Supporting Information

MoO_2Cl_2 catalyzed efficient synthesis of functionalized 3,4-dihydropyrimidin-2(1*H*)-ones/thiones and polyhydroquinolines: Recyclability, Fluoroscence and Biological studies

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Spectral data

Methyl 4-(3-((tert-butyldimethylsilyl)oxy)phenyl)-6-methyl-2-oxo-1,2,3,4 tetrahydropyrimidine-5-carboxylate **(4k)**: White solid, mp 178-181 °C; IR (KBr) ν_{max} 3439, 3245, 3110, 1717, 1656, 1458, 1294, 1232, 1108, 787 cm^{-1}; ^1H NMR (300 MHz, DMSO-d_6) δ 9.22 (1H, s), 7.74 (1H, brs), 7.19 (1H, t, J = 8.2 Hz), 6.87 (1H, d, J = 7.6 Hz), 6.71 (2H, s), 5.10 (1H, d, J = 3.0 Hz), 3.55 (3H, s), 2.24 (3H, s), 0.96 (9H, s), 0.14 (6H, s); ^{13}C NMR (75 MHz, DMSO-d_6) 165.6, 155.0, 152.1, 148.5, 146.1, 129.5, 119.0, 118.5, 117.3, 98.9, 53.2, 50.6, 25.4, 17.6, -4.6; HRMS-ESI: m/z $[M+H]^+$ for calculated $C_{19}H_{28}N_2O_4Si^+$ $[M+H]^+$: 377.1891; found: 377.1887.

Ethyl 4-(3-((tert-butyldiphenylsilyl)oxy)phenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate **(4l)**: White solid, mp 111-114°C; IR (KBr) ν_{max} 3450, 3347, 1698, 1688, 1626, 1458, 1220, 1150, 965, 831 cm^{-1}; ^1H NMR (300 MHz, DMSO-d_6) δ 9.10 (1H, s), 7.65 (5H, m), 7.48 (6H, m), 7.91 (1H, t, J = 7.8 Hz), 6.82 (2H, m), 6.57 (1H, dd, J = 1.7 Hz, J = 7.8 Hz), 5.04 (1H, d, J = 3.2 Hz), 3.89 (2H, m), 2.13 (3H, s), 1.01 (12H, m); ^{13}C NMR (75 MHz, DMSO-d_6) 165.2, 157.3, 152.1, 147.9, 146.1, 136.2, 134.8, 134.3, 129.1, 129.0, 127.8, 127.3, 116.7, 114.0, 113.0, 99.3, 59.0, 53.7, 26.4, 18.5, 17.6, 14.0; HRMS-ESI: m/z $[M+H]^+$ for calculated $C_{30}H_{34}N_2O_4Si^+$ $[M+H]^+$: 515.2361; found: 515.2355.

Methyl 4-(3,5-dimethyl-1-phenyl-1H-pyrazol-4-yl)-6-methyl-2-oxo-1,2,3,4 tetrahydropyrimidine-5-carboxylate (**4m**) : Off white solid, mp 227-230 °C; IR (KBr) ν_{max} 3322, 3244, 2949, 1700, 1684, 1651, 1430, 1334, 1242, 1089, 779 cm^{-1}; ^1H NMR (300 MHz, DMSO-d_6) δ 9.22 (1H, s), 7.53 (6H, m), 5.25 (1H, s), 3.50 (3H, s), 2.25 (6H, s), 2.14 (3H, s); ^{13}C NMR (75 MHz, DMSO-d_6) 165.8, 151.1, 147.0, 146.4, 139.3, 136.3, 128.9, 127.0, 124.3, 121.4, 96.5, 50.6, 46.2, 17.5, 11.9, 10.3; HRMS *m/z* calcd for $C_{18}H_{20}N_4O_3^+$ $[M+H]^+$: 341.1608; found: 341.1605.

Ethyl 6-methyl-2-oxo-4-(4-phenylthiophen-2-yl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (**4n**): Off white solid, mp 192-195 °C; IR (KBr) ν_{max} 3237, 3129, 2974, 1702, 1651, 1452, 1321, 1295, 1236, 1094, 795, 734 cm^{-1}; ^1H NMR (300 MHz, DMSO-d_6) δ 9.36 (1H, s), 7.93 (1H, d, J = 2.2 Hz), 7.64 (1H, s), 7.62 (2H, d, J = 7.7 Hz), 7.45 (2H, t, J = 7.6 Hz), 7.24 (2H, m), 5.47 (1H, d, J = 2.0 Hz), 4.20 (2H, q, J = 6.8 Hz), 2.27 (3H, s), 1.27 (3H, t, J = 6.7 Hz); ^{13}C NMR (75 MHz, DMSO-d_6) 164.9, 152.1, 149.9, 148.8, 140.5, 135.0, 128.8, 127.0, 125.6, 122.2, 119.6, 99.3, 59.3, 49.5, 17.6, 14.1; HRMS-ESI: m/z $[M+H]^+$ for calculated $C_{18}H_{18}N_2O_3S^+$ $[M+H]^+$: 343.1111; found: 343.1107.

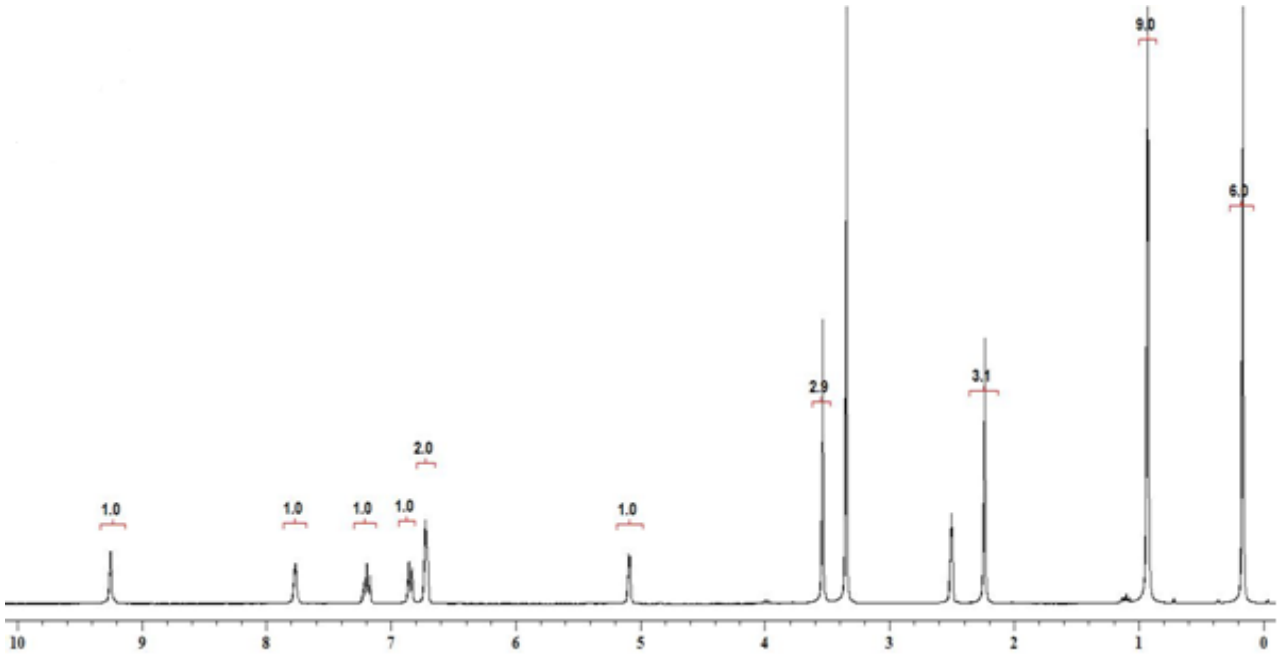
Methyl 4-(7-hydroxy-4-methyl-2-oxo-2H-chromen-5-yl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (**4o**) : Off white solid, mp 249-252 °C; IR (KBr) ν_{max} 3382, 2954, 1741, 1684, 1603, 1447, 1212, 1075, 853 cm^{-1}; ^1H NMR (300 MHz, DMSO-d_6) δ 7.77 (1H, s), 7.62 (2H, m), 6.82 (1H, d, J = 8.6 Hz), 6.27 (1H, s), 4.98 (1H, dd, J = 2.7 Hz, J = 5.0 Hz), 3.72 (3H, s), 2.34 (3H, s), 1.76 (3H, s); ^{13}C NMR (75 MHz, DMSO-d_6) 165.5, 160.0, 159.6, 153.6, 151.6, 151.7, 148.9, 124.7, 117.6, 112.5, 111.4, 109.7, 94.4, 50.1, 45.3, 18.2, 17.7; HRMS *m/z* calcd for $C_{17}H_{16}N_2O_6^+$ $[M+H]^+$: 345.1081; found: 345.1080.

Ethyl 4-(4-(*tert*-butyldimethylsilyloxy)phenyl)-2-methyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**7g**): White solid; M.P: 211-214 °C, IR (KBr) ν_{max} 3287, 2948, 2859, 1697, 1646, 1505, 1477, 1380, 1222, 1181, 1072, 916, 774 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.11 (2H, d, J = 8.3 Hz, ArH), 6.65 (2H, d, J = 8.3 Hz, ArH), 5.01 (1H, s), 4.15 (2H, q, J = 7.1 Hz), 3.01 (1H, m), 2.46 (2H, m), 2.39 (3H, s), 2.32 (1H, m), 1.23 (2H, m), 1.16 (3H, t, J = 7.1 Hz), 0.94 (9H, s), 0.15 (6H, s); ^{13}C NMR (125 MHz, $CDCl_3$) 195.7, 167.4, 153.6, 149.1, 142.8, 140.0, 128.8, 119.2, 113.7, 106.3, 59.7, 37.0, 35.4, 29.6, 27.5, 25.6, 21.0, 19.3, 18.1, 14.1, -4.4; HRMS-ESI: m/z $[M+H]^+$ for calculated $C_{25}H_{35}NO_4Si$: 442.2408; observed: 442.2415.

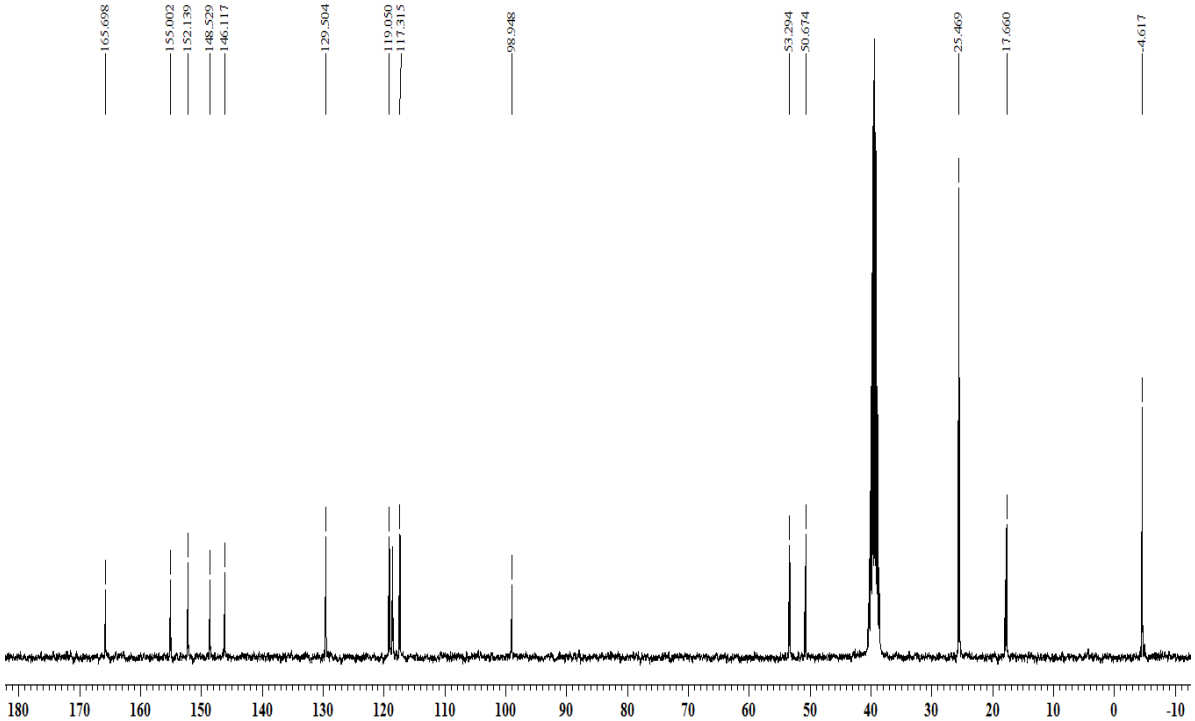
Methyl 4-(4-(*tert*-butyldimethylsilyloxy)phenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**7j**): White solid; M.P: 223-226 °C, IR (KBr) ν_{max} 3488, 2953, 2917, 1698, 1647, 1506, 1380, 1270, 1076, 915, 775 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.11 (2H, d, J = 8.5 Hz, ArH), 6.65 (2H, d, J = 8.5 Hz, ArH), 5.67 (1H, brs.), 5.00 (1H, s), 3.60 (3H, s), 2.39 (3H, s), 2.33 (1H, m), 2.19 (3H, m), 1.07 (3H, s), 0.94 (9H, s), 0.91 (3H, s), 0.14 (6H, s); ^{13}C NMR (125 MHz, $CDCl_3$) 195.4, 167.9, 153.6, 147.4, 143.3, 139.6, 128.6, 119.3, 112.5, 105.9, 50.9, 50.7, 41.1, 35.3, 32.7, 29.6, 29.4, 26.9, 25.6, 19.4, 18.1, -4.4; HRMS-ESI: m/z $[M+H]^+$ for calculated $C_{26}H_{37}NO_4Si$: 456.2565; observed: 456.2572.

Ethyl 4-(3-((1-benzyl-1H-1,2,3-triazol-5-yl)methoxy)phenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**7q**): Yellow solid; M.P: 56-59 °C, IR (KBr) ν_{max} 3487, 3070, 2957, 1685, 1484, 1378, 1212, 1169, 1028, 772, 718 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 7.65 (1H, s, ArH), 7.48 (3H, m, ArH), 7.37 (2H, m, ArH), 7.17 (1H, t, J = 7.9 Hz, ArH), 7.02 (1H, d, J = 7.5 Hz, ArH), 6.98 (1H, s, ArH), 6.77 (1H, d, J = 8.0 Hz, ArH), 6.12 (1H, brs.), 5.59 (2H, s), 5.21 (2H, d, J = 2.2 Hz), 5.10 (1H, s), 4.12 (2H, t, J = 7.0 Hz), 2.43 (3H, s), 2.34 (2H, m), 2.24 (2H, m), 1.26 (3H, t, J = 7.1 Hz), 1.14 (3H, s), 0.99 (3H, s); ^{13}C NMR (125 MHz, $CDCl_3$) 195.6, 167.4, 157.9, 148.6, 144.7, 143.6, 134.4,129.0, 128.7, 128.0, 122.9, 121.2, 114.1, 112.5, 111.8, 105.7, 61.7, 59.7, 54.1, 50.6, 40.9, 36.5, 32.6, 29.2, 27.2, 20.7, 19.2, 14.2; HRMS-ESI: m/z $[M+H]^+$ for calculated $C_{31}H_{34}N_4O_4$: 527.2653; observed: 527.2658.

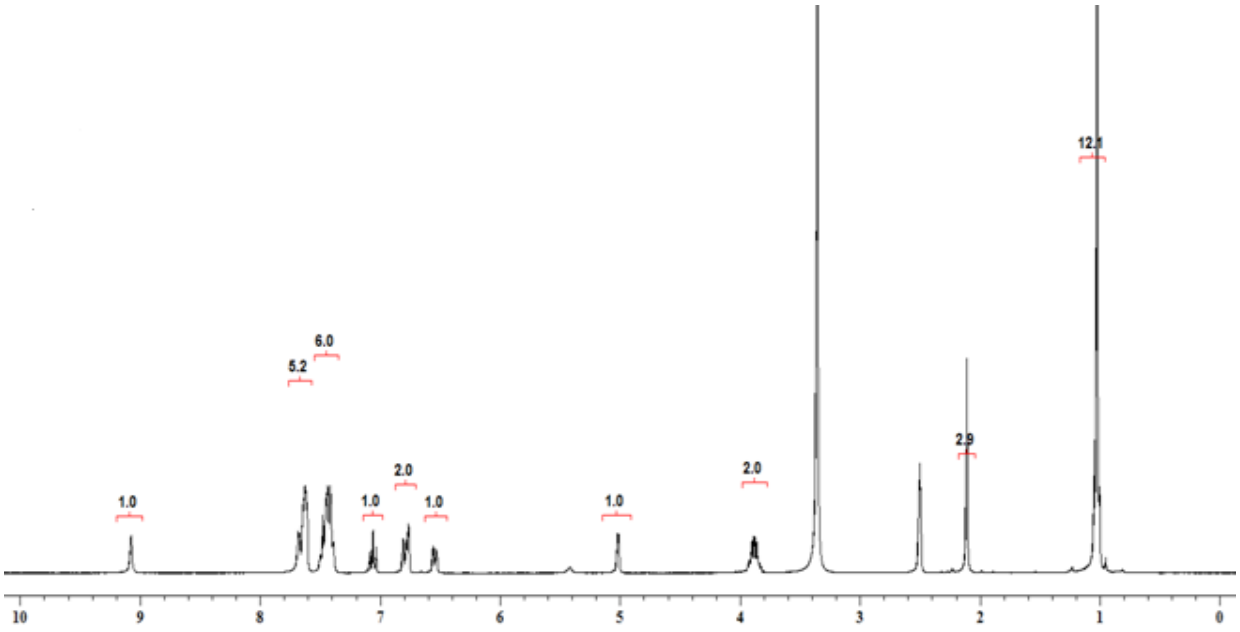
Ethyl 2,7,7-trimethyl-5-oxo-4-(1-(2-(piperidin-1-yl)acetyl)-*1H*-indol-3-yl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**7s**): White solid, M.P: 171-173 °C, IR (KBr) ν_{max} 3429, 2936, 1648, 1467, 1380, 1215, 1188, 1107, 1016, 1113, 801, 739 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$) δ 8.92 (1H, brs.), 7.62 (1H, d, J = 7.9 Hz, ArH), 7.30 (1H, m, ArH), 7.20 (1H, t, J = 7.5 Hz, ArH), 7.12 (2H, m, ArH), 6.55 (1H, d, J = 2.8 Hz), 4.91 (2H, s), 4.42 (2H, q, J = 7.1 Hz), 3.59 (2H, m), 3.42 (2H, m), 3.28 (2H, s), 3.07 (3H, s), 2.60 (2H, s), 1.64 (2H, m), 1.57 (2H, m), 1.45 (5H, m), 1.14 (6H, s); ^{13}C NMR (125 MHz, $CDCl_3$) 196.3, 165.5, 164.0, 163.5, 138.1, 136.4, 128.5, 128.2, 125.3, 125.0, 121.9, 121.0, 119.6, 108.9, 102.2, 61.7, 51.7, 48.2, 46.3, 45.3, 43.3, 32.9, 29.6, 28.1, 26.2, 25.4, 24.2, 14.2; HRMS-ESI: m/z $[M+H]^+$ for calculated $C_{30}H_{37}N_3O_4$ 504.2857; observed: 504.2861.



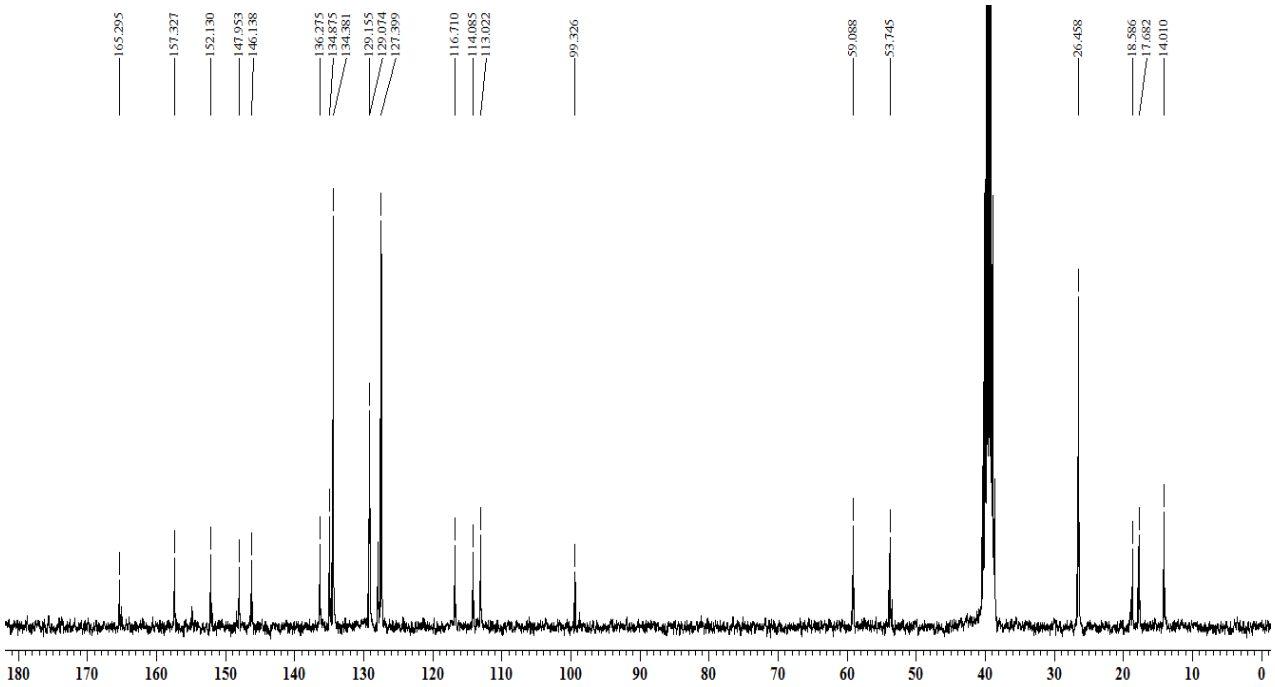
^{1}H NMR Spectrum of methyl 4-(3-((tert-butyldimethylsilyl)oxy)phenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4k)



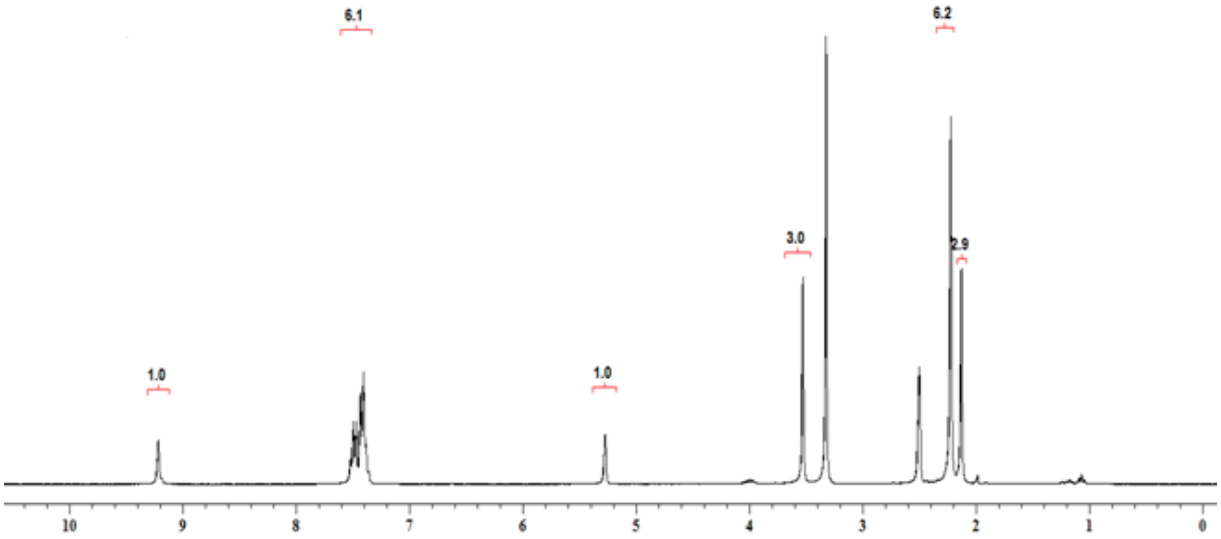
^{13}C NMR Spectrum of methyl 4-(3-((tert-butyldimethylsilyl)oxy)phenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4k).



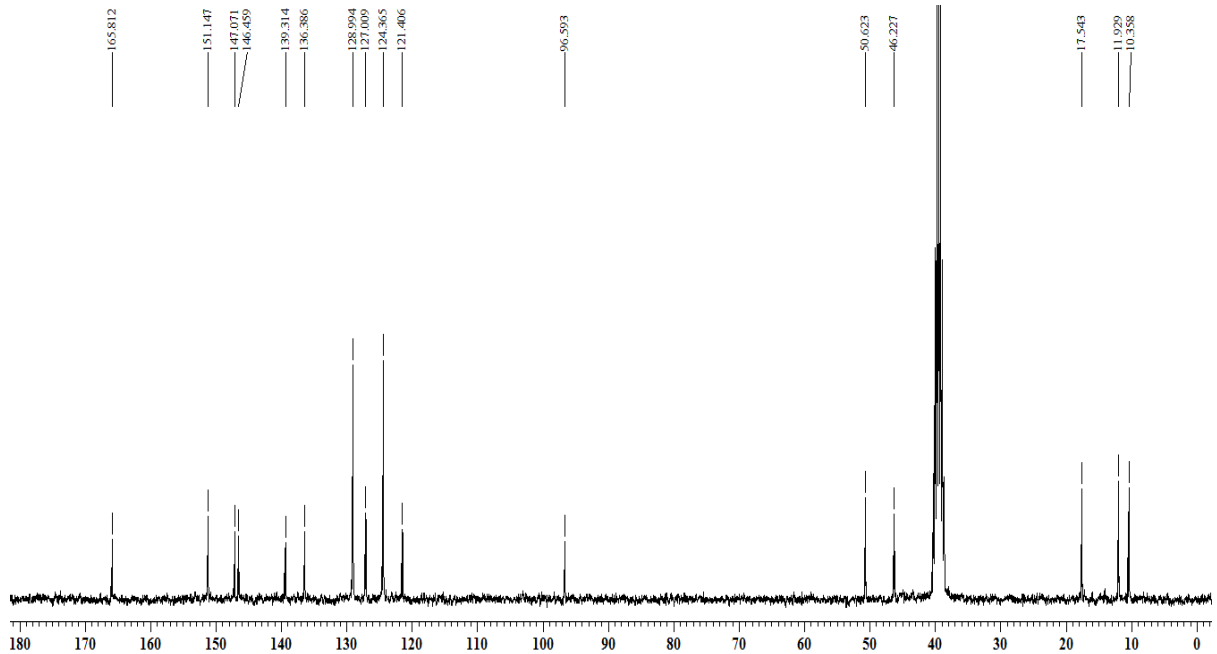
^{1}H NMR Spectrum of ethyl 4-(3-((tert-butyldiphenylsilyl)oxy)phenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4l)



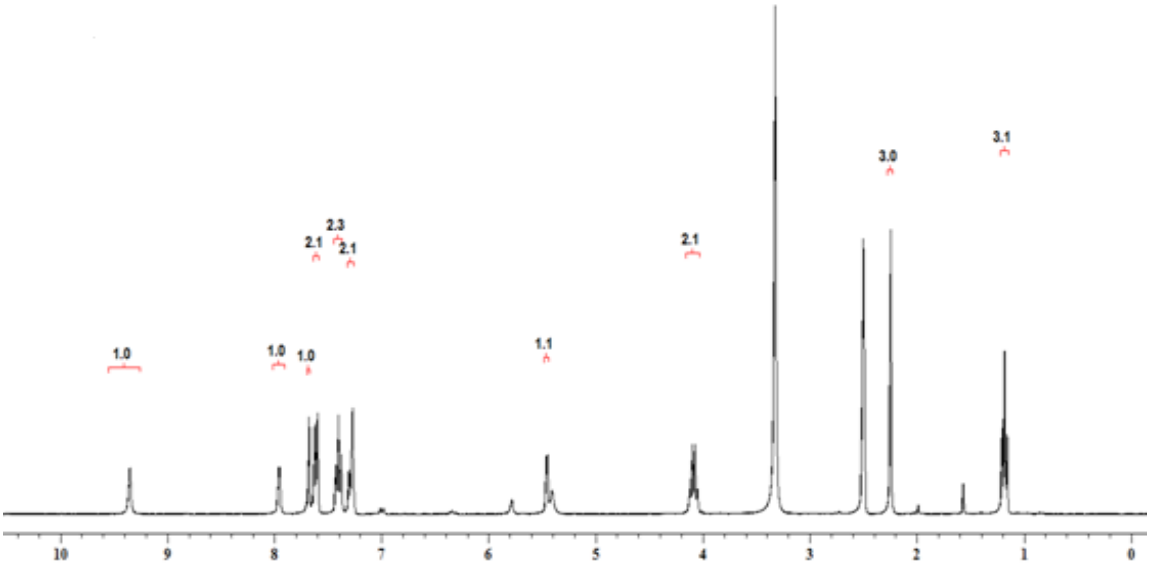
^{13}C NMR Spectrum of ethyl 4-(3-((tert-butyldiphenylsilyl)oxy)phenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4l)



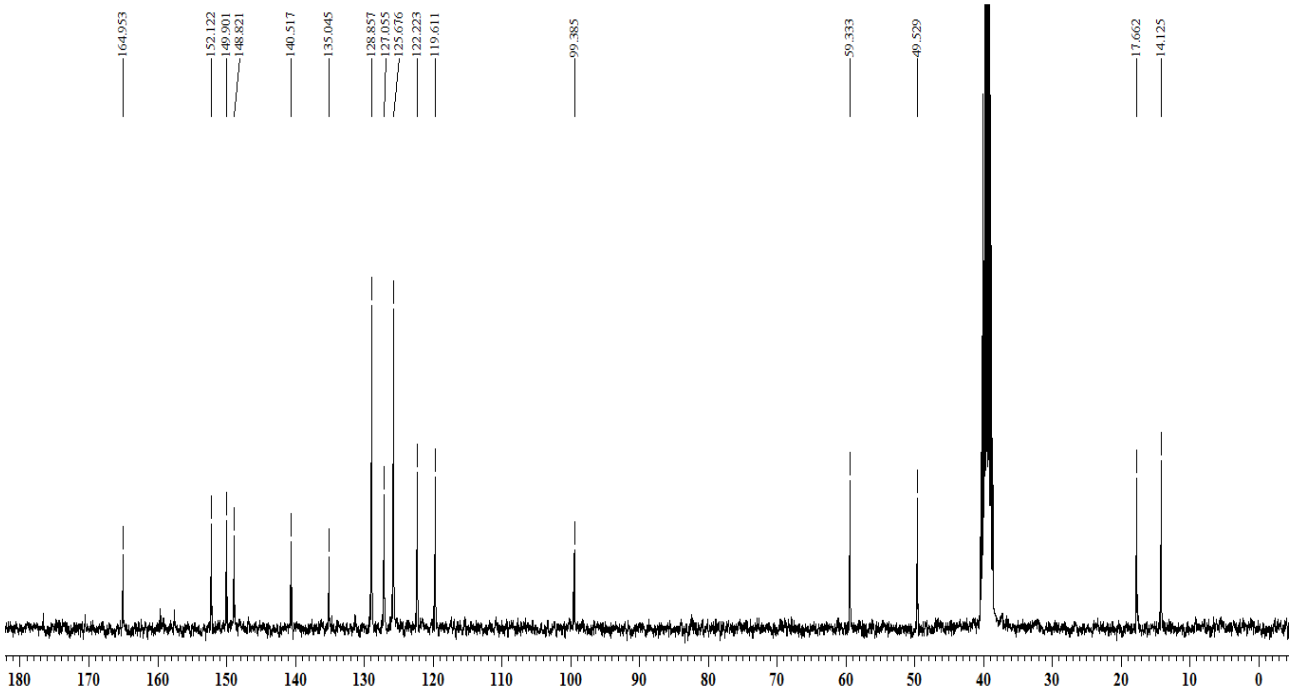
^{1}H NMR spectrum of methyl 4-(3,5-dimethyl-1-phenyl-1H-pyrazol-4-yl)-6-methyl-2-oxo-1,2,3,4 tetrahydropyrimidine-5-carboxylate (4m)



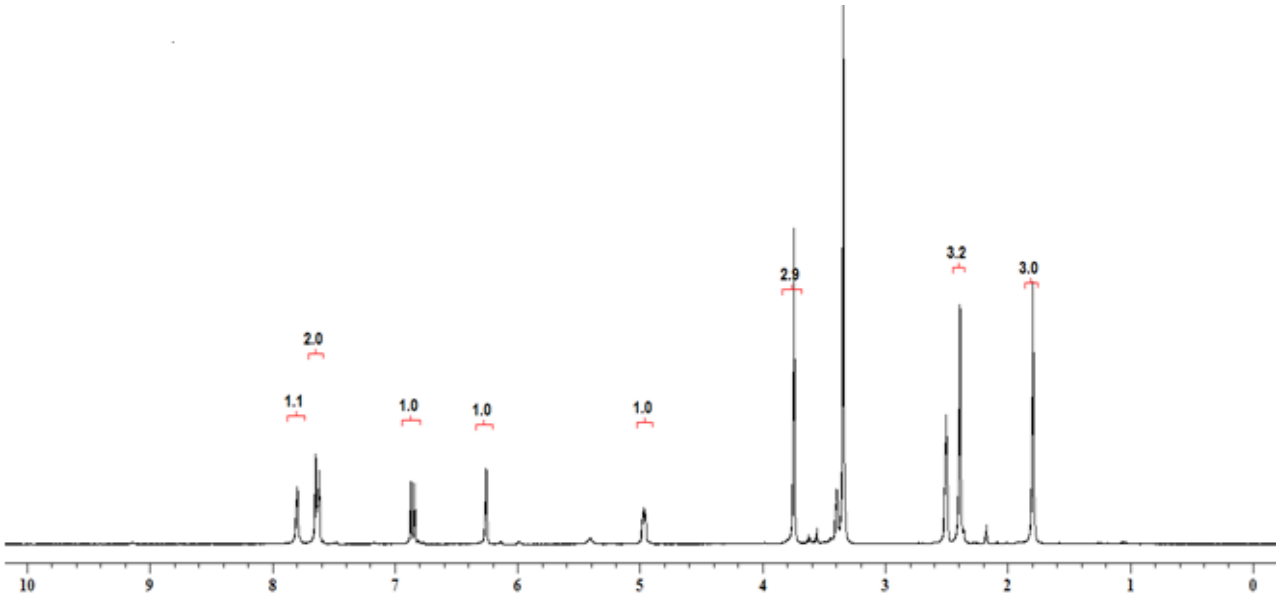
^{13}C NMR spectrum of methyl 4-(3,5-dimethyl-1-phenyl-1H-pyrazol-4-yl)-6-methyl-2-oxo-1,2,3,4 tetrahydropyrimidine-5-carboxylate (4m)



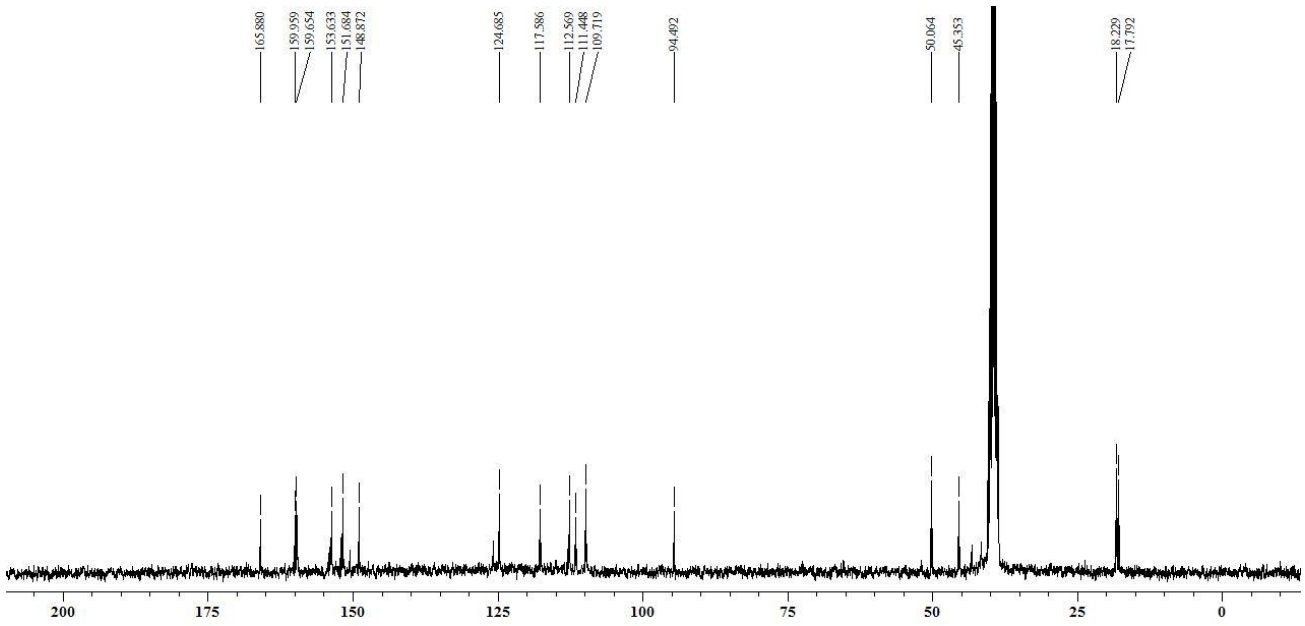
^{1}H NMR spectrum of ethyl 6-methyl-2-oxo-4-(4-phenylthiophen-2-yl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4n)



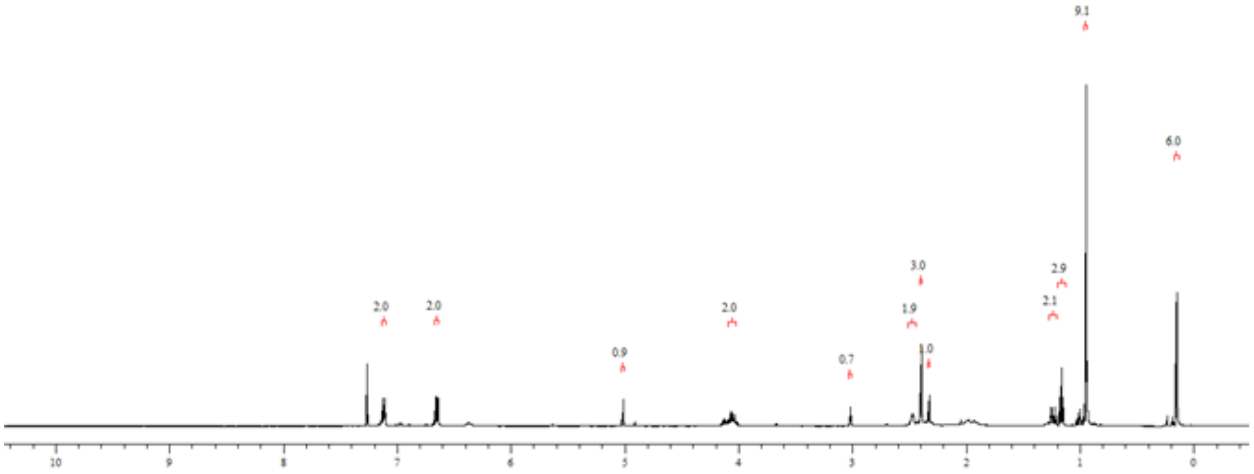
^{13}C NMR spectrum of ethyl 6-methyl-2-oxo-4-(4-phenylthiophen-2-yl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4n)



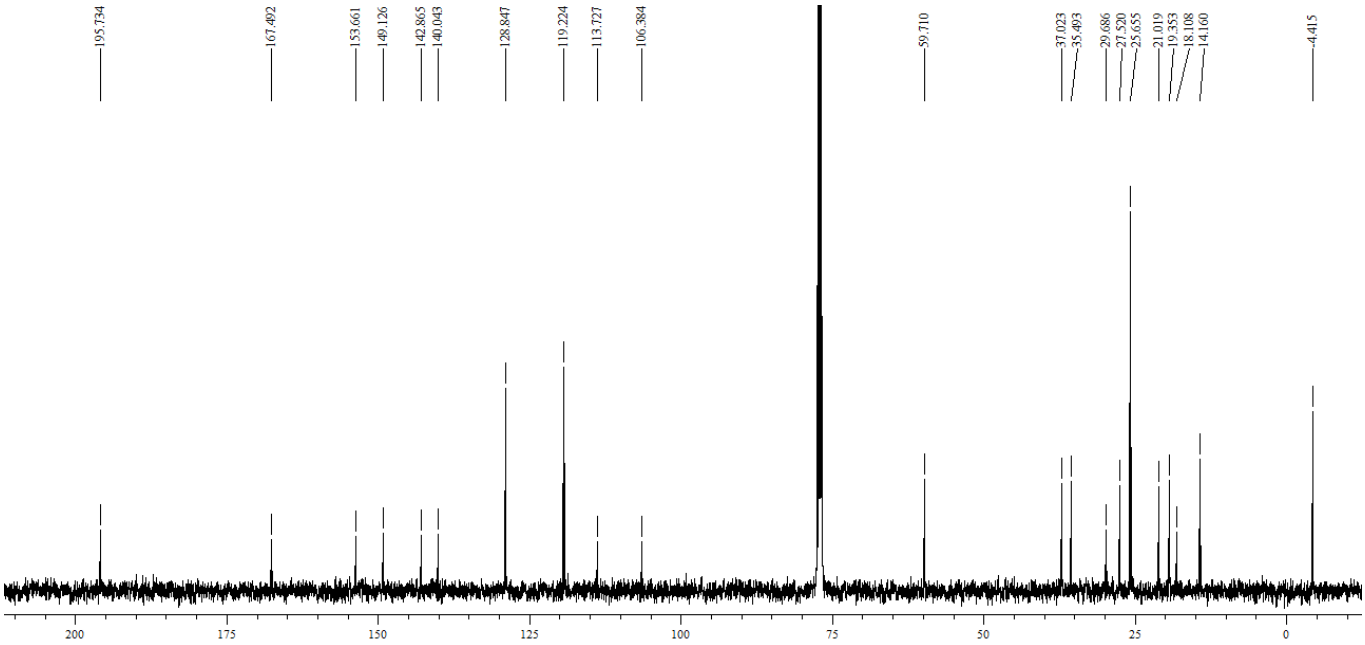
^{1}H NMR spectrum of methyl 4-(7-hydroxy-4-methyl-2-oxo-2H-chromen-5-yl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4o).



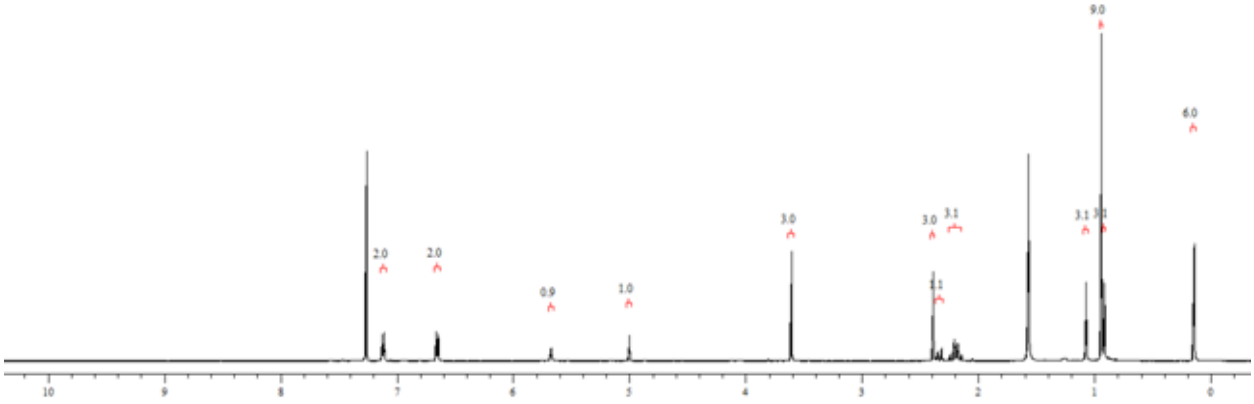
^{13}C NMR spectrum of methyl 4-(7-hydroxy-4-methyl-2-oxo-2H-chromen-6-yl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (4o).



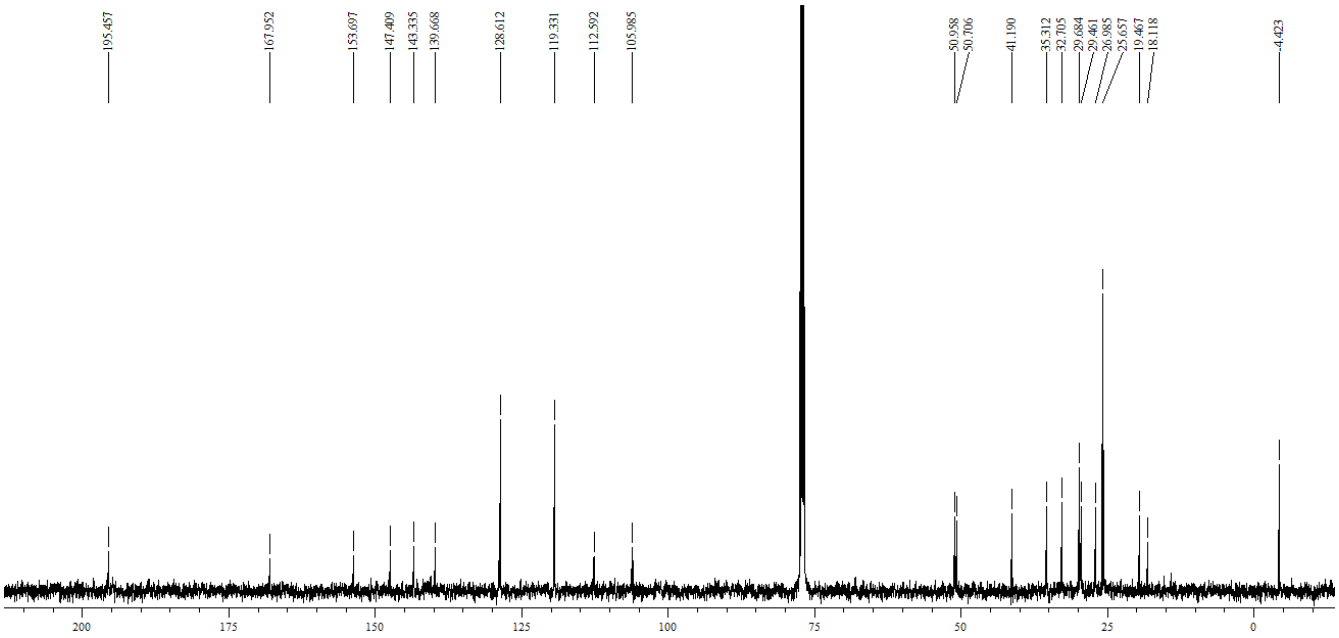
^{1}H NMR spectrum of ethyl 4-(4-(*tert*-butyldimethylsilyloxy) phenyl)-2-methyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7g).



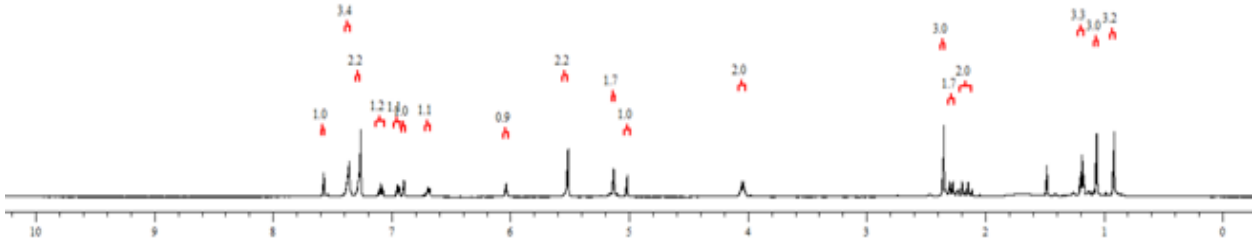
^{13}C NMR spectrum of ethyl 4-(4-(*tert*-butyldimethylsilyloxy) phenyl)-2-methyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7g).



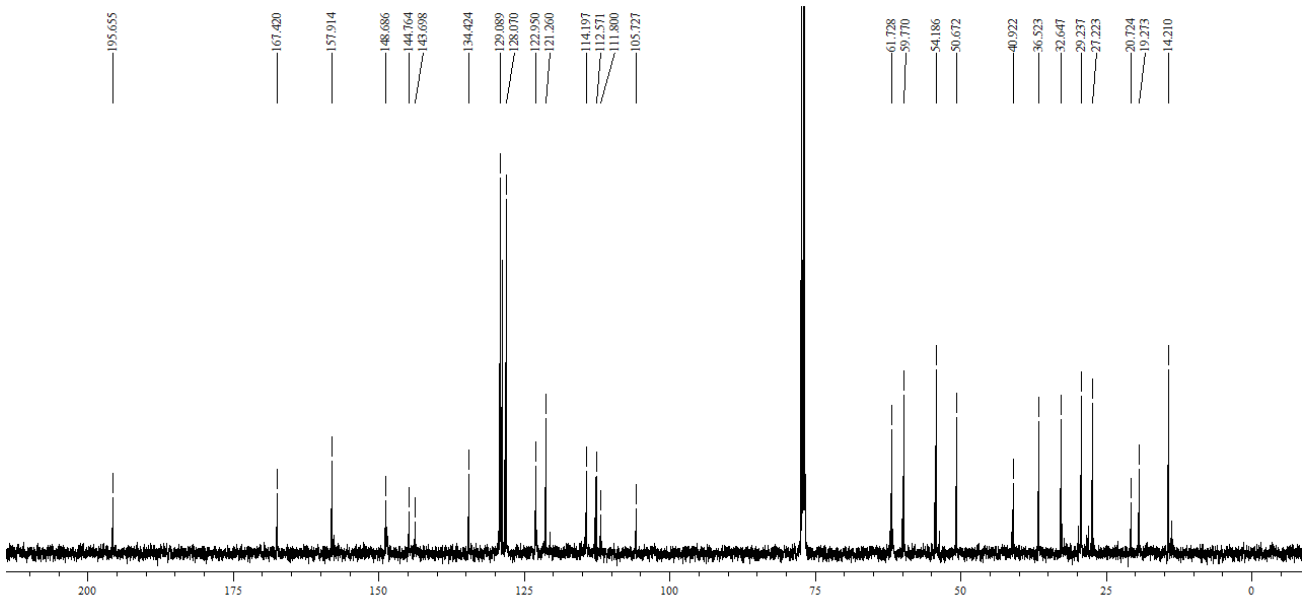
[1]H NMR spectrum of methyl 4-(4-(*tert*-butyldimethylsilyloxy)phenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7j).



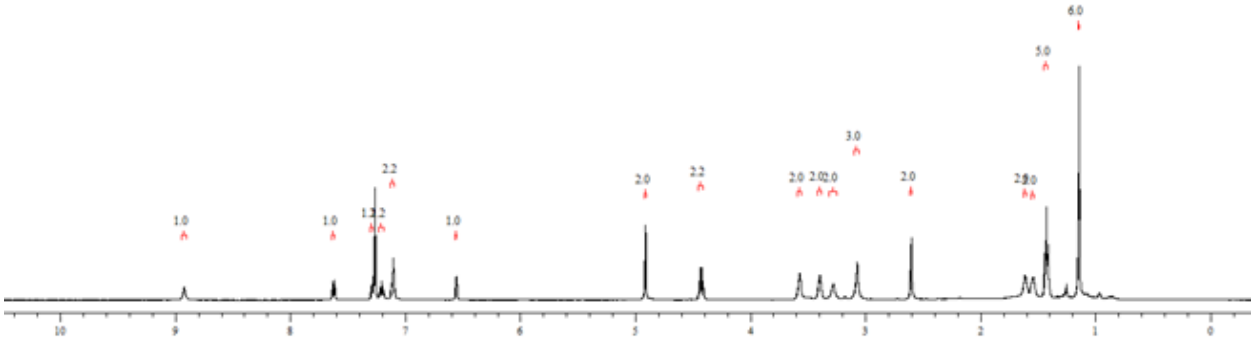
[13]C NMR spectrum of methyl 4-(4-(*tert*-butyldimethylsilyloxy)phenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7j).



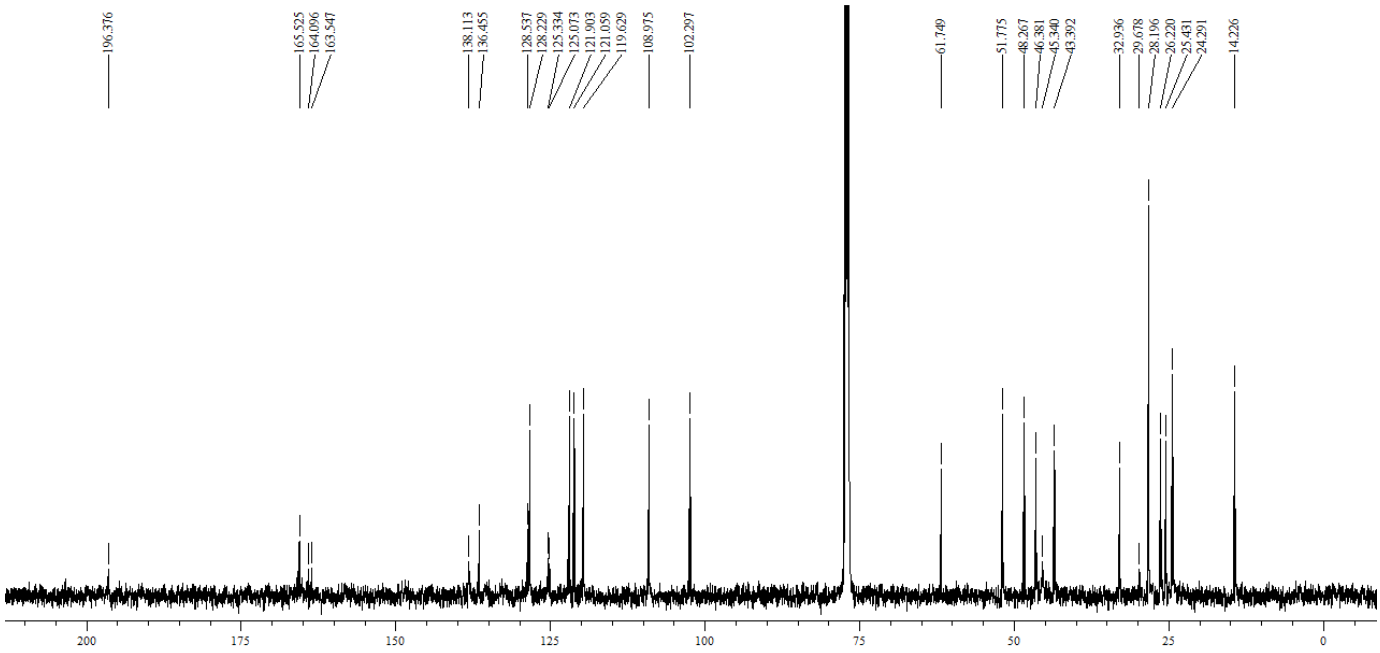
[1]H NMR spectrum of ethyl 4-(3-((1-benzyl-1H-1,2,3-triazol-5-yl)methoxy)phenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7q).



[13]C NMR spectrum of ethyl 4-(3-((1-benzyl-1H-1,2,3-triazol-5-yl)methoxy)phenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7q).



[1]H NMR spectrum of ethyl 2,7,7-trimethyl-5-oxo-4-(1-(2-(piperidin-1-yl)acetyl)-*1H*-indol-3-yl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7s).



[13]C NMR spectrum of ethyl 2,7,7-trimethyl-5-oxo-4-(1-(2-(piperidin-1-yl)acetyl)-*1H*-indol-3-yl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (7s).

UPLC data of compound **4p**:

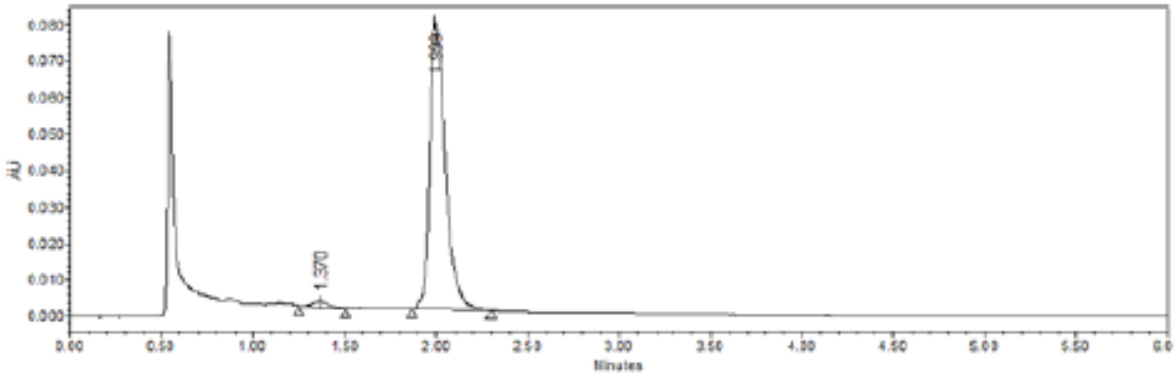
Empower 3 SOFTWARE

CHEM

SAMPLE INFORMATION

Sample Name:	GS DH_T2	Acquired By:	System
Sample Type:	Unknown	Sample Set Name	20150902B
Vial:	17	Acq. Method Set:	GS
Injection #:	1	Processing Method	RIN
Injection Volume:	10.00 ul	Channel Name:	237.0nm@2
Run Time:	6.0 Minutes	Proc. Chnl. Descr.:	PDA 237.0 nm (190-400)nm
Date Acquired:	9/2/2015 4:56:13 PM IST		
Date Processed:	9/3/2015 3:31:18 PM IST		

Auto-Scaled Chromatogram



Peak Results

	Name	RT	Height	% Area	Area (µV*sec)
1		1.370	1479	2.01	8980
2		1.999	78402	97.99	438802

Cytotoxicity assay:

MTT assay is a standard colorimetric assay for measuring cellular proliferation. MTT is a tetrazolium salt, which is yellow in color and is photosensitive. MTT [3-(4, 5- dimethylthiazol-2-yl)-2, 5-diphenyl tetrazolium bromide] is taken by the living cells and reduced by a mitochondrial dehydrogenase enzyme to a purple formazan product that is impermeable to the cell membrane. Solubilisation with solvents like DMSO leads to liberation of product and amount of purple formazan product is directly related to the cell viability. 1x104 Cells (counted by Trypan blue exclusion dye method)) in 96- well plates were incubated with series of concentrations of compounds for 48 h at 37 °C in DMEM with 10% FBS medium. Then the above media was replaced with 90µl of fresh serum free media and 10 µl of MTT reagent (5mg/ml) and plates were incubated at 37 °C for 4h, there after the above media was replaced with 200µl of DMSO and incubated at 37 °C for 10min.The absorbance at 570 nm was measured on a spectrophotometer (spectra max, Molecular devices). IC_{50} values were determined from plot: % cell viability (from control) versus concentration.