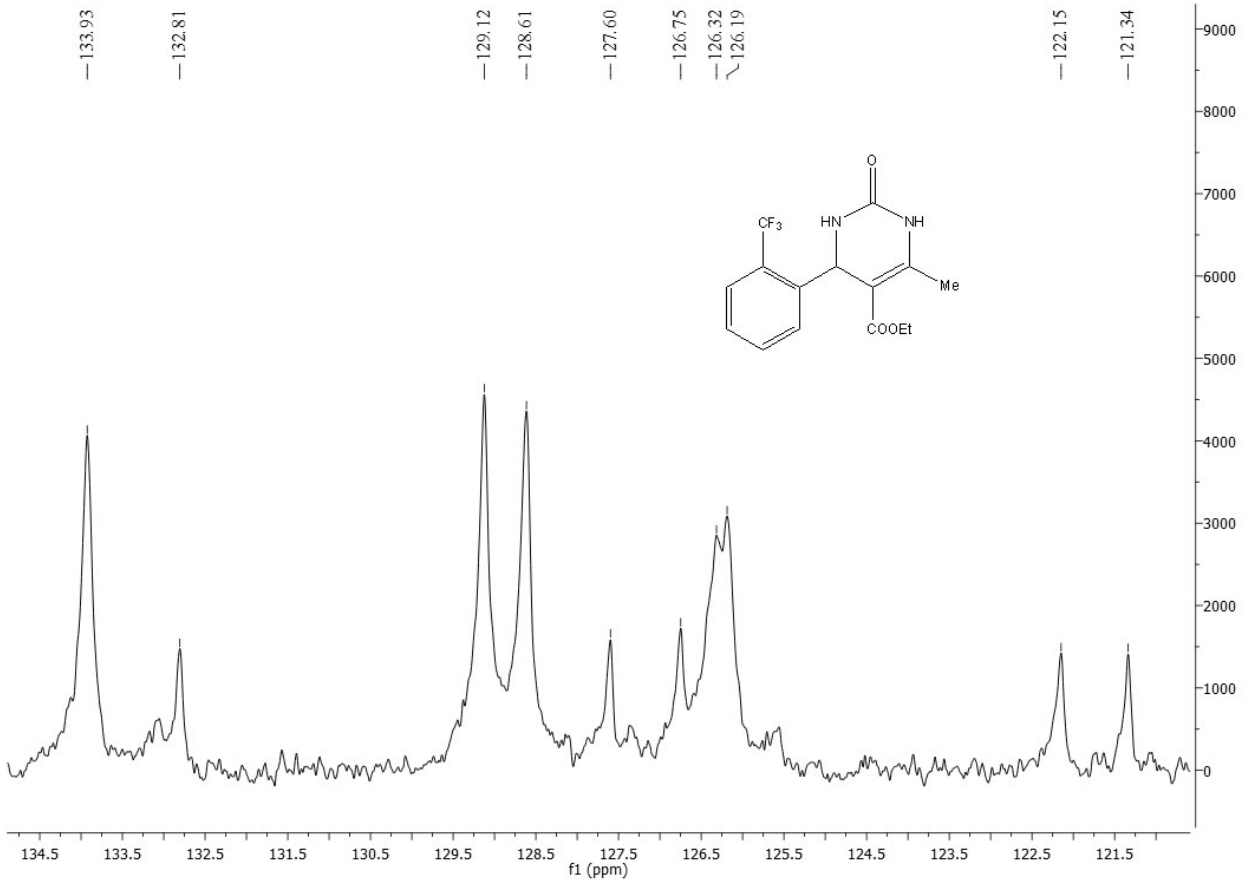
COOEt
f1 (ppm)

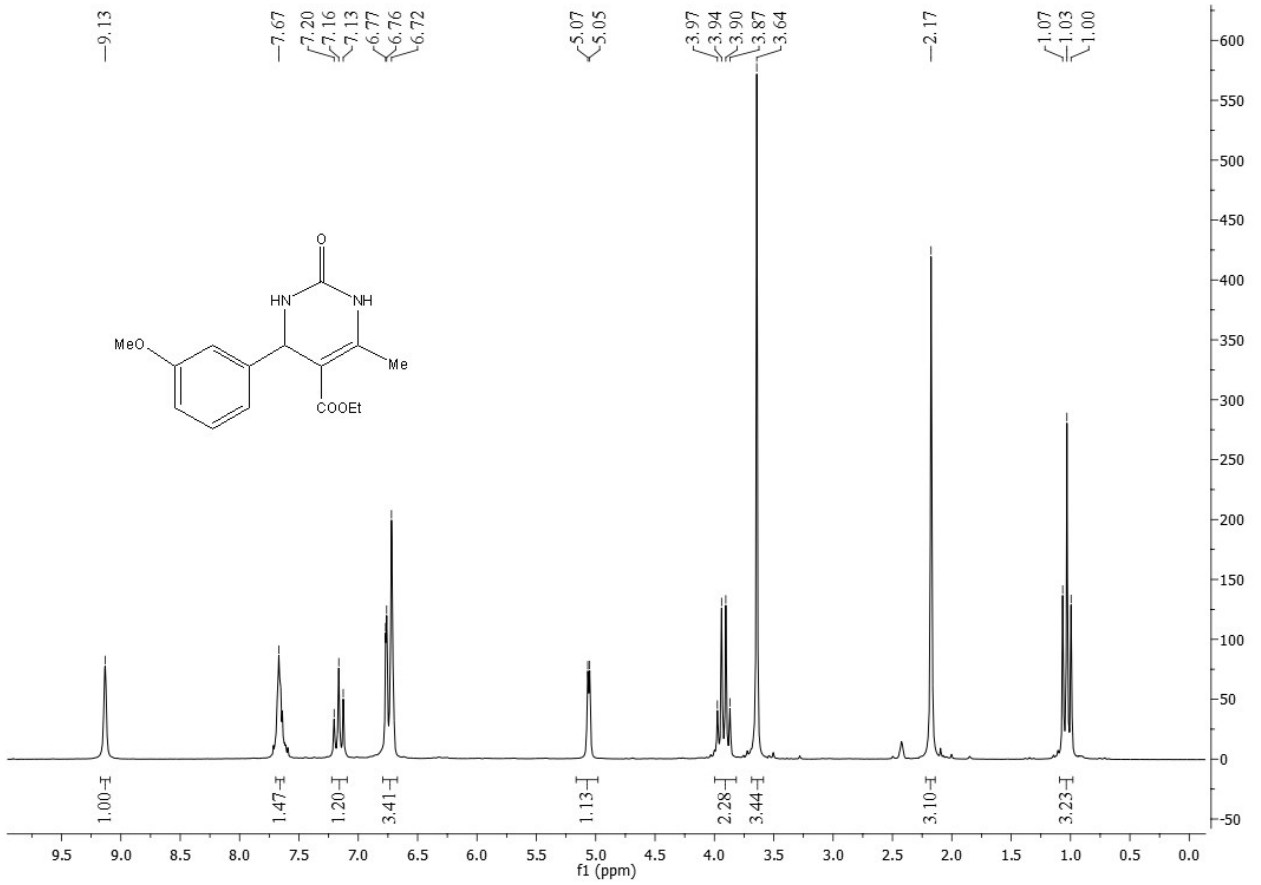
## 6. NMR spectra of 6






**Expansion between 134.5 and 121 ppm**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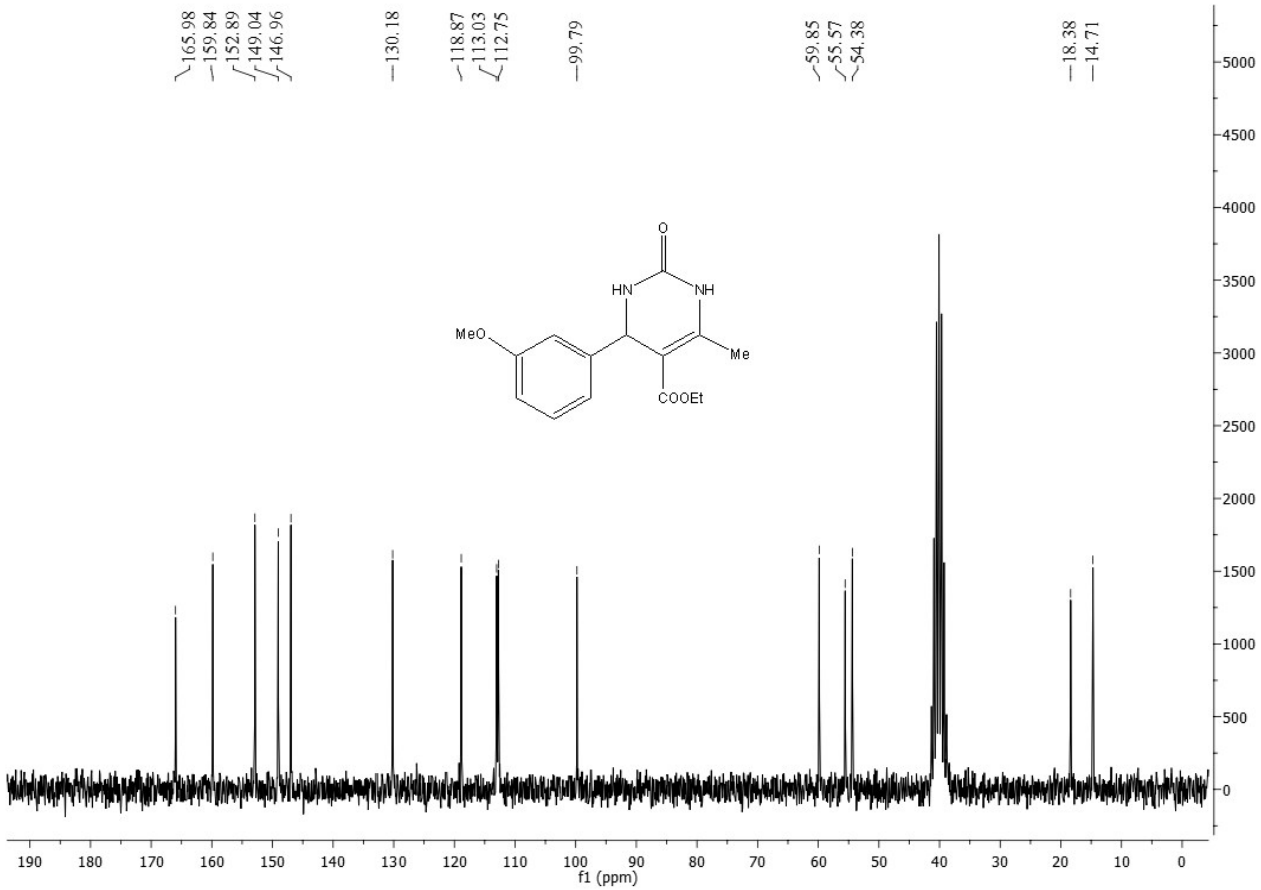
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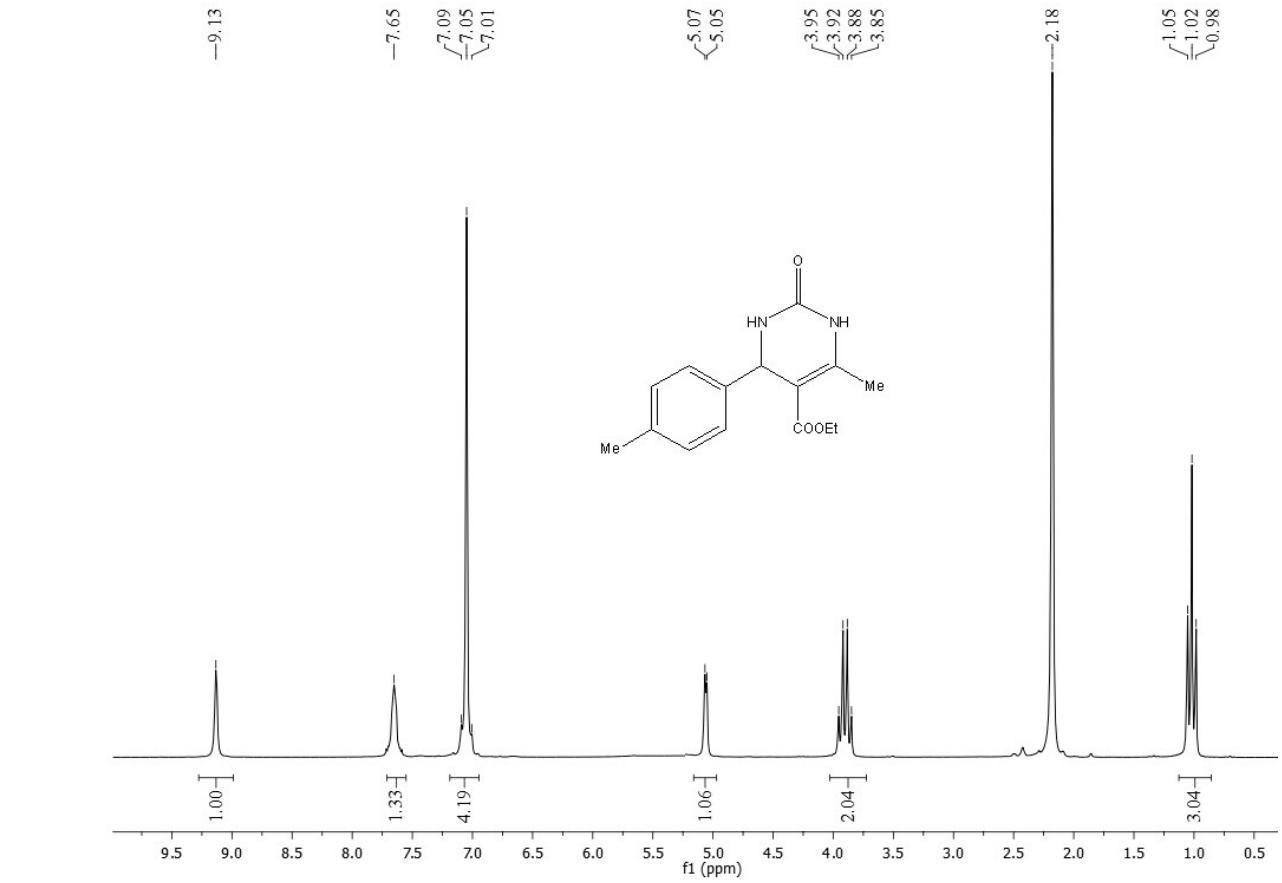
COOEt
f1 (ppm)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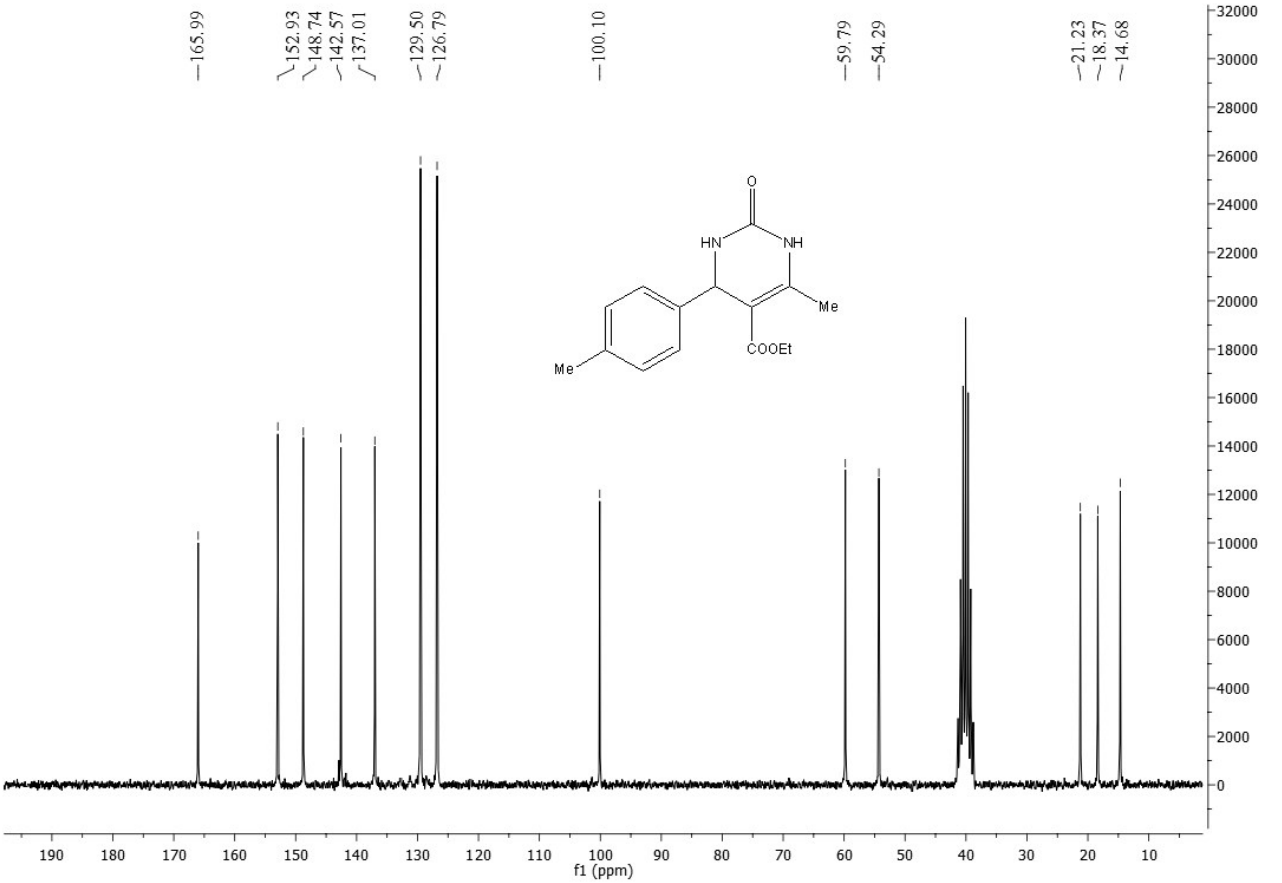
f1 (ppm)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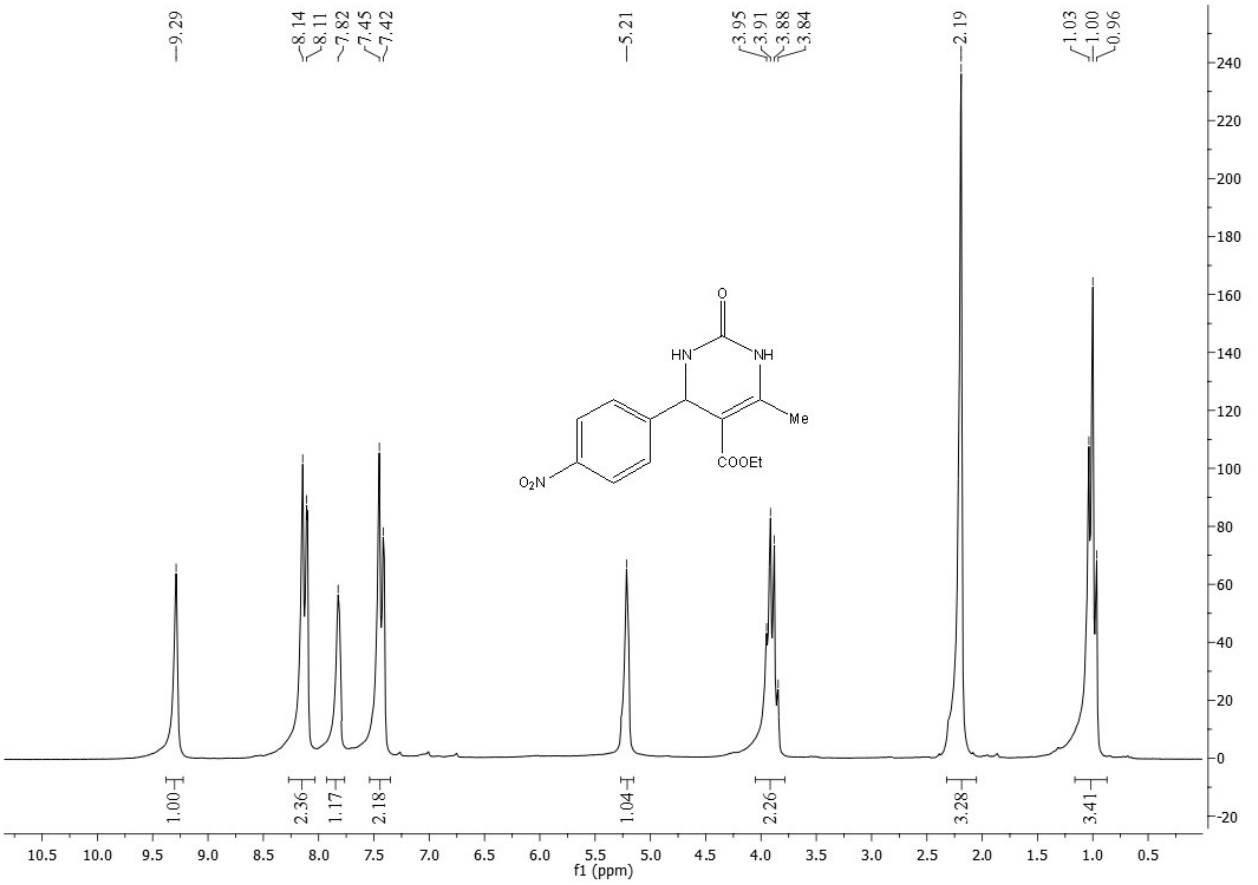
f1 (ppm)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1.00
0.96
1.00
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COOEt
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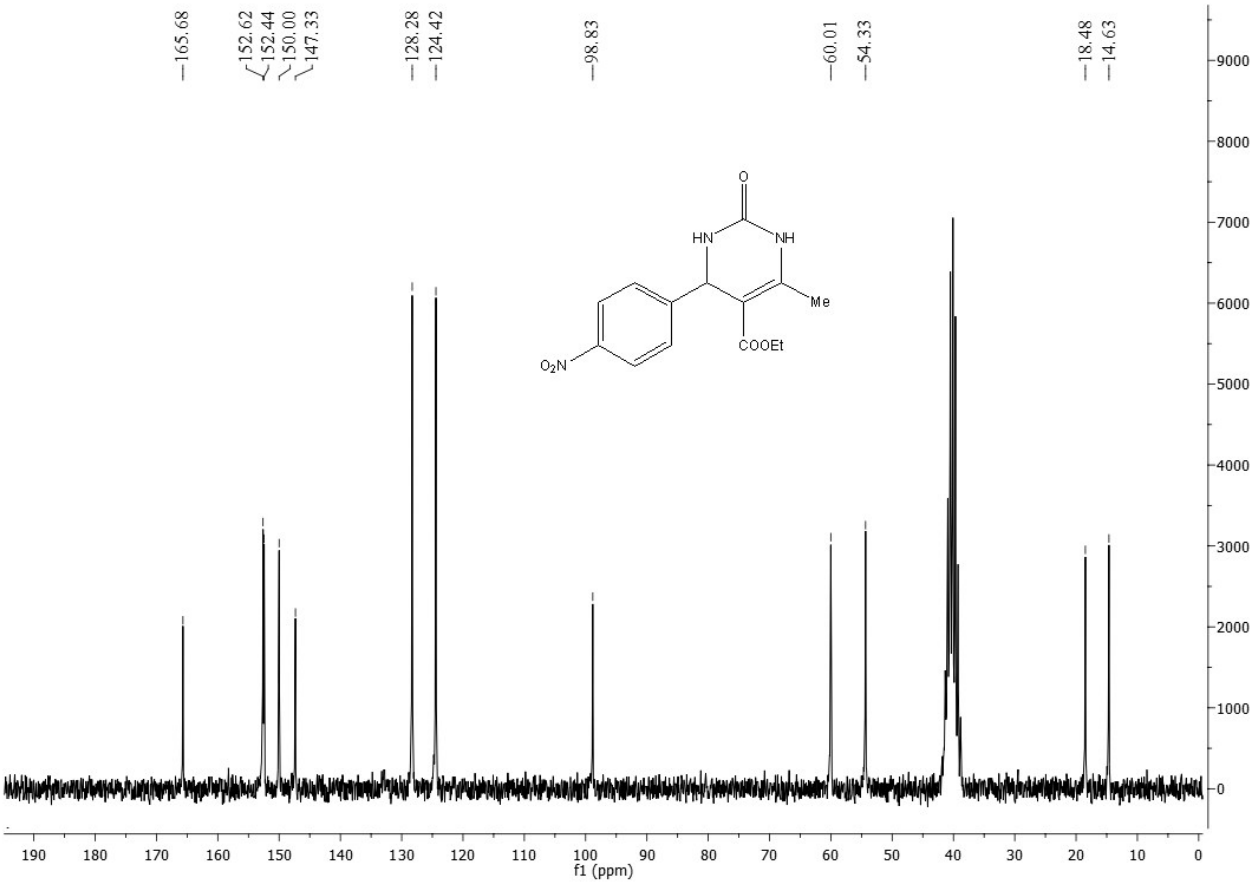
f1 (ppm)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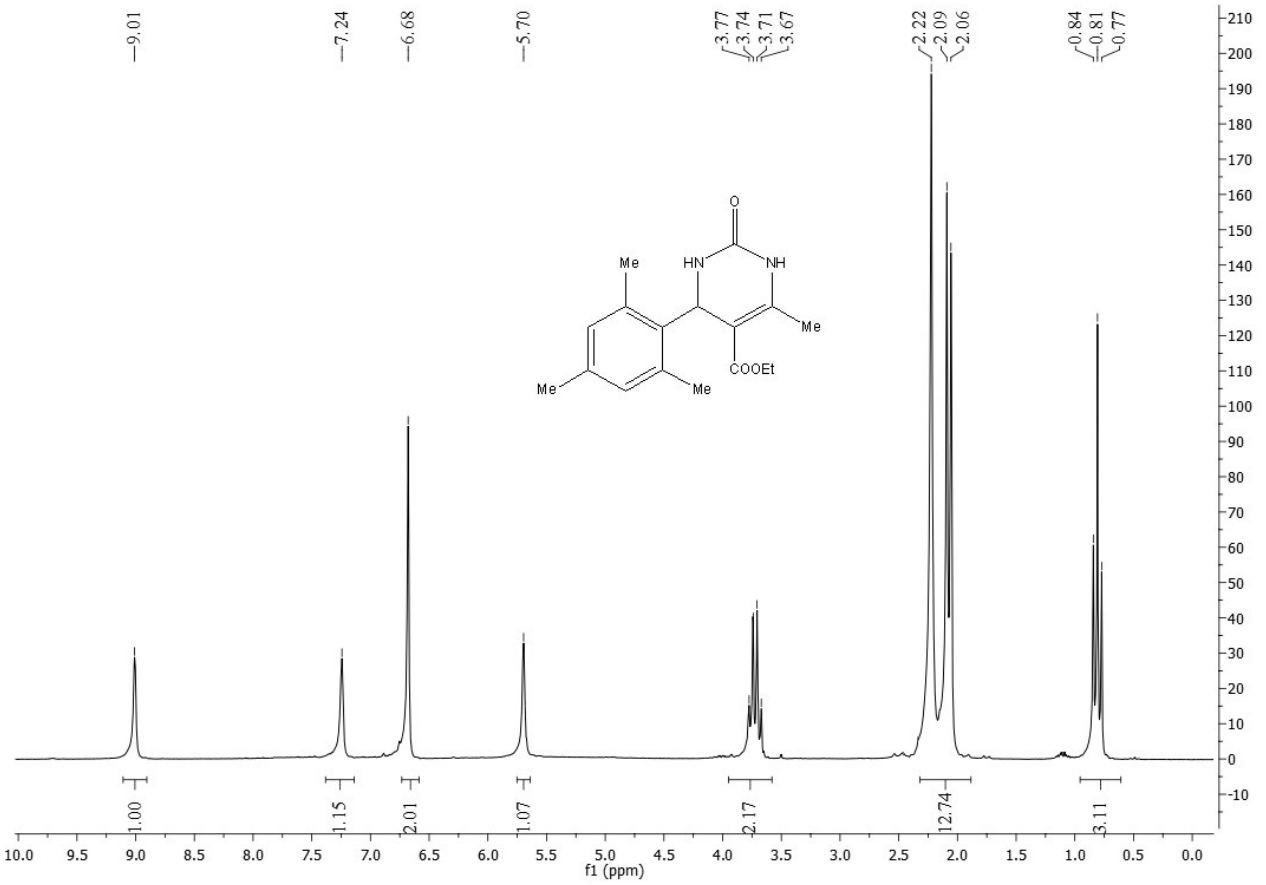
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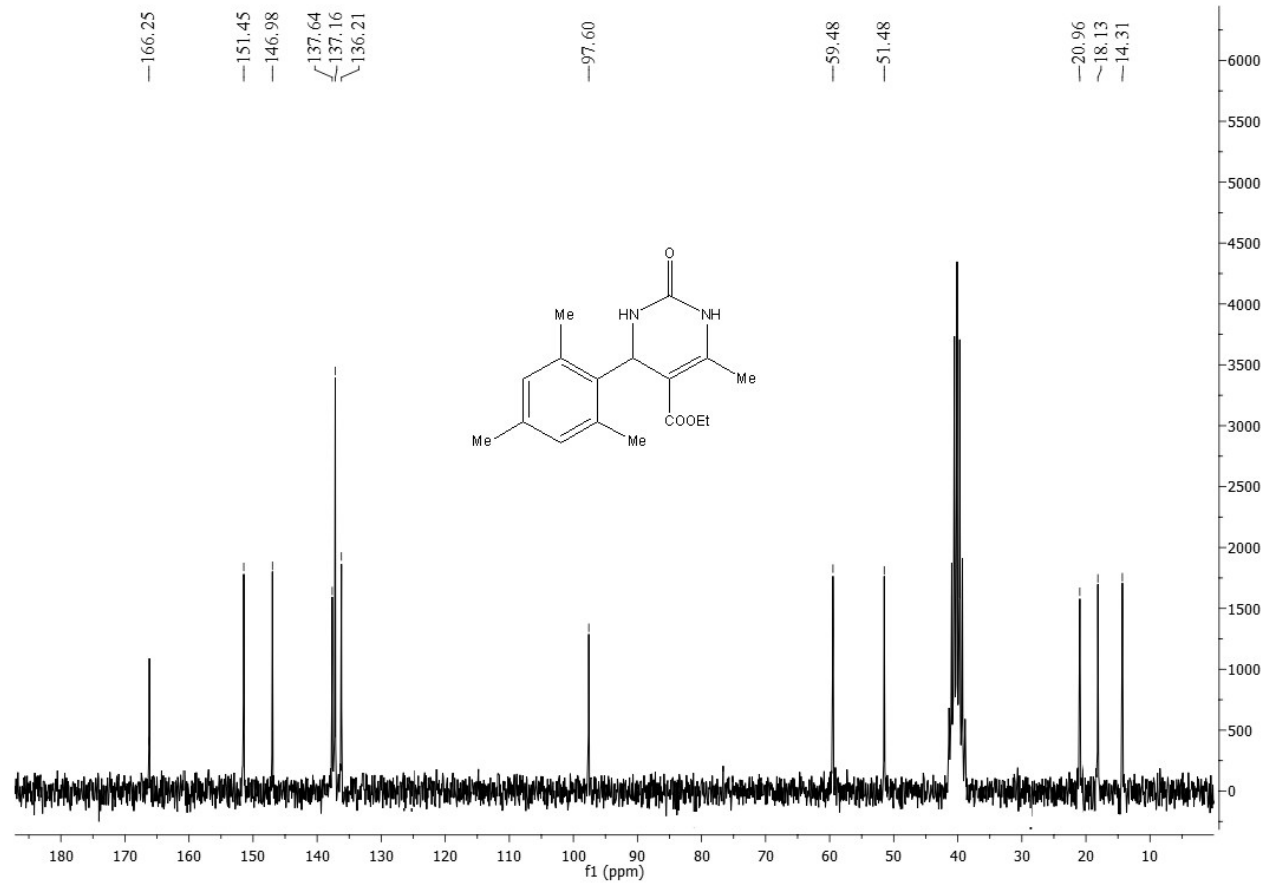
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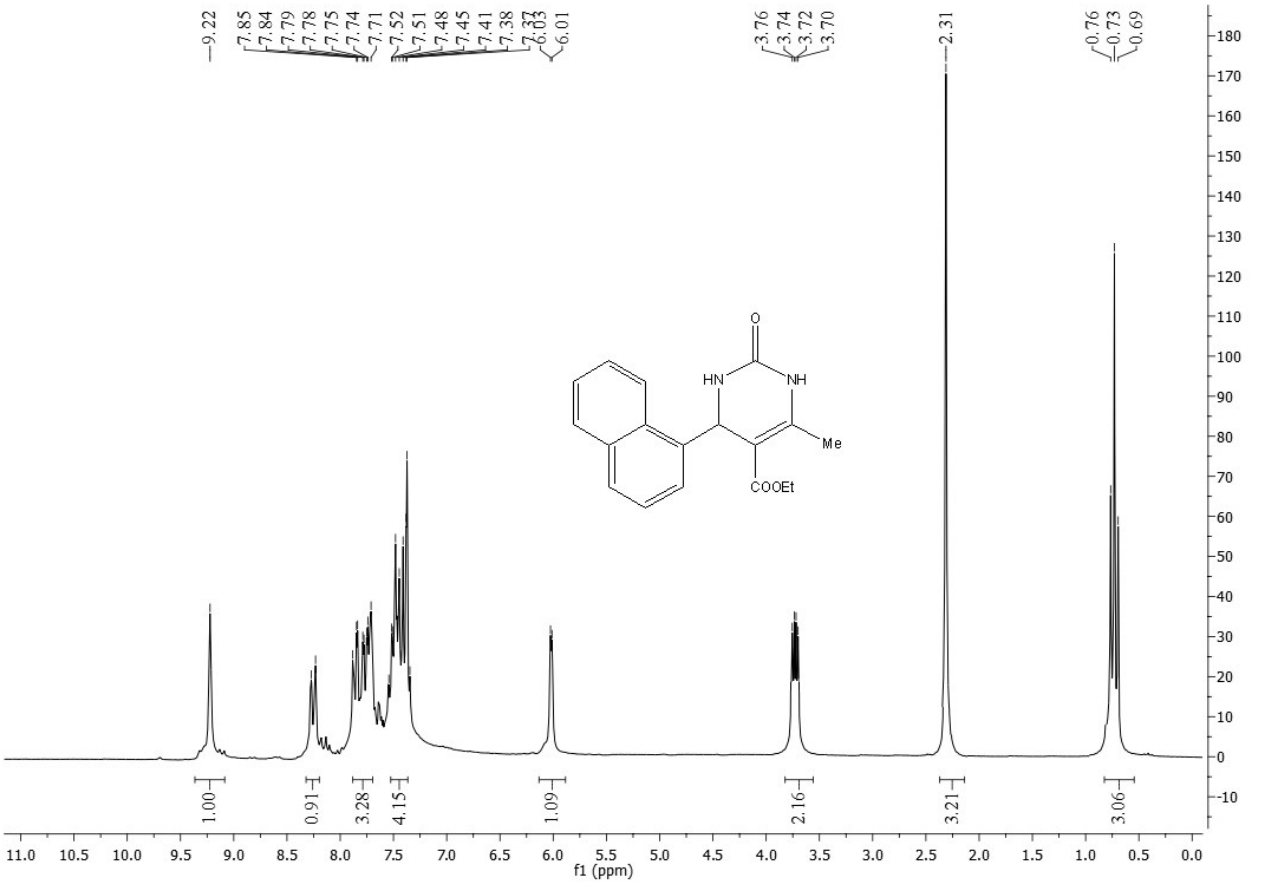
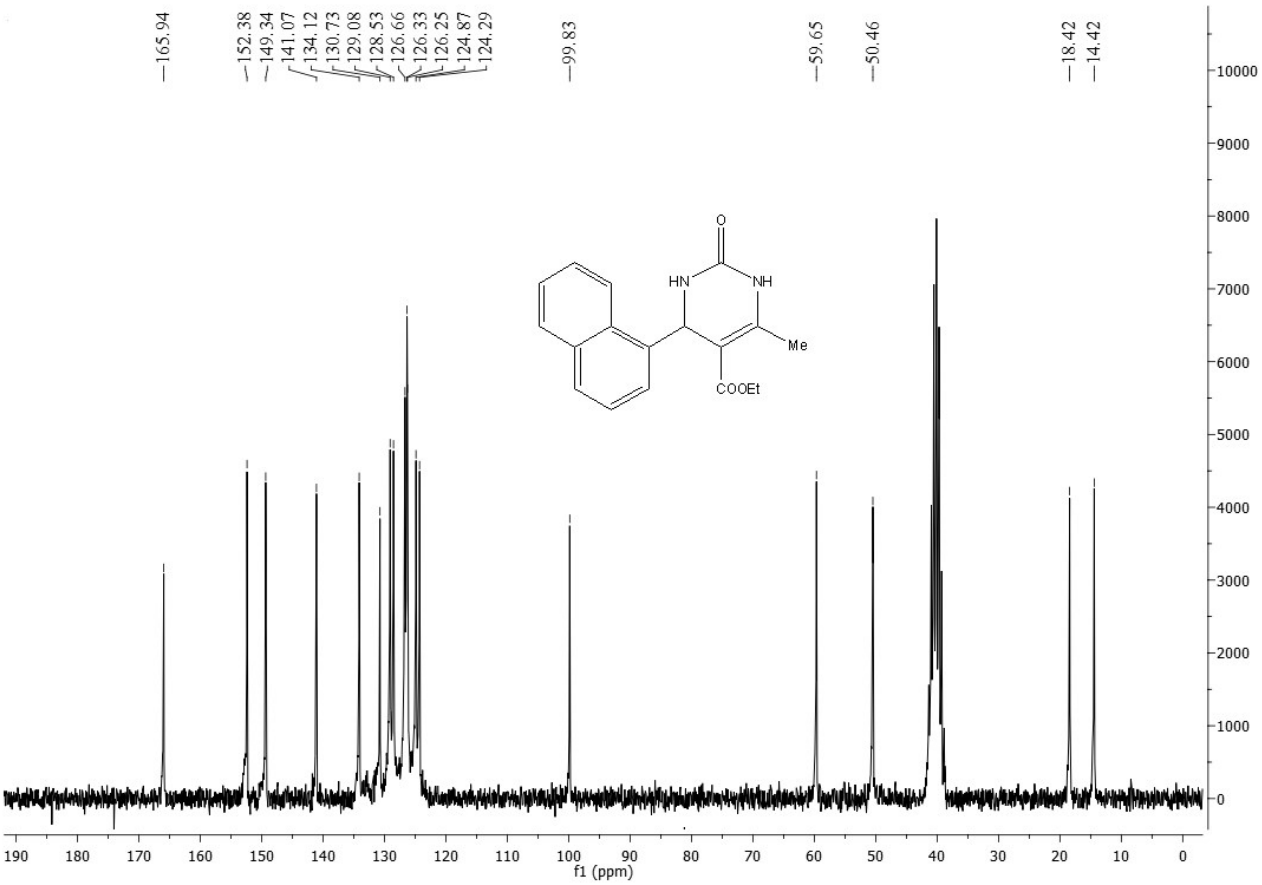
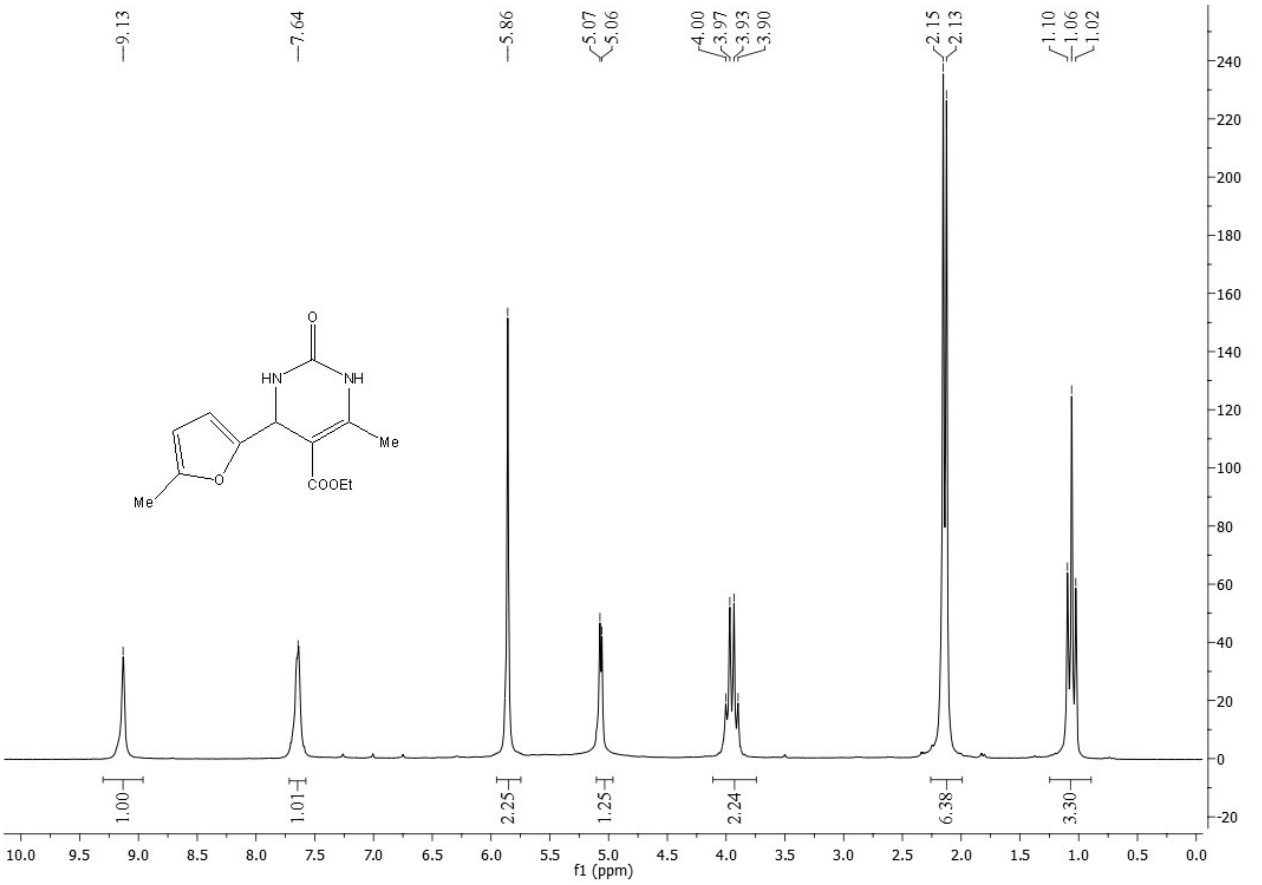
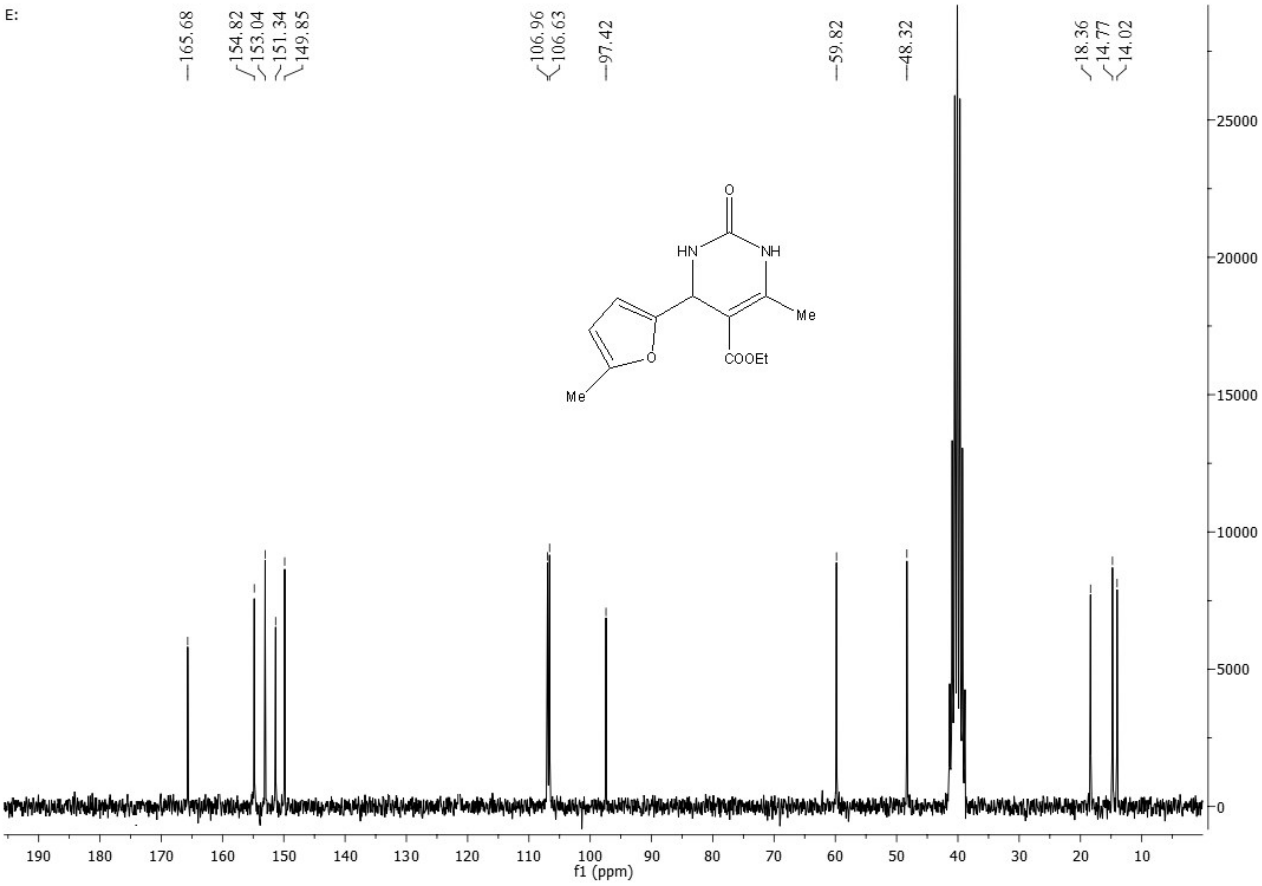
NH
Me
Me
Me
Me
COOEt

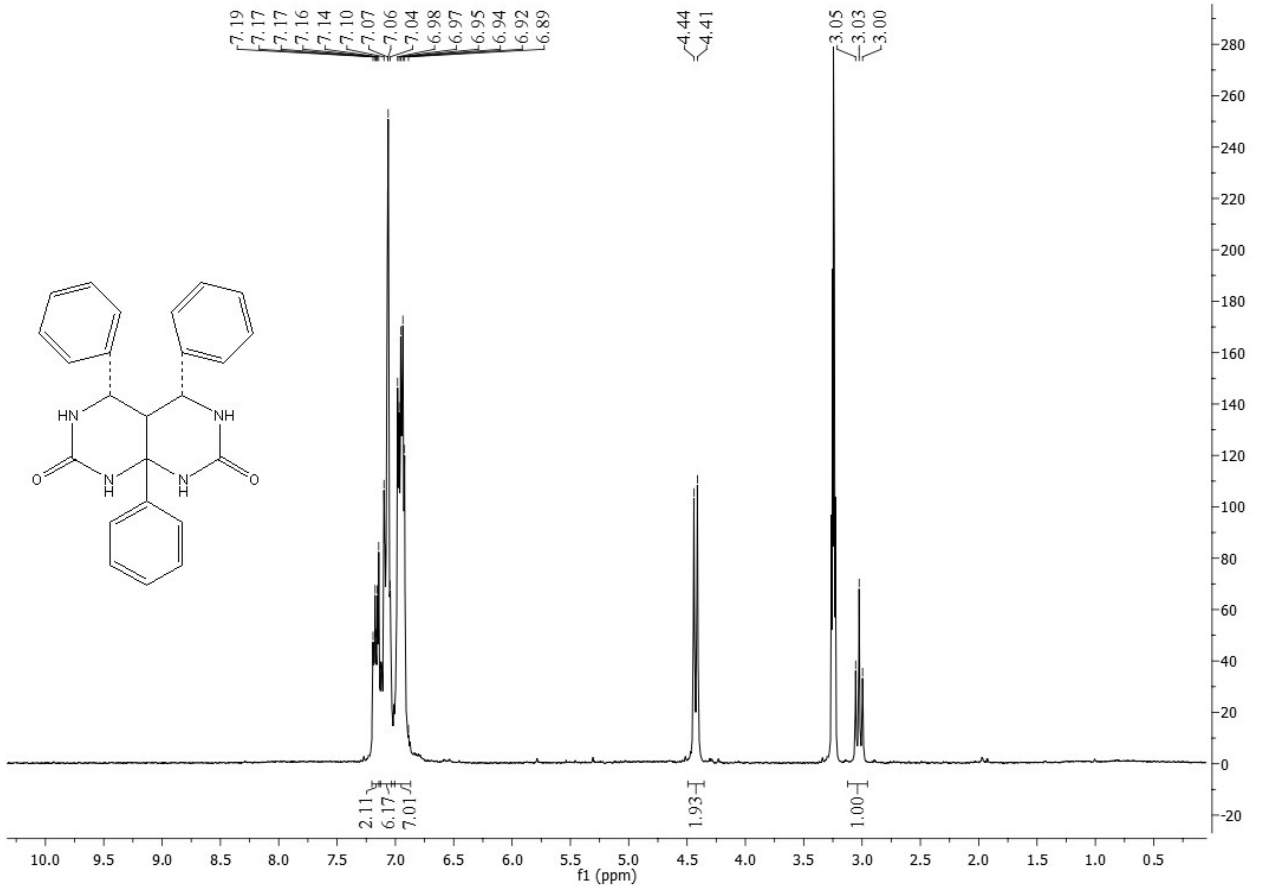

9.22
7.85
7.84
7.79
7.78
7.75
7.74
7.71
7.52
7.51
7.48
7.45
7.41
7.38
6.03
6.01
3.76
3.74
3.72
3.70
2.31
0.76
0.73
0.69
HN
NH
O
Me
COOEt
1.00
0.91
3.28
4.15
1.09
2.16
3.21
3.06
f1 (ppm)

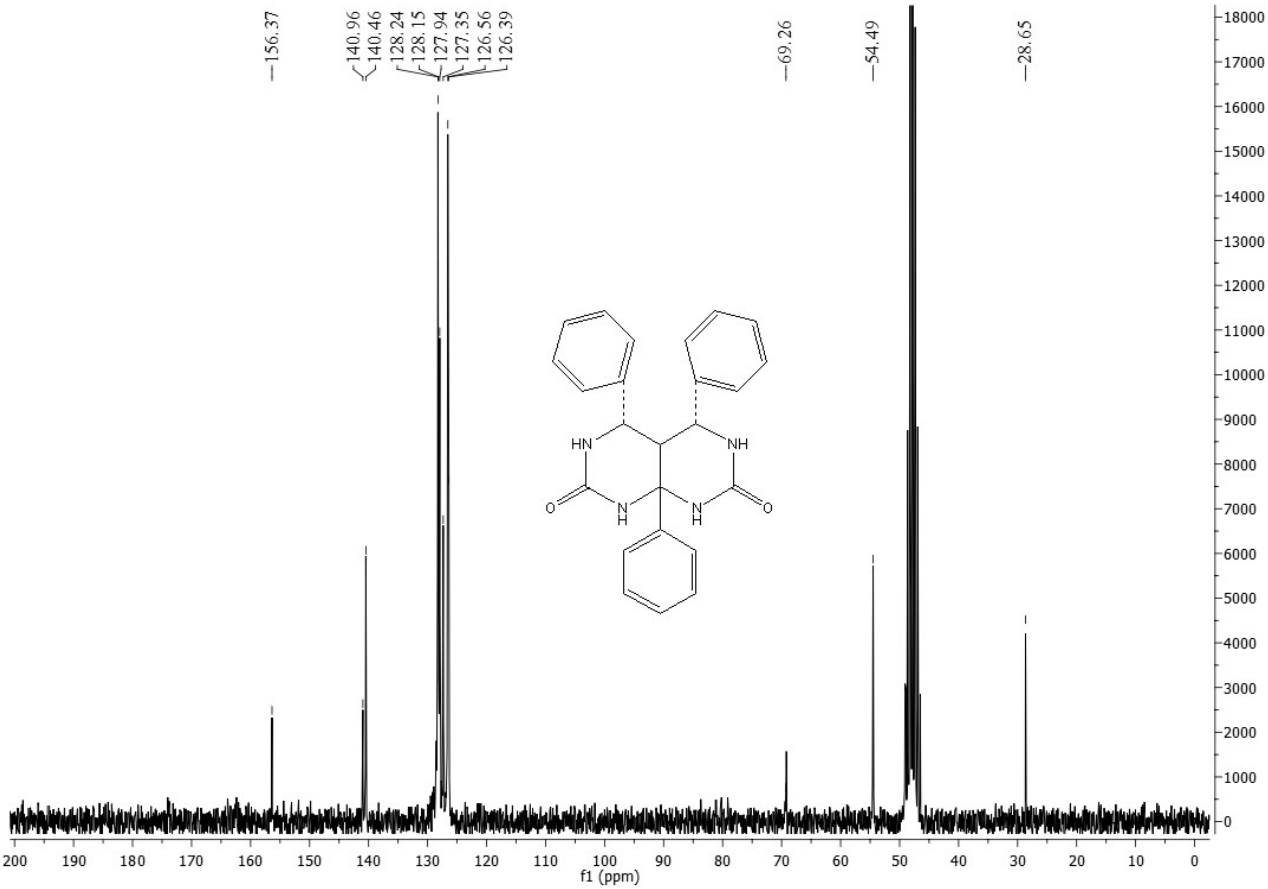

165.94
152.38
149.34
141.07
134.12
130.73
129.08
128.53
126.66
126.33
126.25
124.87
124.29
99.83
59.65
50.46
18.42
14.42
HN
NH
O
Me
COOEt
f1 (ppm)

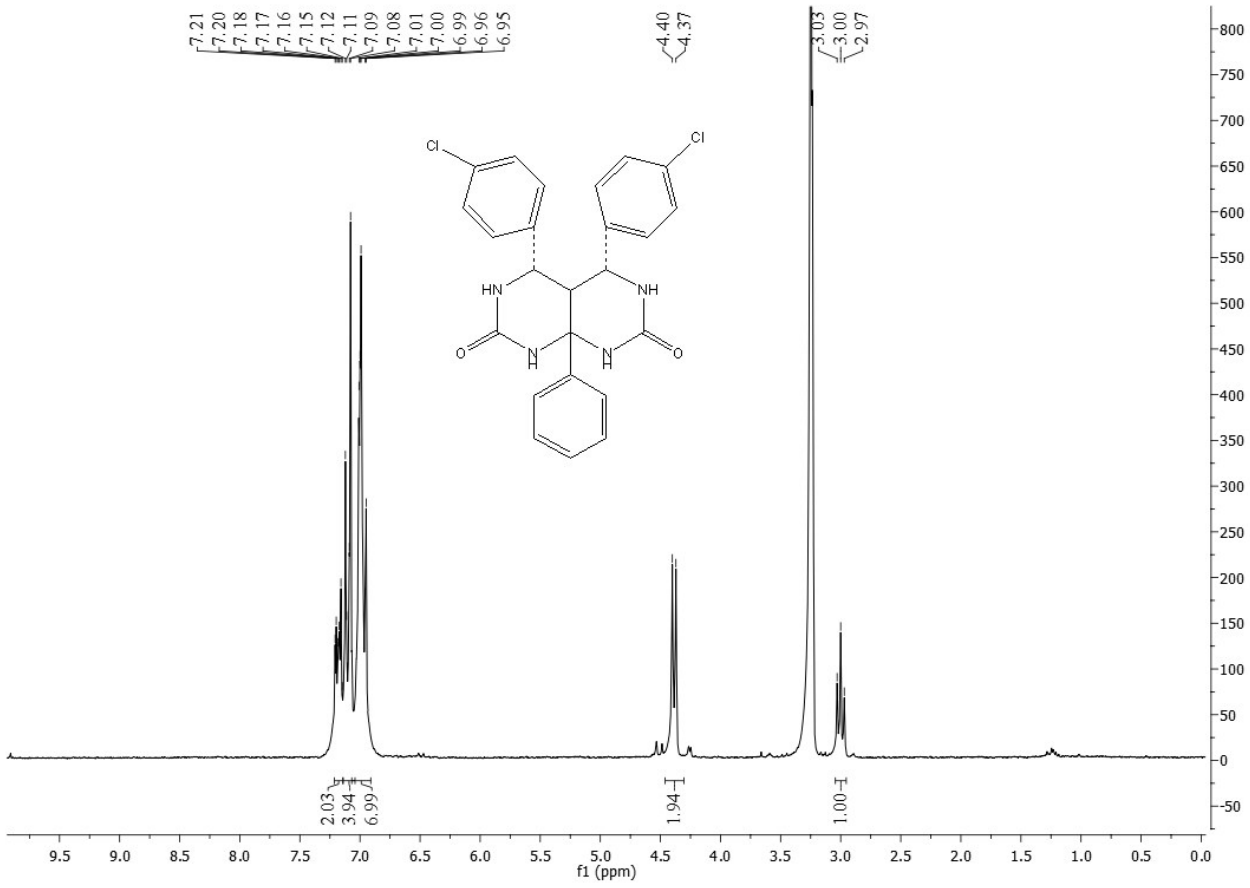

9.13
7.64
5.86
5.07
5.06
4.00
3.97
3.93
3.90
2.15
2.13
1.10
1.06
1.02
HN
NH
O
Me
COOEt
Me
1.00
1.01
2.25
1.25
2.24
6.38
3.30
f1 (ppm)

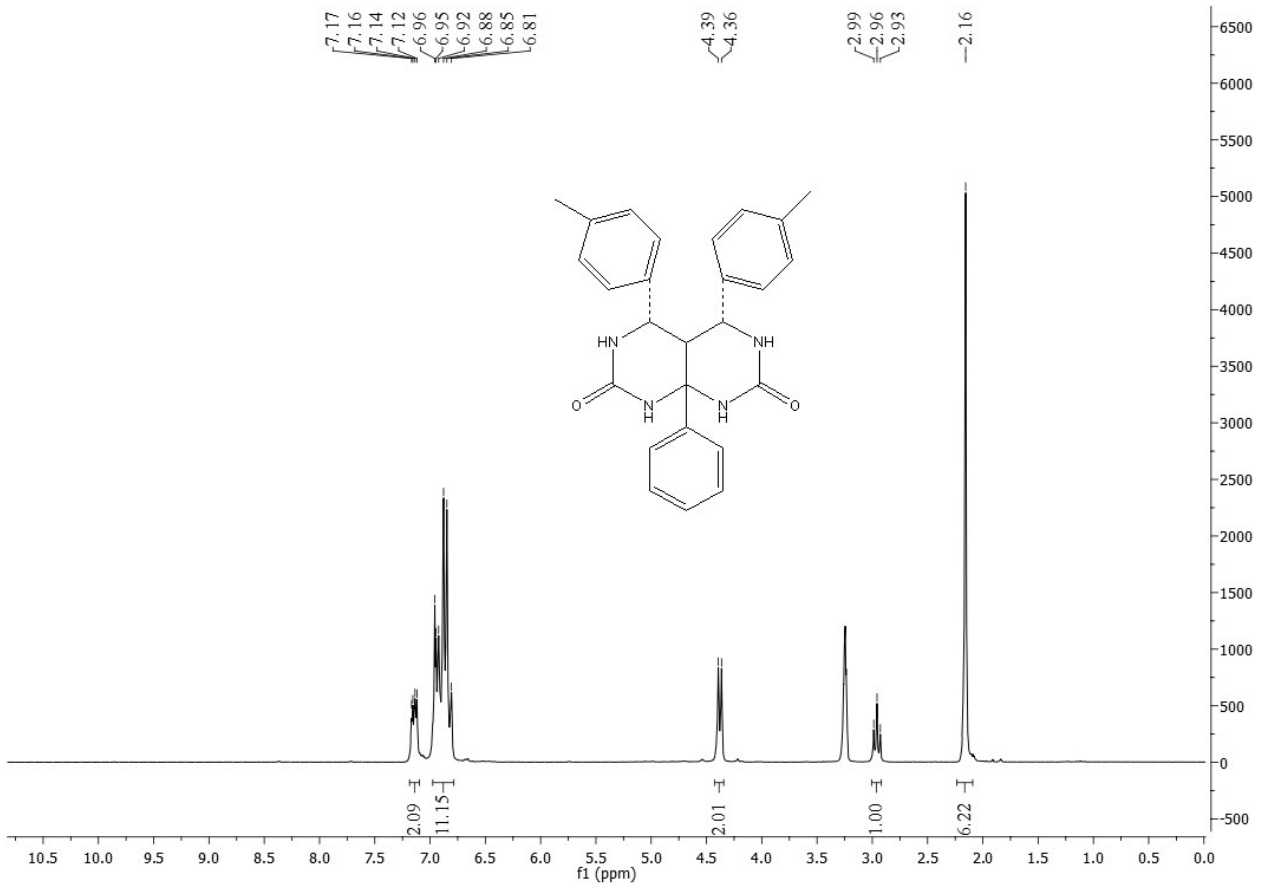

E:
165.68
154.82
153.04
151.34
149.85
106.96
106.63
97.42
59.82
48.32
18.36
14.77
14.02
HN
NH
O
Me
COOEt
Me
f1 (ppm)

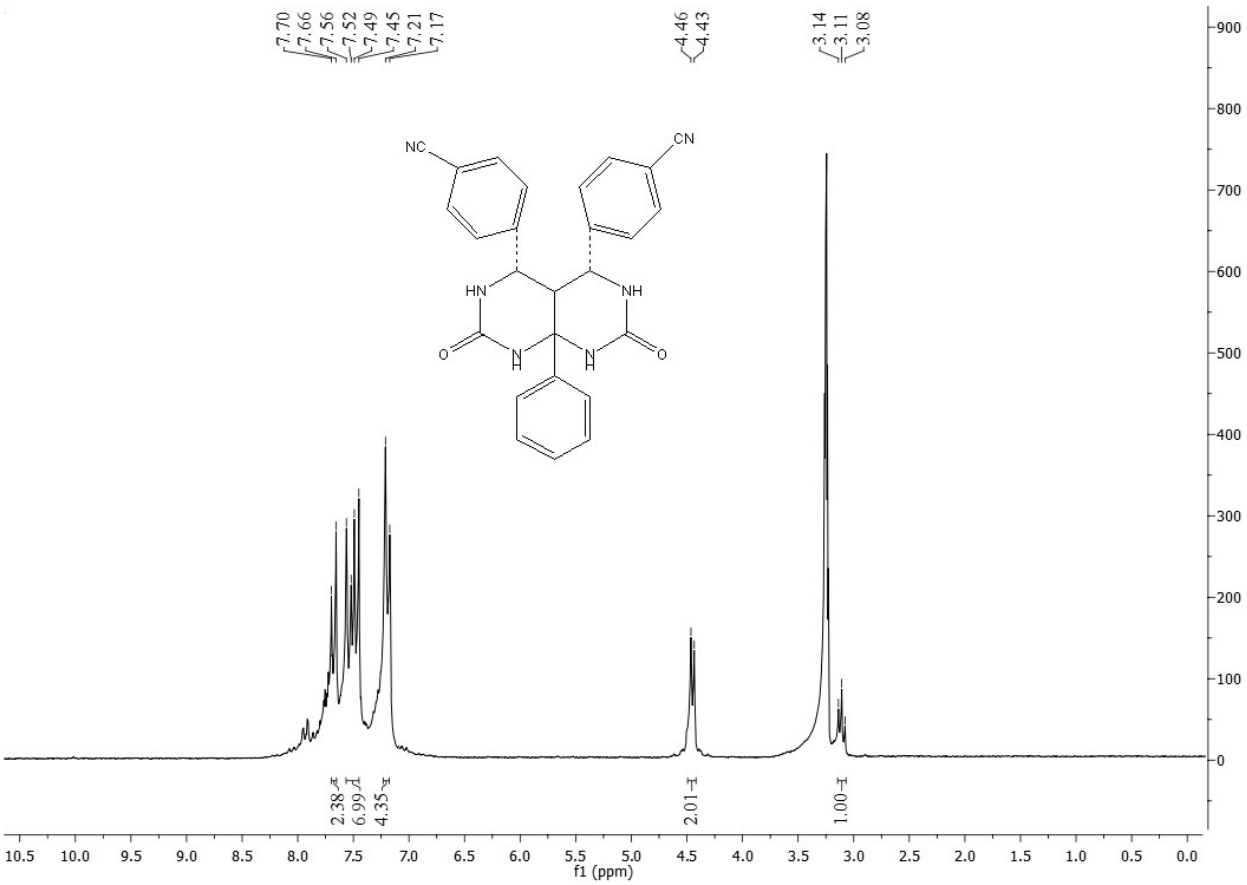
## 7. NMR spectra of 18

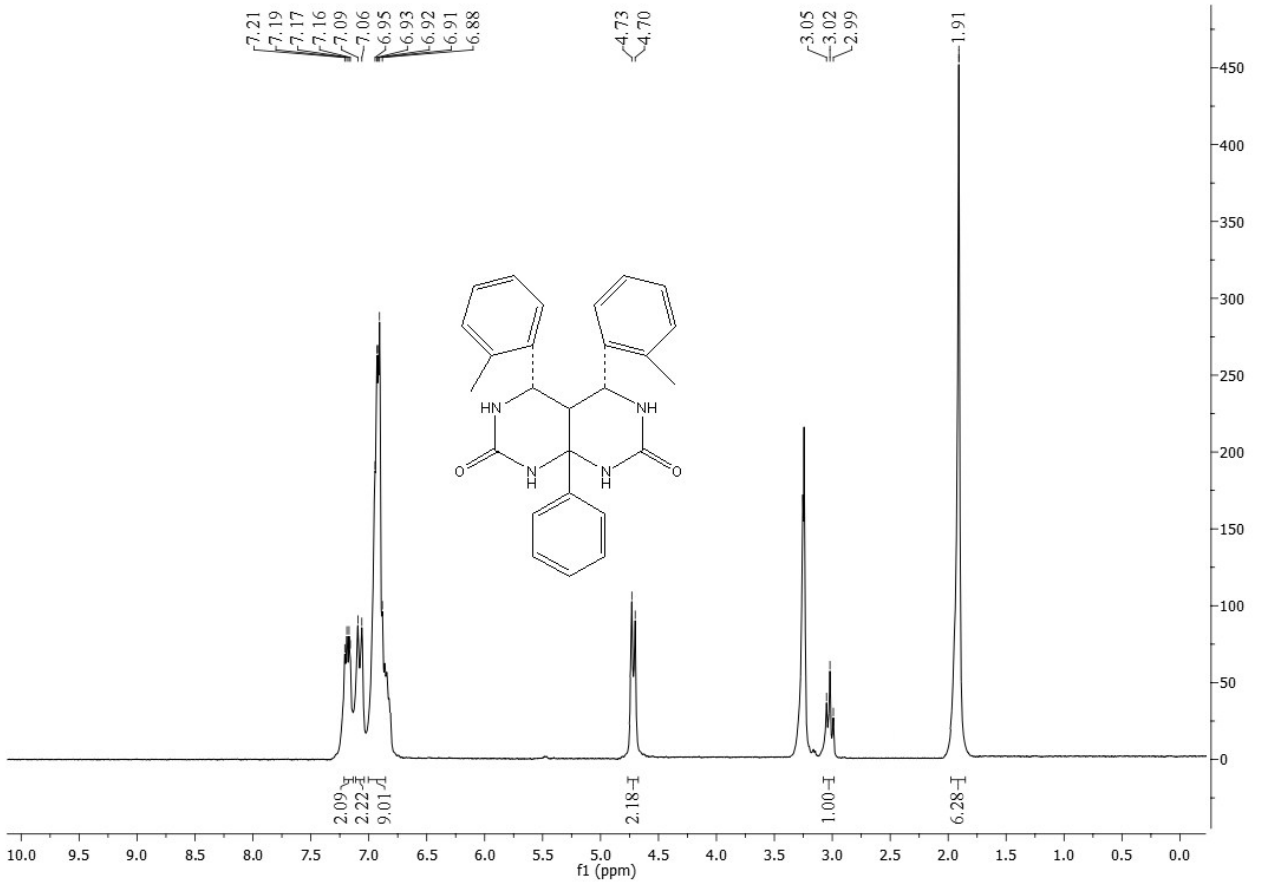


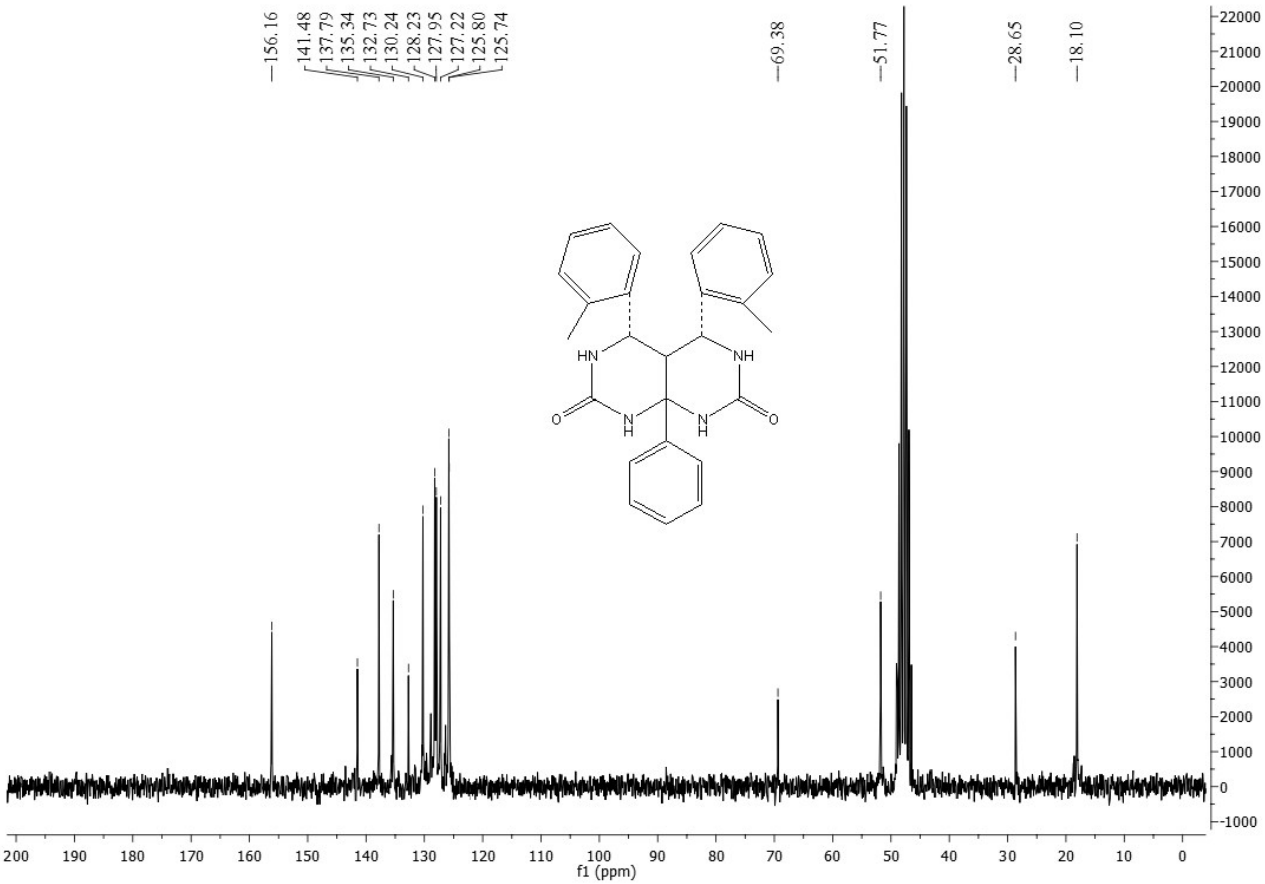



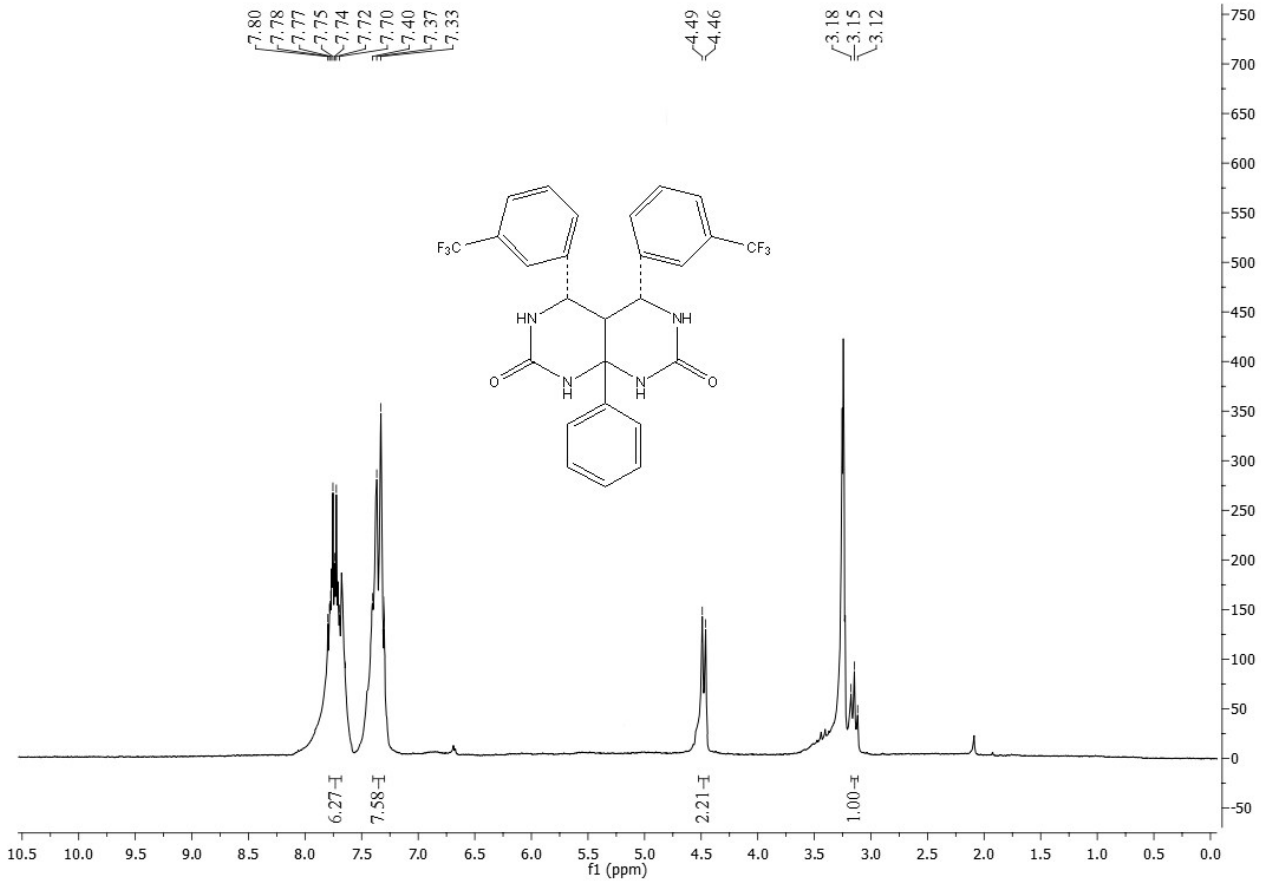

7.21
7.20
7.18
7.17
7.16
7.15
7.12
7.11
7.09
7.08
7.01
7.00
6.99
6.96
6.95
4.40
4.37
3.03
3.00
2.97
Cl
Cl
HN
NH
O
O
N
H
N
H
2.03
3.94
6.99
1.94
1.00
f1 (ppm)

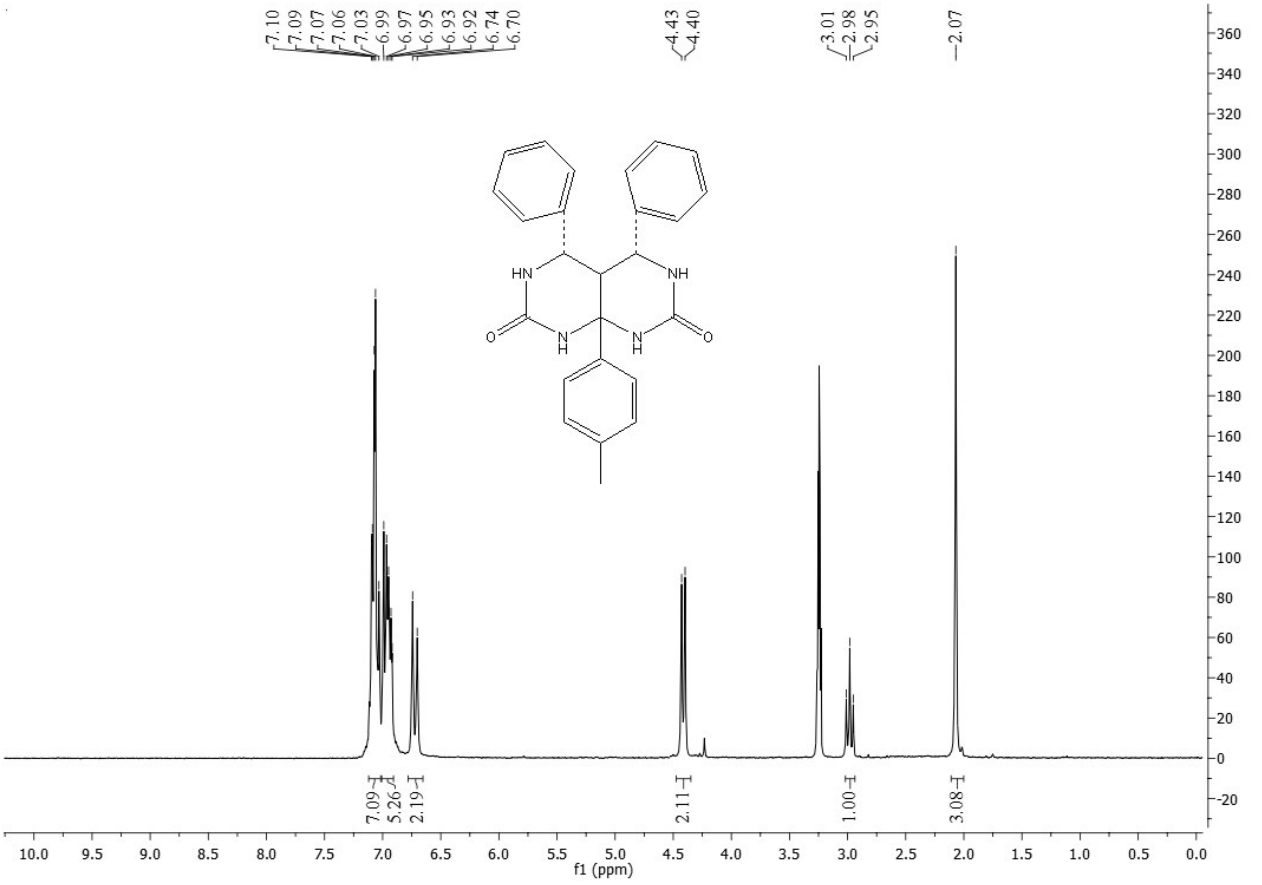

7.17
7.16
7.14
7.12
6.96
6.95
6.92
6.88
6.85
6.81
4.39
4.36
2.99
2.96
2.93
2.16
HN
NH
O
N
H
N
H
O
2.09
11.15
2.01
1.00
6.22
f1 (ppm)

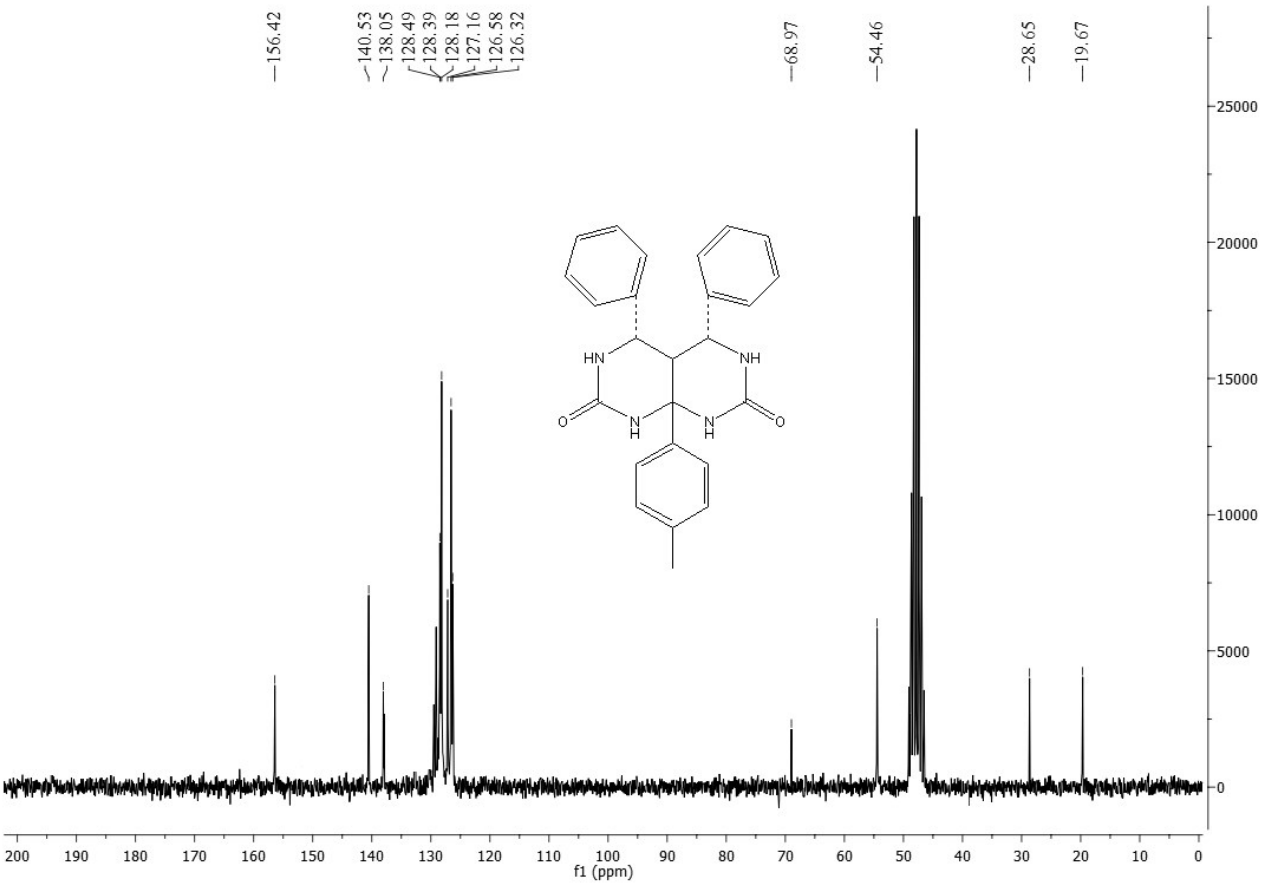

7.70
7.66
7.56
7.52
7.49
7.45
7.21
7.17
4.46
4.43
3.14
3.11
3.08
NC
CN
HN
NH
O
O
2.38
6.99
4.35
2.01
1.00
f1 (ppm)


7.21
7.19
7.17
7.16
7.09
7.06
6.95
6.93
6.92
6.91
6.88
4.73
4.70
3.05
3.02
2.99
1.91
HN
NH
O
N
H
N
H
O
2.09
2.22
9.01
2.18
1.00
6.28
f1 (ppm)

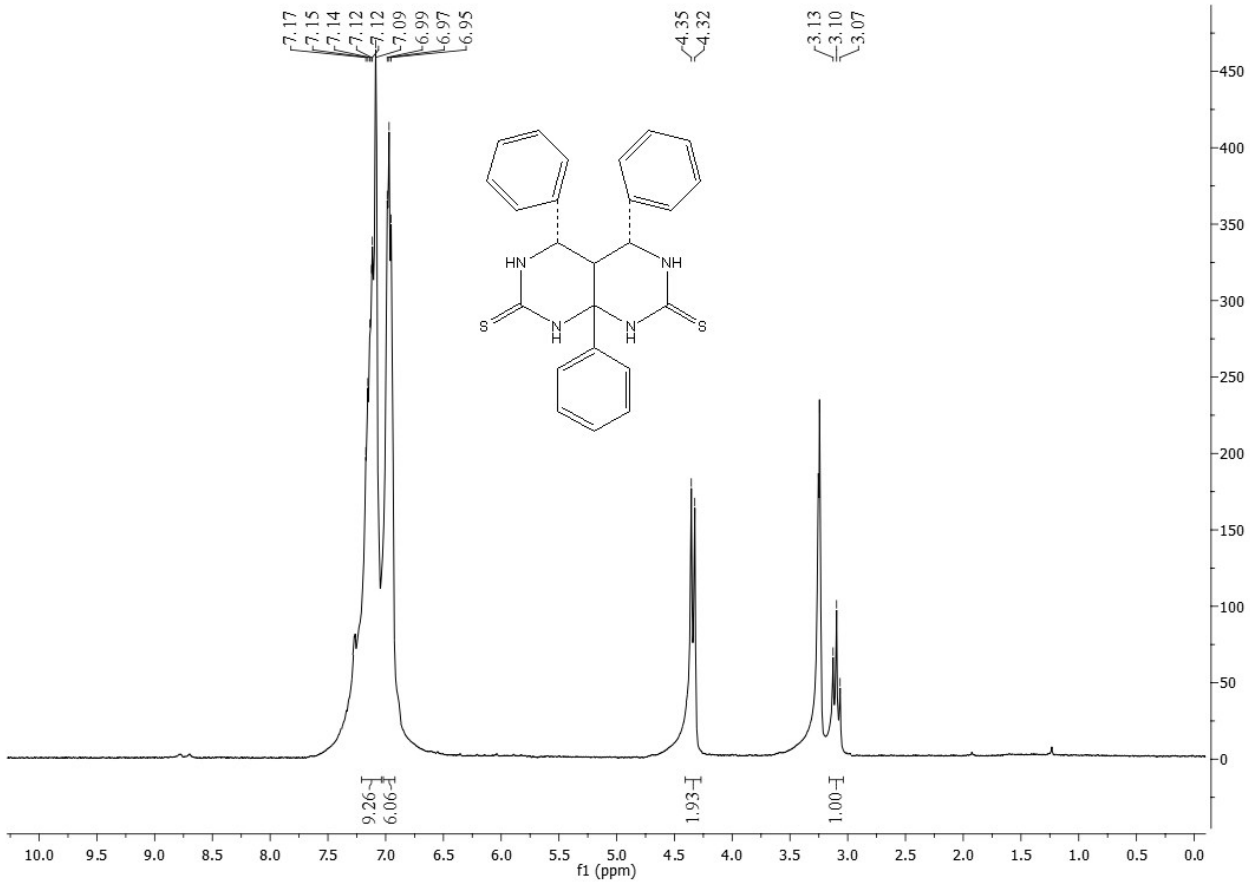

156.16
141.48
137.79
135.34
132.73
130.24
128.23
127.95
127.22
125.80
125.74
69.38
51.77
28.65
18.10
HN
NH
O
N
H
N
H
O
f1 (ppm)

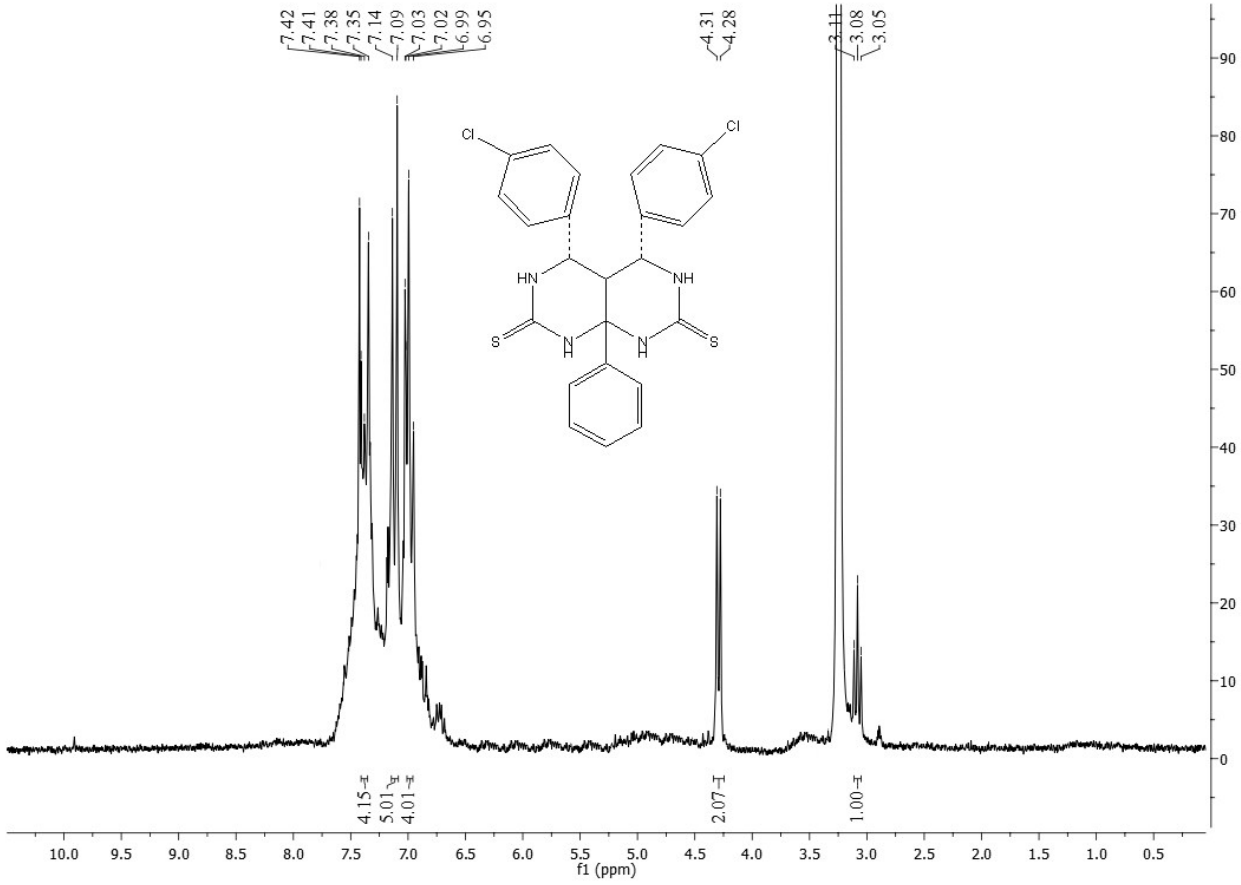

7.80
7.78
7.77
7.75
7.74
7.72
7.70
7.40
7.37
7.33
4.49
4.46
3.18
3.15
3.12
F3C
CF3
HN
NH
O
N
H
N
H
O
6.27
7.58
2.21
1.00
f1 (ppm)

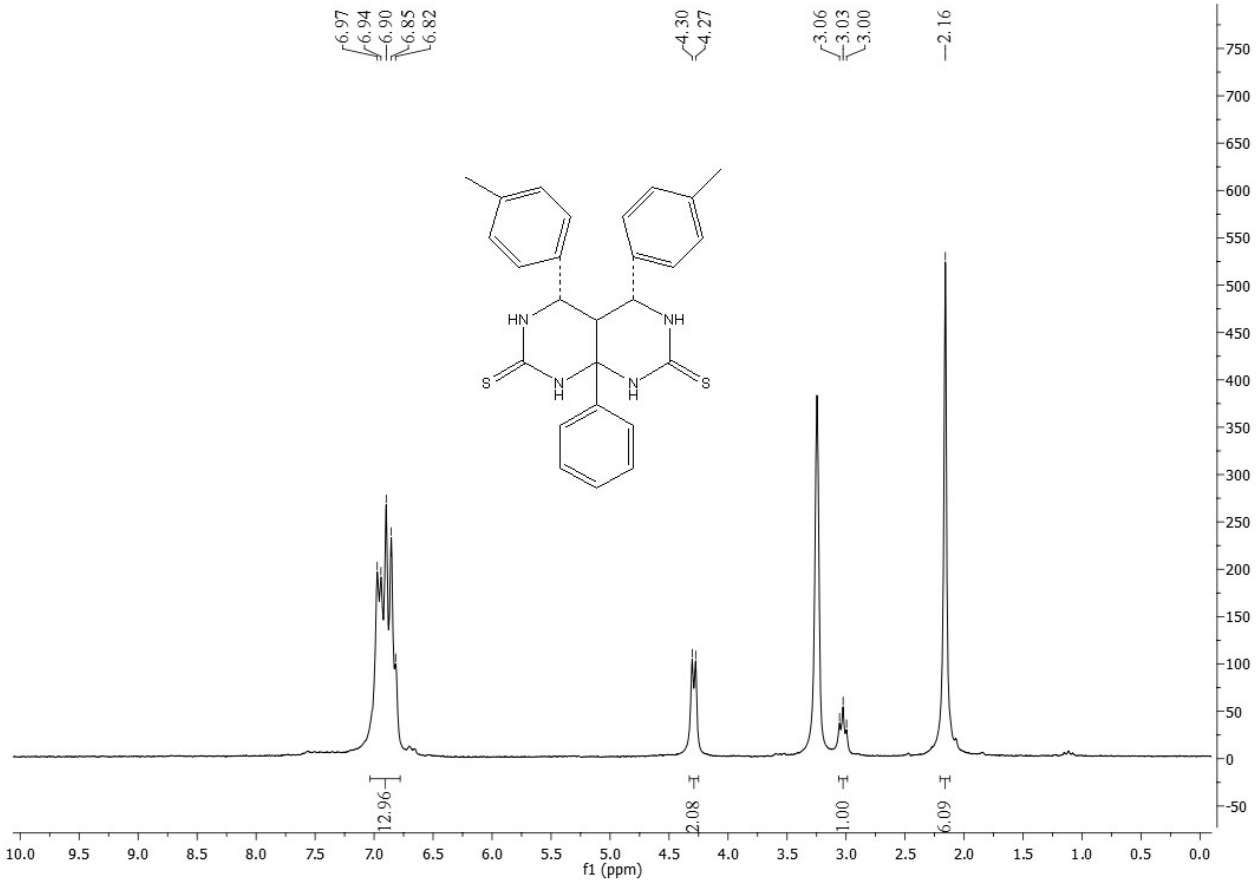

7.10
7.09
7.07
7.06
7.03
6.99
6.97
6.95
6.93
6.92
6.74
6.70
4.43
4.40
3.01
2.98
2.95
2.07
HN
NH
O
N
H
N
H
O
7.09
5.26
2.19
2.11
1.00
3.08
f1 (ppm)

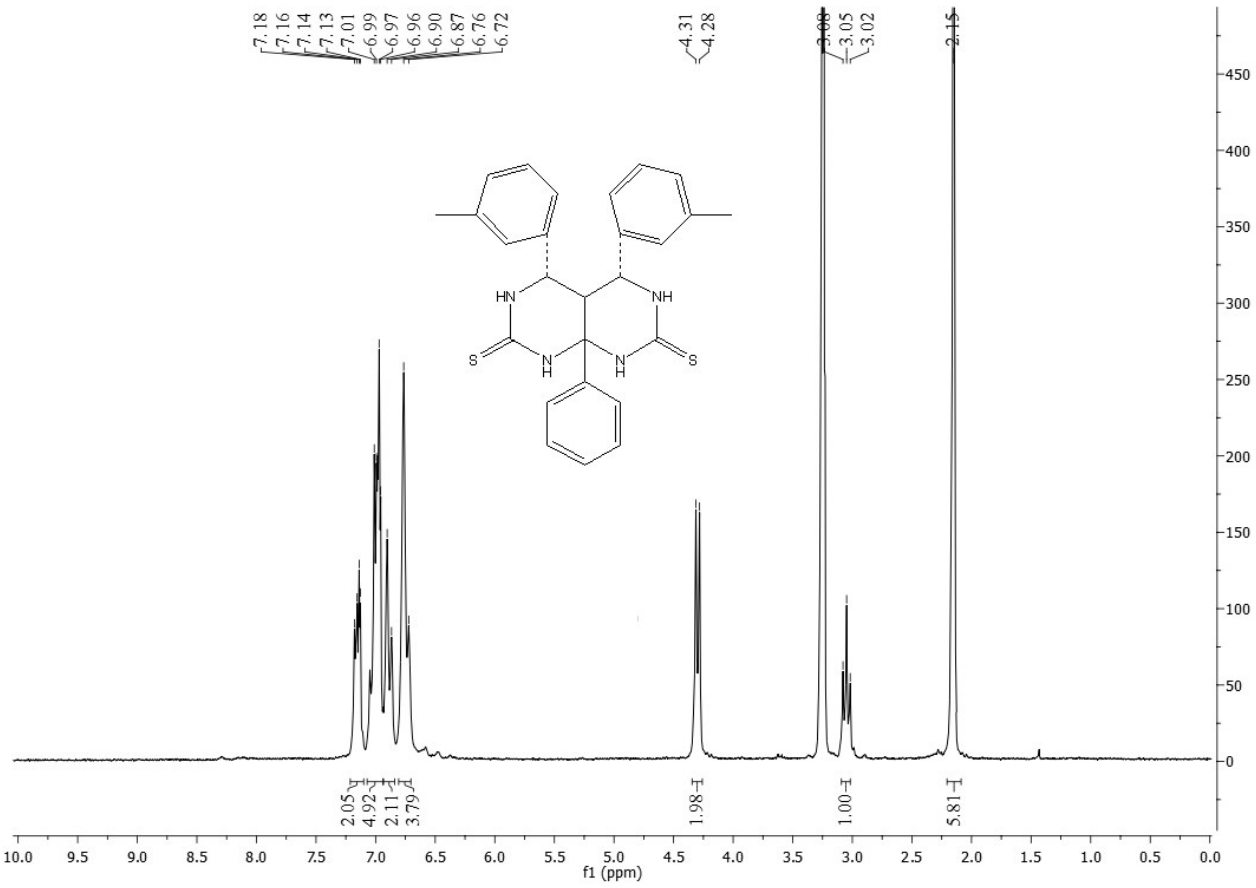

156.42
140.53
138.05
128.49
128.39
128.18
127.16
126.58
126.32
68.97
54.46
28.65
19.67
HN
NH
O
N
H
N
H
O
f1 (ppm)

## 8. NMR spectra of 19




7.42
7.41
7.38
7.35
7.14
7.09
7.03
7.02
6.99
6.95
4.31
4.28
3.11
3.08
3.05
Cl
Cl
HN
NH
S
S
4.15
5.01
4.01
2.07
1.00
f1 (ppm)


6.97
6.94
6.90
6.85
6.82
4.30
4.27
3.06
3.03
3.00
2.16
HN
NH
S
S
N
H
N
H
12.96
2.08
1.00
6.09
f1 (ppm)

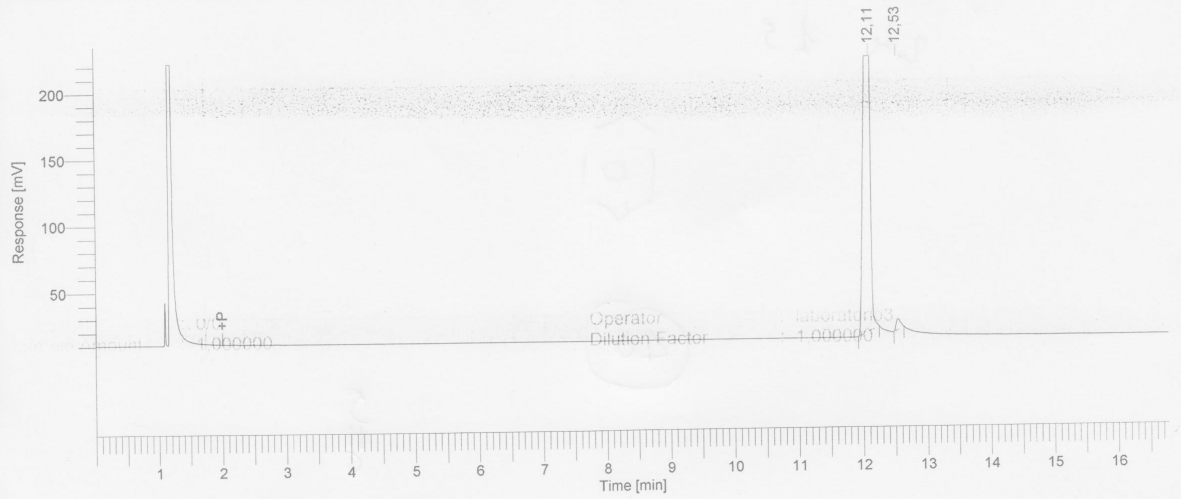

7.18
7.16
7.14
7.13
7.01
6.99
6.97
6.96
6.90
6.87
6.76
6.72
4.31
4.28
3.08
3.05
3.02
2.15
HN
NH
S
N
H
N
H
S
2.05
4.92
2.11
3.79
1.98
1.00
5.81
f1 (ppm)

## 9. Chiral GC analyses of 5 and 6

Page 1 of 1

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 19/09/2016 15.23.32 |
| Reprocess Number | : hsmsc11: 11952 | | |
| Sample Name | : | Data Acquisition Time | : 19/09/2016 15.06.37 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1,000000 | Dilution Factor | : 1,000000 |
| Cycle | : 11 | | |

Result File : D:\DATI_TC\Chrom\data011-20160919-152331.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




DEFAULT REPORT

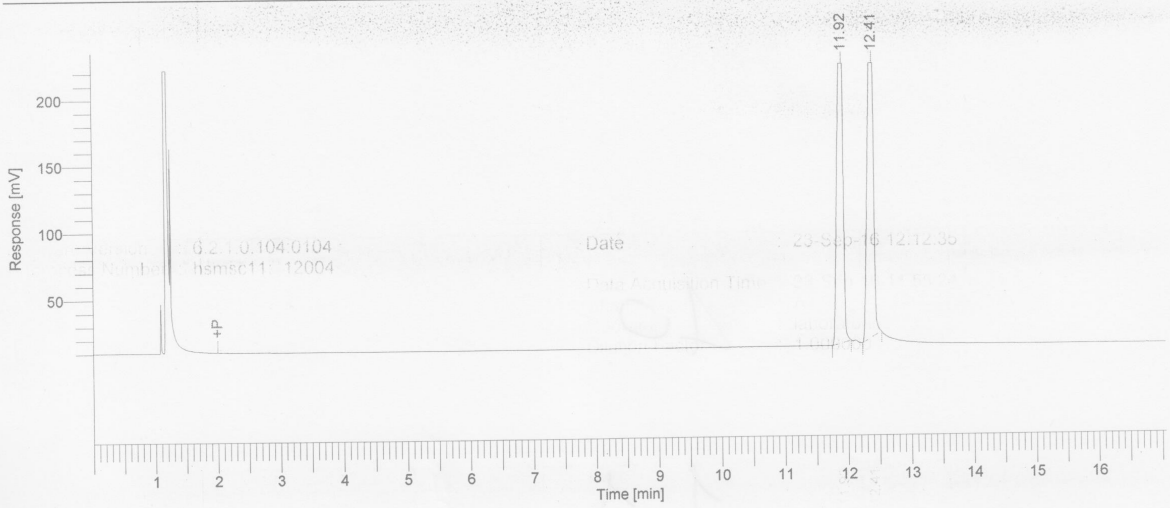
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12,111 | 2126911,43 | 337994,24 | 98,19 |
| 2 | | 12,535 | 39116,13 | 8084,56 | 1,81 |
| | | | 2166027,57 | 346078,80 | 100,00 |

**(*R*)-(-)-Ethyl-6-methyl-4-phenyl-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5a)**

Software Version : 6.2.1.0.104:0104
Reprocess Number : hsmsc11: 12004
Sample Name :
Instrument Name : AUTOSYSTEM_XL
Rack/Vial : 0/0
Sample Amount : 1.000000
Cycle : 9

Date : 23-Sep-16 12:12:35
Data Acquisition Time : 23-Sep-16 11:55:24
Channel : A
Operator : laboratorio3
Dilution Factor : 1.000000

Result File : D:\DATI_TC\Chrom\data009-20160923-121234.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




# DEFAULT REPORT

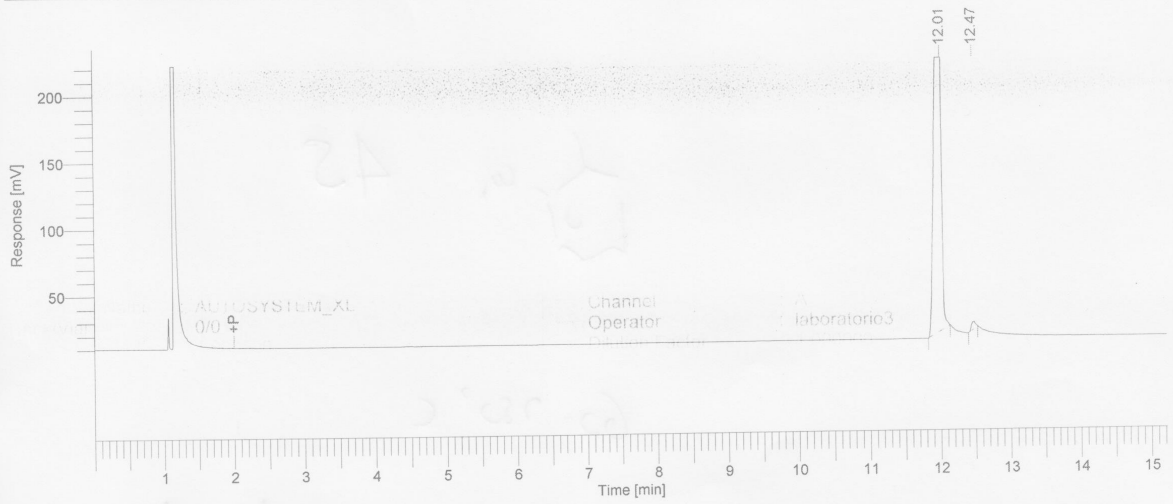
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 11.925 | 1690031.74 | 298356.47 | 50.14 |
| 2 | | 12.406 | 1680493.09 | 288906.34 | 49.86 |
| | | | 3370524.82 | 587262.81 | 100.00 |

**Racemic mixture of ethyl-6-methyl-4-phenyl-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5a).**

Software Version : 6.2.1.0.104:0104
Reprocess Number : hsmsc11: 11959
Sample Name :
Instrument Name : AUTOSYSTEM_XL
Rack/Vial : 0/0
Sample Amount : 1.000000
Cycle : 2

Date : 20-Sep-16 08:29:17
Data Acquisition Time : 20-Sep-16 08:13:55
Channel : A
Operator : laboratorio3
Dilution Factor : 1.000000

Result File : D:\DATI_TC\Chrom\data002-20160920-082916.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




DEFAULT REPORT

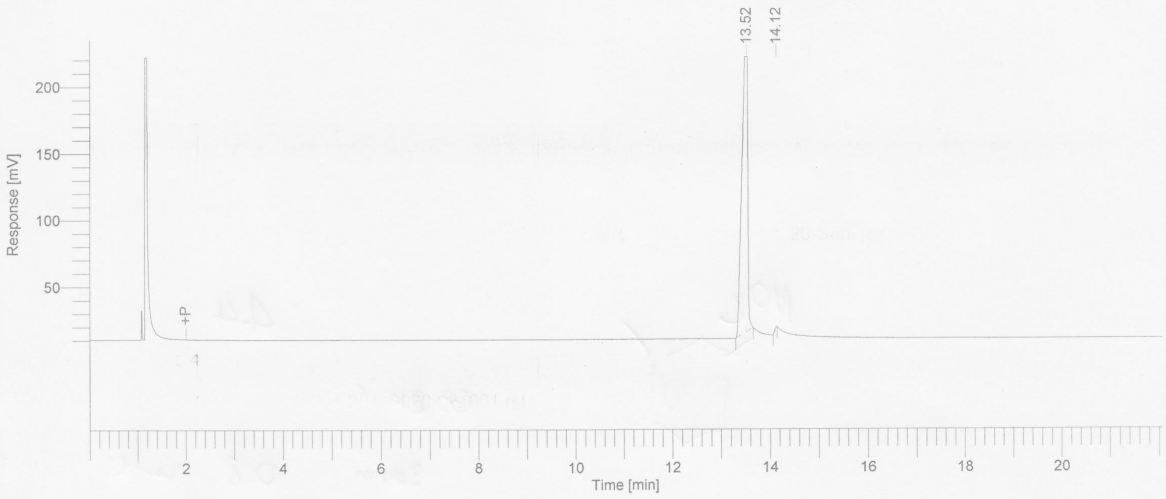
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12.012 | 1982195.04 | 315060.35 | 98.87 |
| 2 | | 12.474 | 22677.71 | 5350.06 | 1.13 |
| | | | 2004872.75 | 320410.41 | 100.00 |

DEFAULT REPORT

**(*R*)-(-)-Ethyl-6-methyl-4-(2-tolyl)-2-thioxo-1,2,3,4-tetrahydropyrimidine -5-carboxylate (5b).**

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 20-Sep-16 09:10:02 |
| Reprocess Number | : hsmsc11: 11961 | | |
| Sample Name | : | Data Acquisition Time | : 20-Sep-16 08:47:50 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1.000000 | Dilution Factor | : 1.000000 |
| Cycle | : 4 | | |

Result File : D:\DATI_TC\Chrom\data004-20160920-091001.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




DEFAULT REPORT

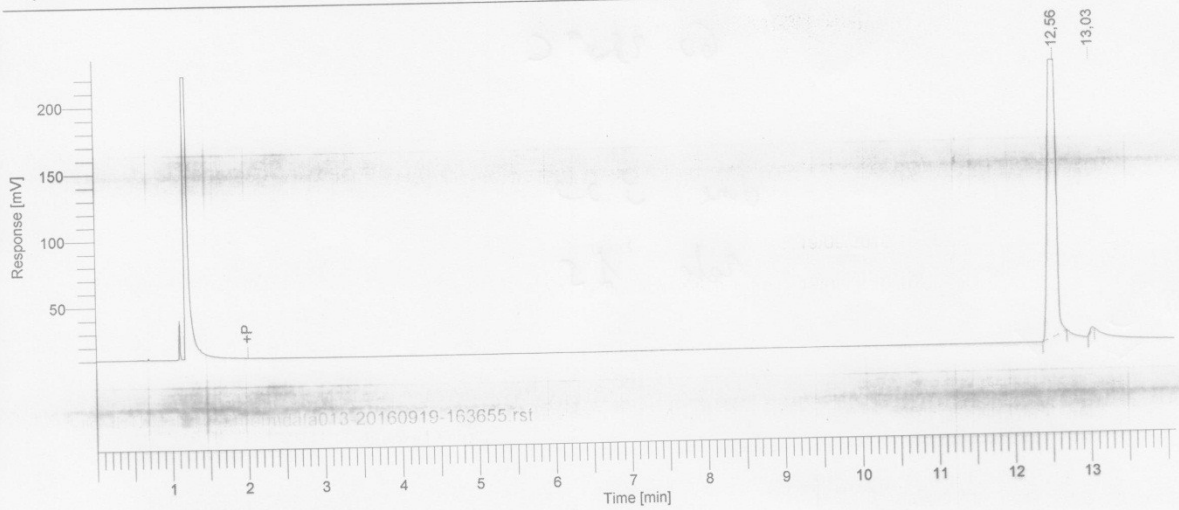
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 13.517 | 1856314.28 | 249308.51 | 99.69 |
| 2 | | 14.123 | 5694.79 | 1574.40 | 0.31 |
| | | | 1862009.08 | 250882.91 | 100.00 |

**(*R*)-(-)-Ethyl-6-methyl-4-(3-nitrophenyl)-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5c).**

Software Version : 6.2.1.0.104:0104
Reprocess Number : hsmsc11: 11954
Sample Name :
Instrument Name : AUTOSYSTEM_XL
Rack/Vial : 0/0
Sample Amount : 1,000000
Cycle : 13

Date : 19/09/2016 16.36.56
Data Acquisition Time : 19/09/2016 16.22.42
Channel : A
Operator : laboratorio3
Dilution Factor : 1,000000

Result File : D:\DATI_TC\Chrom\data013-20160919-163655.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




# DEFAULT REPORT

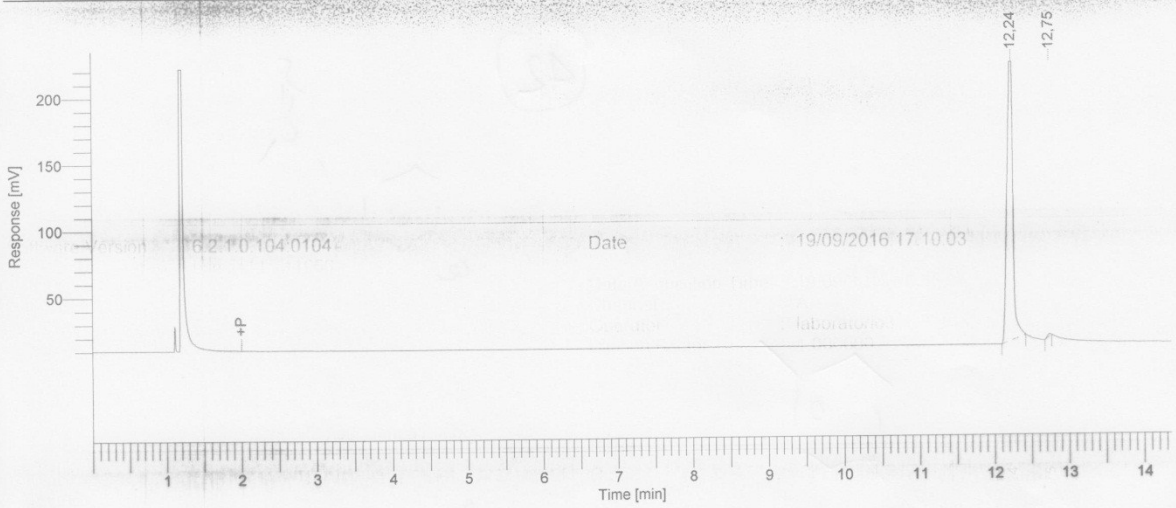
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12,559 | 1908489,31 | 314592,99 | 99,58 |
| 2 | | 13,029 | 8086,50 | 2275,45 | 0,42 |
| | | | 1916575,81 | 316868,44 | 100,00 |

**(*R*)-(-)-Ethyl-4-(4-methoxyphenyl)-6-methyl-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5d).**

Software Version : 6.2.1.0.104:0104
Reprocess Number : hsmsc11: 11956
Sample Name :
Instrument Name : AUTOSYSTEM_XL
Rack/Vial : 0/0
Sample Amount : 1,000000
Cycle : 15

Date : 19/09/2016 17.10.03
Data Acquisition Time : 19/09/2016 16.55.34
Channel : A
Operator : laboratorio3
Dilution Factor : 1,000000

Result File : D:\DATI_TC\Chrom\data015-20160919-171003.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




# DEFAULT REPORT

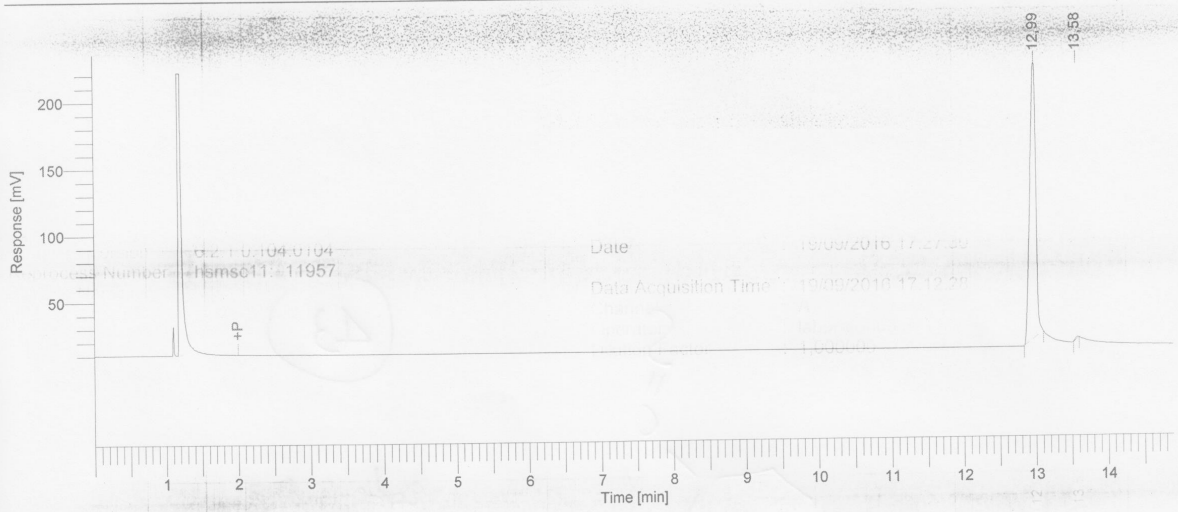
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12,237 | 1201686,29 | 236855,48 | 99,53 |
| 2 | | 12,748 | 5684,10 | 1320,37 | 0,47 |
| | | | 1207370,39 | 238175,85 | 100,00 |

**(*R*)-(-)-Ethyl-4-(4-chlorophenyl)-6-methyl-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5e).**

Software Version : 6.2.1.0.104:0104
Reprocess Number : hsmsc11: 11957
Sample Name :
Instrument Name : AUTOSYSTEM_XL
Rack/Vial : 0/0
Sample Amount : 1,000000
Cycle : 16

Date : 19/09/2016 17.27.30
Data Acquisition Time : 19/09/2016 17.12.28
Channel : A
Operator : laboratorio3
Dilution Factor : 1,000000

Result File : D:\DATI_TC\Chrom\data016-20160919-172729.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




# DEFAULT REPORT

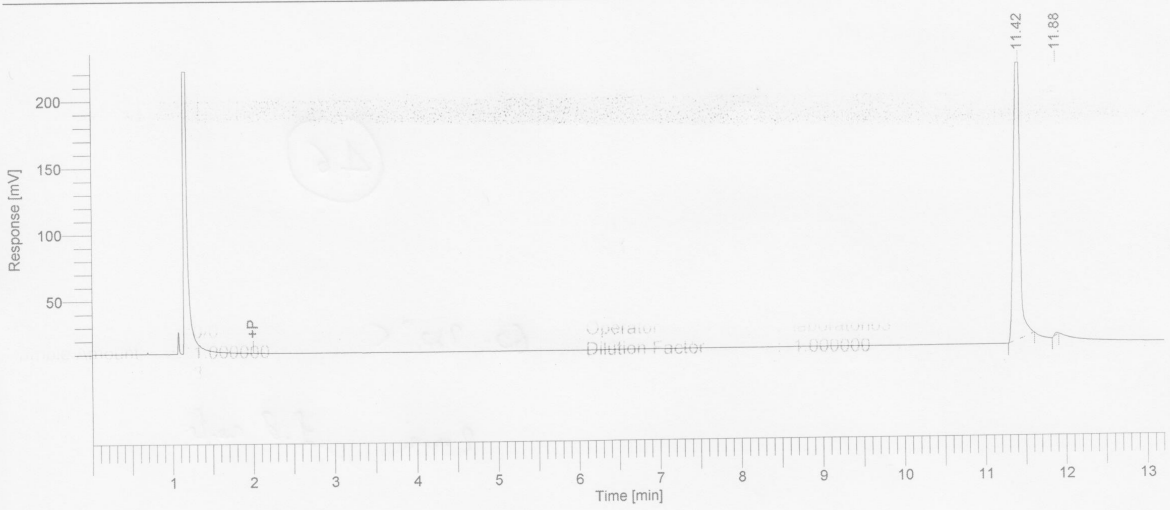
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12,994 | 1214133,26 | 207449,26 | 99,68 |
| 2 | | 13,577 | 3842,90 | 1209,62 | 0,32 |
| | | | 1217976,17 | 208658,88 | 100,00 |

**(*R*)-(-)-Ethyl-4-(4-cianophenyl)-6-methyl-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5f).**

Software Version : 6.2.1.0.104:0104
Reprocess Number : hsmsc11: 11960
Sample Name :
Instrument Name : AUTOSYSTEM_XL
Rack/Vial : 0/0
Sample Amount : 1.000000
Cycle : 3

Date : 20-Sep-16 08:45:06
Data Acquisition Time : 20-Sep-16 08:31:45
Channel : A
Operator : laboratorio3
Dilution Factor : 1.000000

Result File : D:\DATI_TC\Chrom\data003-20160920-084505.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq



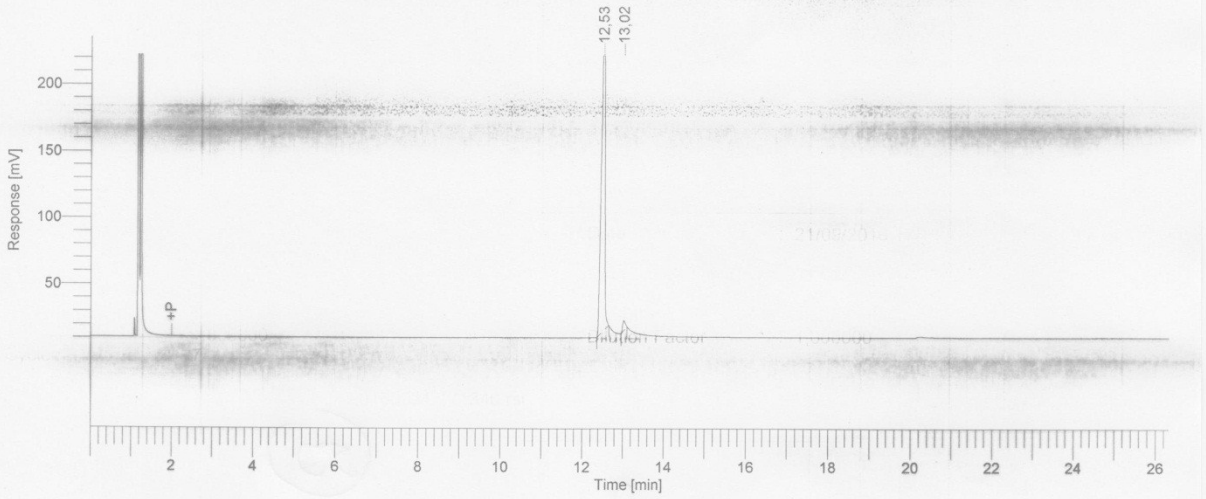

# DEFAULT REPORT

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 11.420 | 1276293.09 | 259797.10 | 99.65 |
| 2 | | 11.885 | 4537.43 | 1433.65 | 0.35 |
| | | | 1280830.52 | 261230.75 | 100.00 |

**(*R*)-(-)-Ethyl-6-methyl-4-(2-thienyl)- 2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5g).**

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 21/09/2016 17.13.47 |
| Reprocess Number | : hsmsc11: 11982 | | |
| Sample Name | : | Data Acquisition Time | : 21/09/2016 16.47.19 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1,000000 | Dilution Factor | : 1,000000 |
| Cycle | : 7 | | |

Result File : D:\DATI_TC\Chrom\data007-20160921-171346.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq



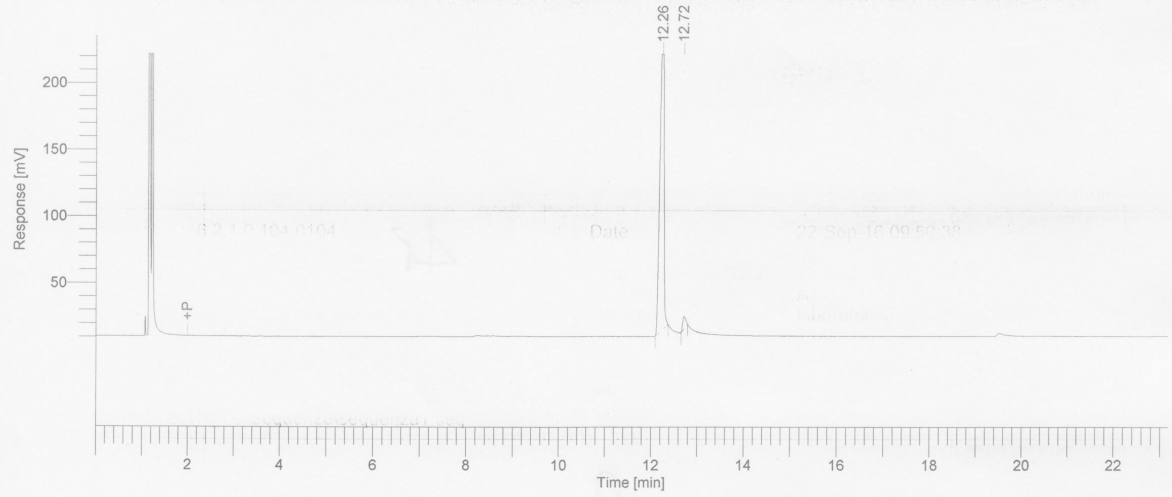

DEFAULT REPORT

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12,529 | 1448101,99 | 250780,65 | 97,76 |
| 2 | | 13,021 | 33185,70 | 7558,75 | 2,24 |
| | | | 1481287,69 | 258339,40 | 100,00 |

**(*R*)-(-)-Ethyl-6-methyl-2-oxo-4-(2-trifluoromethylphenyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6a).**

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 22-Sep-16 09:50:38 |
| Reprocess Number | : hsmsc11: 11988 | | |
| Sample Name | : | Data Acquisition Time | : 22-Sep-16 09:27:20 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1.000000 | Dilution Factor | : 1.000000 |
| Cycle | : 6 | | |

Result File : D:\DATI_TC\Chrom\data006-20160922-095038.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq



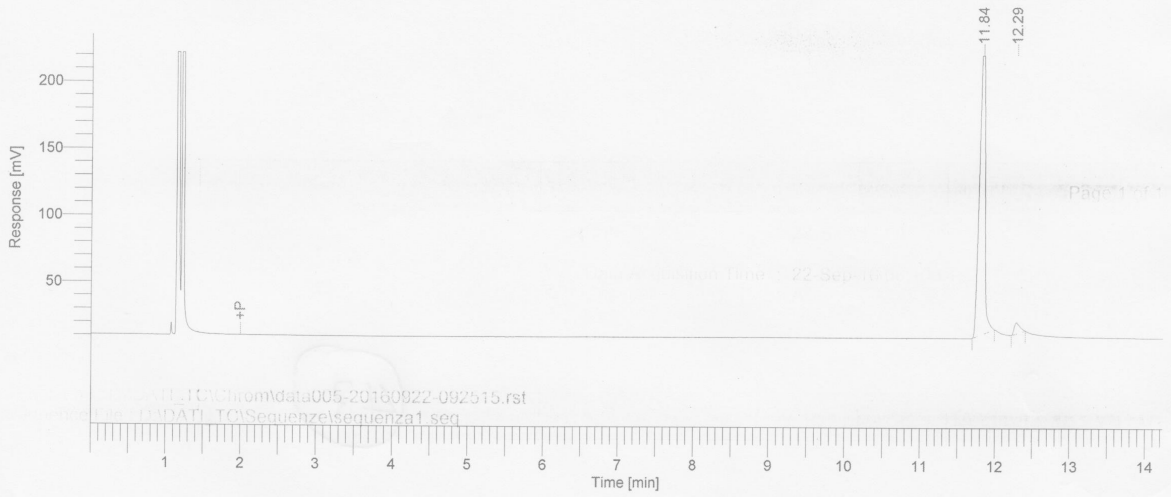

DEFAULT REPORT

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12.261 | 1470992.78 | 264816.38 | 97.33 |
| 2 | | 12.716 | 40359.96 | 9262.74 | 2.67 |
| | | | 1511352.75 | 274079.12 | 100.00 |

**(*R*)-(-)-Ethyl--4-(3-methoxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6b).**

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 22-Sep-16 09:25:16 |
| Reprocess Number | : hsmsc11: 11987 | | |
| Sample Name | : | Data Acquisition Time | : 22-Sep-16 09:10:54 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1.000000 | Dilution Factor | : 1.000000 |
| Cycle | : 5 | | |

Result File : D:\DATI_TC\Chrom\data005-20160922-092515.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq



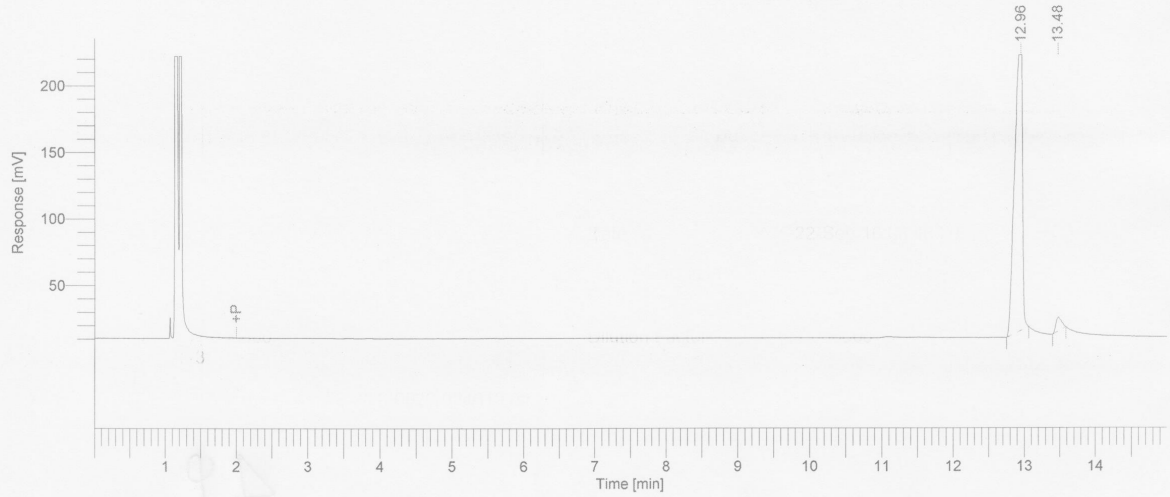

# DEFAULT REPORT

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 11.838 | 1200975.62 | 245364.83 | 96.37 |
| 2 | | 12.287 | 45257.59 | 8402.41 | 3.63 |
| | | | 1246233.21 | 253767.24 | 100.00 |

***(R)*-(-)-Ethyl-6-methyl- 2-oxo-4-(4-tolyl)-1,2,3,4-tetrahydropyrimidine 5-carboxylate (6c).**

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 22-Sep-16 08:46:20 |
| Reprocess Number | : hsmsc11: 11985 | | |
| Sample Name | : | Data Acquisition Time | : 22-Sep-16 08:31:12 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1.000000 | Dilution Factor | : 1.000000 |
| Cycle | : 3 | | |

Result File : D:\DATI_TC\Chrom\data003-20160922-084619.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




DEFAULT REPORT

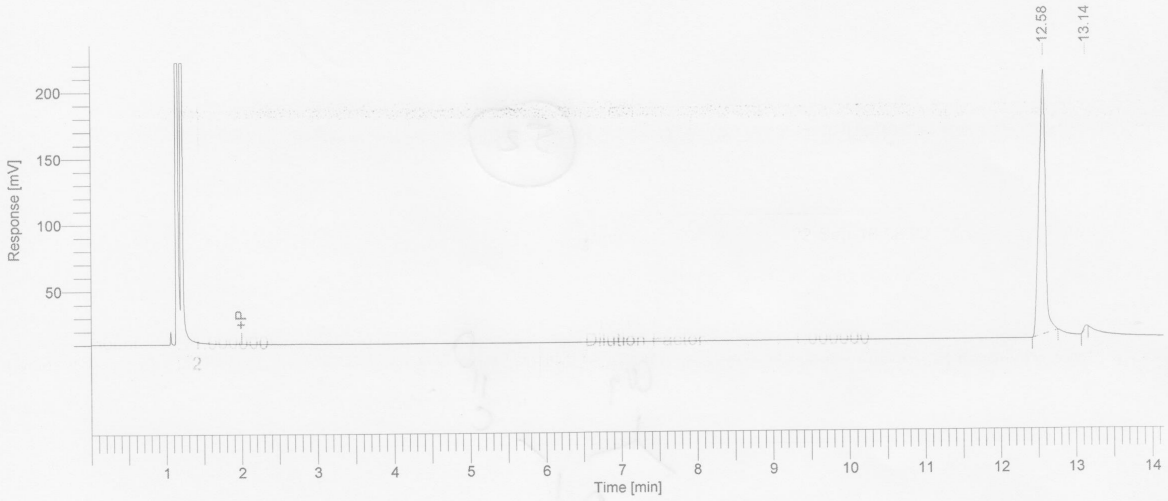
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12.956 | 1719312.62 | 249063.17 | 96.73 |
| 2 | | 13.479 | 58063.03 | 10397.81 | 3.27 |
| | | | 1777375.65 | 259460.98 | 100.00 |

**(*R*)-(-)-Ethyl-6-methyl-4-(4-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6d).**

Page 1 of 1

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 22-Sep-16 08:29:39 |
| Reprocess Number | : hsmsc11: 11984 | | |
| Sample Name | : | Data Acquisition Time | : 22-Sep-16 08:15:21 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1.000000 | Dilution Factor | : 1.000000 |
| Cycle | : 2 | | |

Result File : D:\DATI_TC\Chrom\data002-20160922-082938.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq



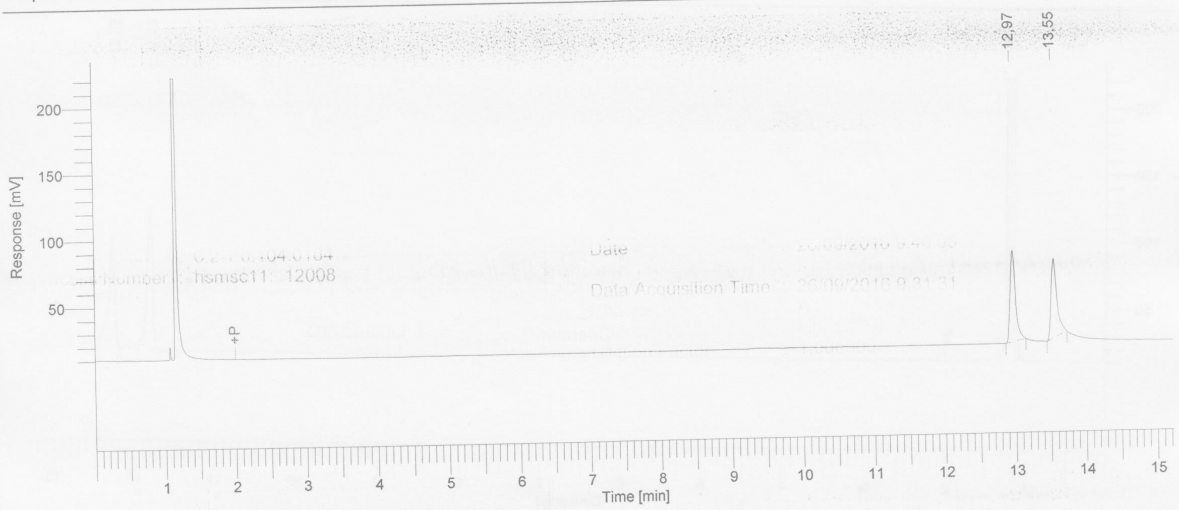

# DEFAULT REPORT

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12.576 | 1144598.05 | 197977.43 | 99.39 |
| 2 | | 13.136 | 6986.11 | 2049.17 | 0.61 |
| | | | 1151584.16 | 200026.60 | 100.00 |

**(*R*)-(-)-Ethyl-6-methyl-2-oxo-4-(2,4,6-trimethylphenyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6e).**

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 26/09/2016 9.46.53 |
| Reprocess Number | : hsmsc11: 12008 | Data Acquisition Time | : 26/09/2016 9.31.31 |
| Sample Name | : | Channel | : A |
| Instrument Name | : AUTOSYSTEM_XL | Operator | : laboratorio3 |
| Rack/Vial | : 0/0 | Dilution Factor | : 1,000000 |
| Sample Amount | : 1,000000 | | |
| Cycle | : 4 | | |

Result File : D:\DATI_TC\Chrom\data004-20160926-094652.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq




# DEFAULT REPORT

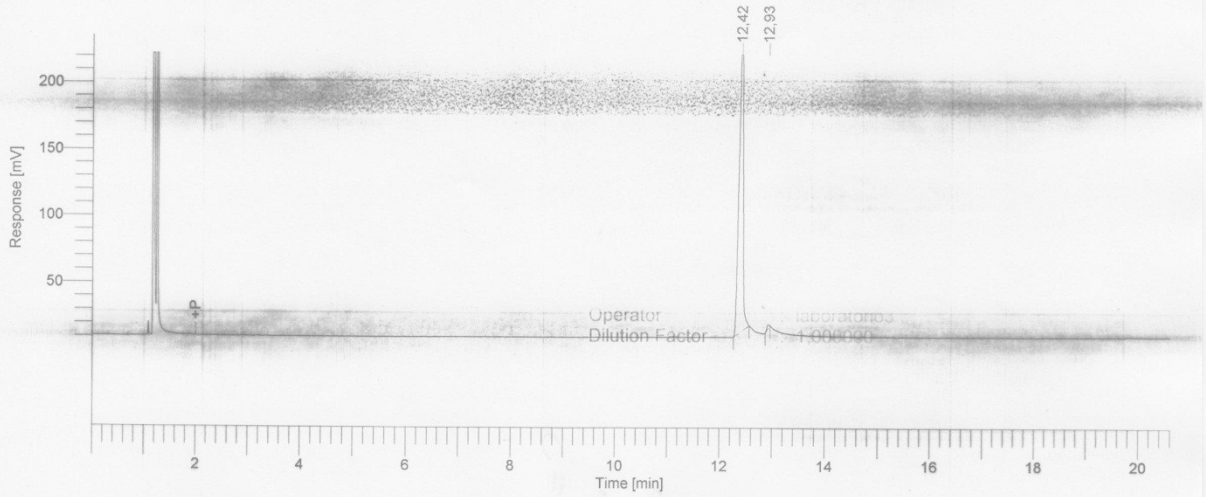
| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12,971 | 362411,47 | 68421,00 | 51,04 |
| 2 | | 13,553 | 347695,96 | 59391,17 | 48,96 |
| | | | 710107,43 | 127812,17 | 100,00 |

**Racemic mixture of ethyl-6-methyl-2-oxo-4-(2,4,6-trimethylphenyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6e).**

Software Version : 6.2.1.0.104:0104
Reprocess Number : hsmsc11: 11981
Sample Name :
Instrument Name : AUTOSYSTEM_XL
Rack/Vial : 0/0
Sample Amount : 1,000000
Cycle : 6

Date : 21/09/2016 16.44.02
Data Acquisition Time : 21/09/2016 16.23.17
Channel : A
Operator : laboratorio3
Dilution Factor : 1,000000

Result File : D:\DATI_TC\Chrom\data006-20160921-164402.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq



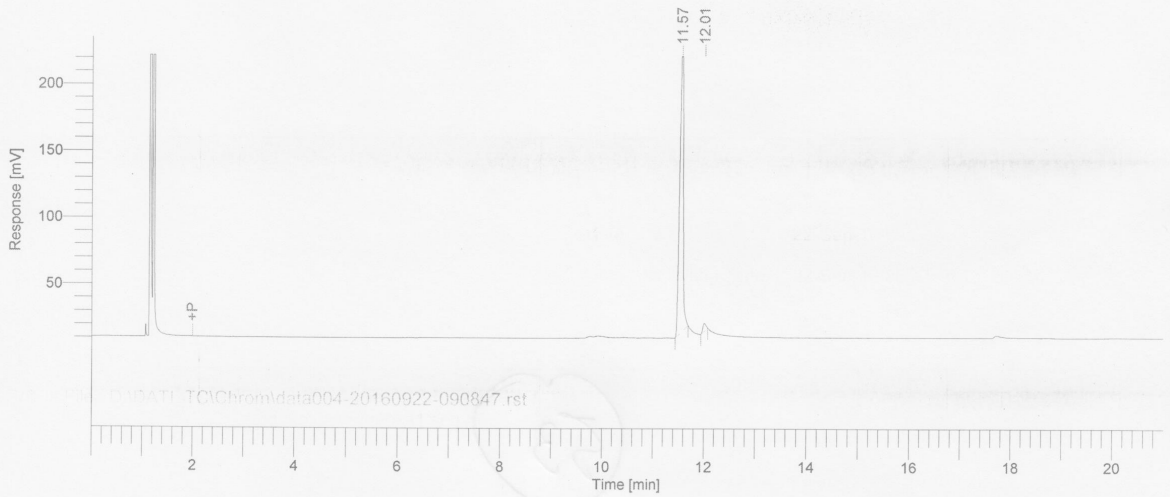

DEFAULT REPORT

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 12,417 | 1245670,68 | 230614,20 | 99,25 |
| 2 | | 12,931 | 9440,98 | 2588,23 | 0,75 |
| | | | 1255111,66 | 233202,43 | 100,00 |

**(*R*)-(-)-Ethyl-6-methyl-4-(1-naphthyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6f).**

| | | | |
|---|---|---|---|
| Software Version | : 6.2.1.0.104:0104 | Date | : 22-Sep-16 09:08:48 |
| Reprocess Number | : hsmsc11: 11986 | | |
| Sample Name | : | Data Acquisition Time | : 22-Sep-16 08:47:40 |
| Instrument Name | : AUTOSYSTEM_XL | Channel | : A |
| Rack/Vial | : 0/0 | Operator | : laboratorio3 |
| Sample Amount | : 1.000000 | Dilution Factor | : 1.000000 |
| Cycle | : 4 | | |

Result File : D:\DATI_TC\Chrom\data004-20160922-090847.rst
Sequence File : D:\DATI_TC\Sequenze\sequenza1.seq



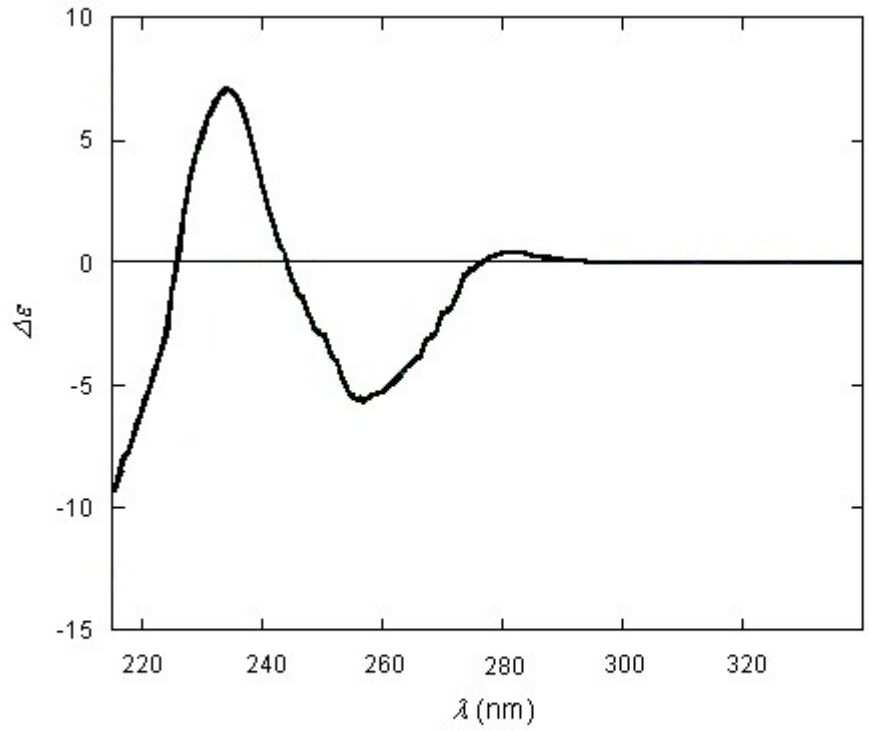

DEFAULT REPORT

| Peak # | Component Name | Time [min] | Area [uV*sec] | Height [uV] | Area [%] |
|---|---|---|---|---|---|
| 1 | | 11.567 | 1100954.91 | 240819.26 | 97.78 |
| 2 | | 12.009 | 24945.56 | 5990.19 | 2.22 |
| | | | 1125900.47 | 246809.46 | 100.00 |

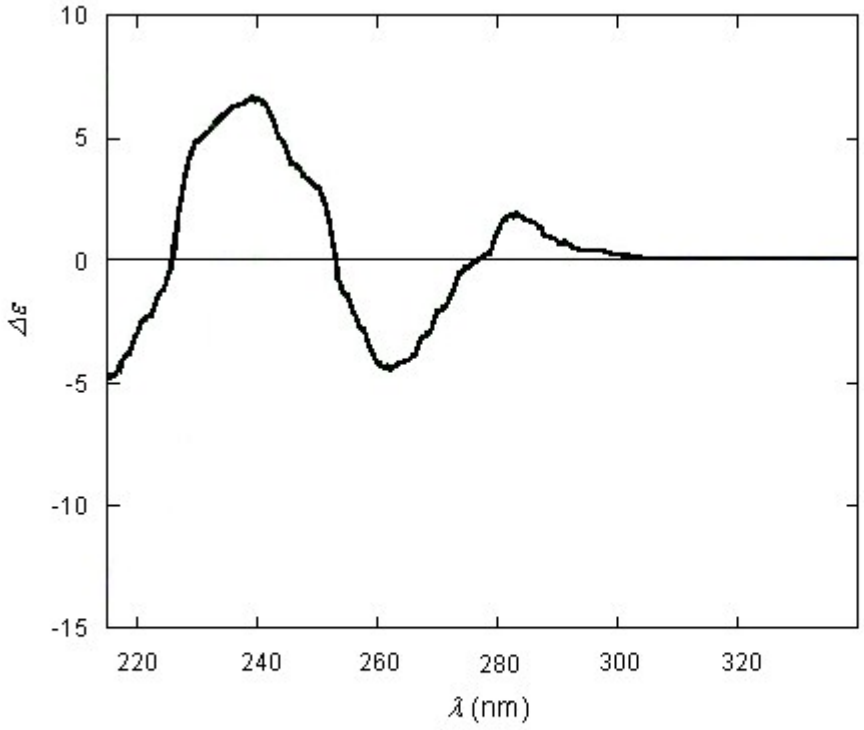
**(*R*)-(-)-Ethyl-6-methyl-4-(5-methylfuran-2-yl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6g).**

## 10. Circular dichroism spectra for compound 5a and 6a

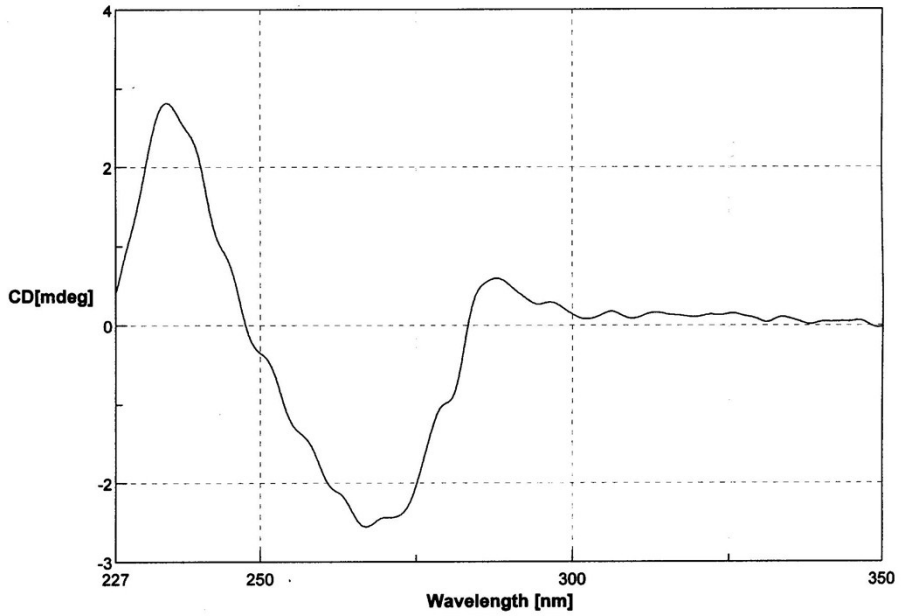
All synthesized adducts **5** and **6** have patterns almost identical to the CD spectra of **5a** and **6a** shown below as an example. Moreover, the spectrum of **6a** is identical to that reported in the literature by Zhu.[24.]




**(*R*)-(-)-Ethyl-6-methyl-4-phenyl-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (5a)**




***(R)*-(-)-Ethyl-6-methyl-2-oxo-4-(2-trifluoromethylphenyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (6a).**




***(R)*-(-)-Ethyl-6-methyl-2-oxo-4-(2-trifluoromethylphenyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate by Zhu [24]**

All compound **5** and **6** have negative Cotton effects around 260 nm and positive Cotton effects around 235 nm.

Zhu[24] compared the CD spectrum of **6a** with that of a dihydropyrimidine-2-one which has established absolute configuration; he hence assigned the absolute configuration of this enantiomer as *R*.

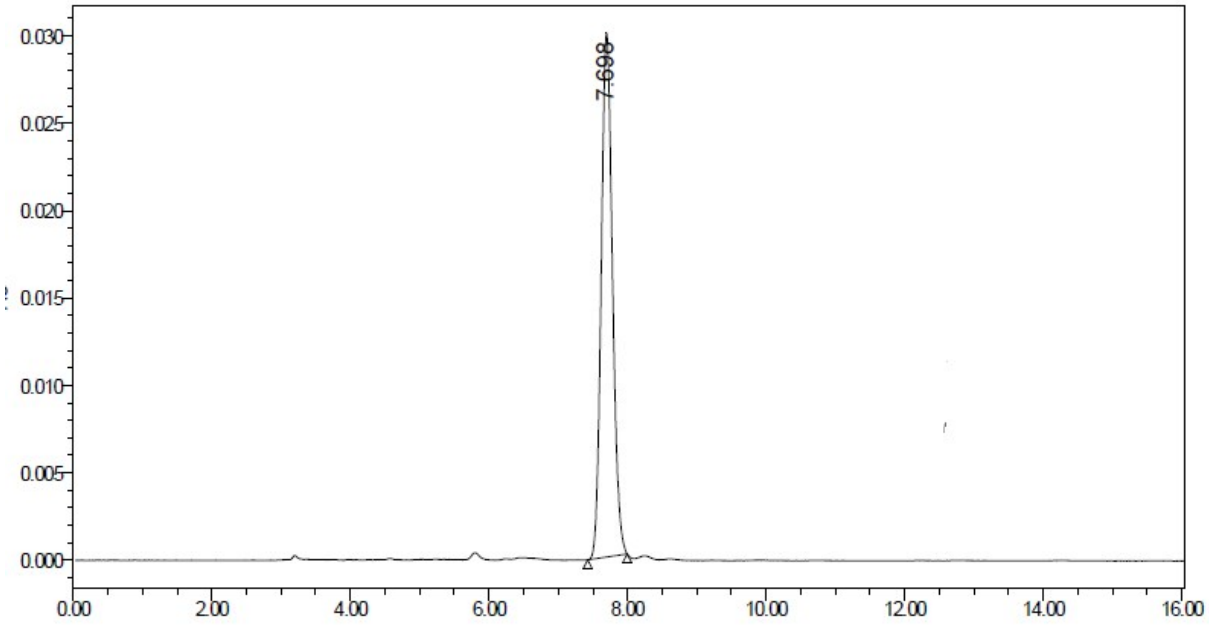
In the light of these, the absolute configuration of all compound **5** and **6** is *R*

**11. Chiral HPLC of 18a**

Project name Solfonimmide

Reported by user: Breeze user (Breeze)

| SAMPLE INFORMATION | |
|---|---|
| Sample name: **Adduct 18a** | Acquired by: Breeze |
| Sample type: Unknown | Date acquired: 3/11/2016 08:32:15 AM CEST |
| Vial: 1 | Acq.Method: immide |
| Injection: # | Processed by: Breeze |
| Injection volume: 6.00 ul | Date processed: 3/11/2016 09:10:37 AM CEST |
| Run time: 25 minutes | Channel name: 2998 Ch1 254nm@1.2nm |
| Sampling rate: 10.00 per sec | Channel desc: 2998 Ch1 254nm@1.2nm |



| | RT(min) | Peak Type | Area (μV*sec) | Area % | Height (μV) | Integration Type | Points Across Peaks | Start Time (min) | End Time (min) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.904 | **18a** | 337038 | 100.0 | 29981 | BB | 1670 | 7.425 | 7.995 |

## 12. References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