Supporting Information

The unique opportunity of glass wastes utilization as resources for catalytic applications: Toward a cleaner environment

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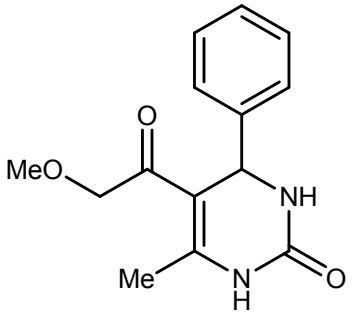
Spectral data of some selected compounds from table3.

Ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry1).



Melting point: 207-208, FT-IR (KBr), ν.max (cm-1): 3247.90, 3116.75, 2977.89, 1720.39, 1643.24, 1465.80, 1226.64, 1095.49, 779.19, 702.0. ^{1}H-NMR (300 MHz; $CDCl_3$): δ_H (ppm)= 8.62 (s, 1H, NH), 7.24-7.31 (m, 5H, ArH), 6.1 (s, 1H, NH), 5.38 (s, 1 H, CH), 4.03 (q, 2 H, OCH_2), 2.32 (s, 3H, CH_3), 1.13 (t, 3H, OCH_2CH_3). ^{13}C NMR (75 MHz; $CDCl_3$): δ_C (ppm): 14.12, 18.55, 55.59, 59.97, 101.23, 126.56, 127.88, 128.66, 143.73, 146.48, 153.73, 165.65.

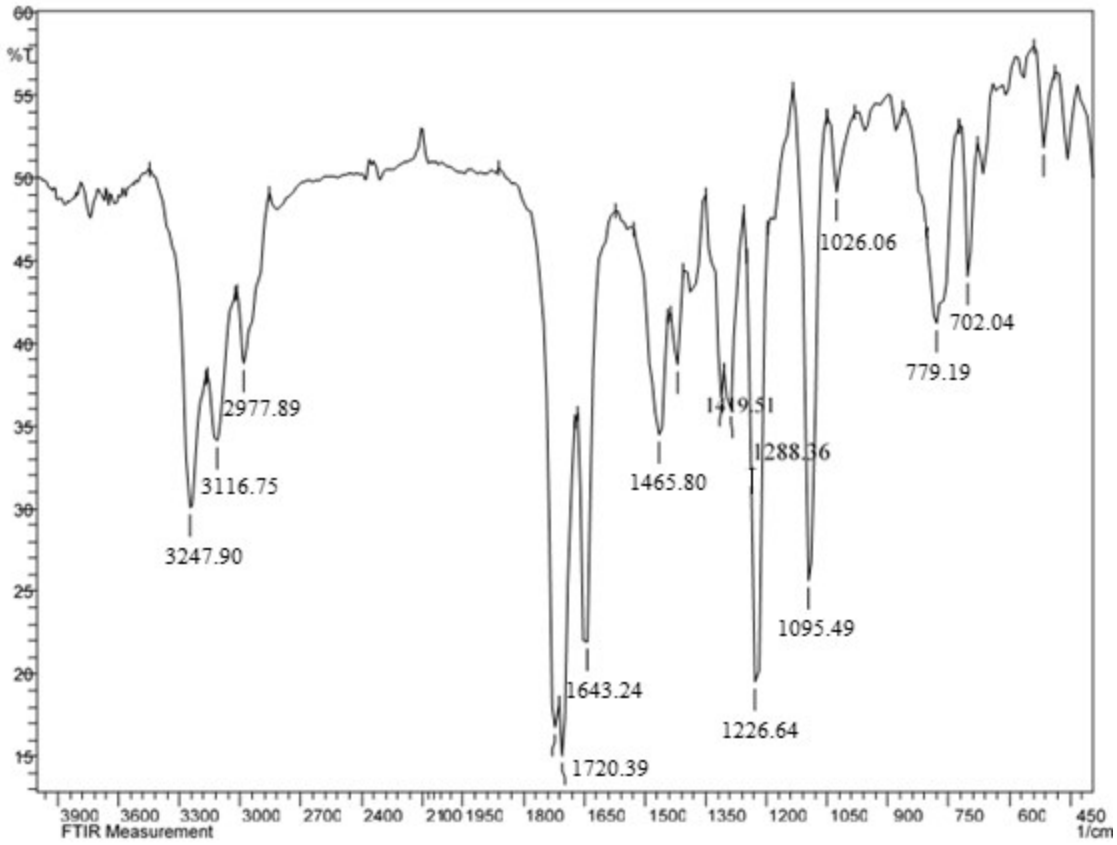


Fig. 1. FT-IR (KBr discs) spectrum of ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry1).

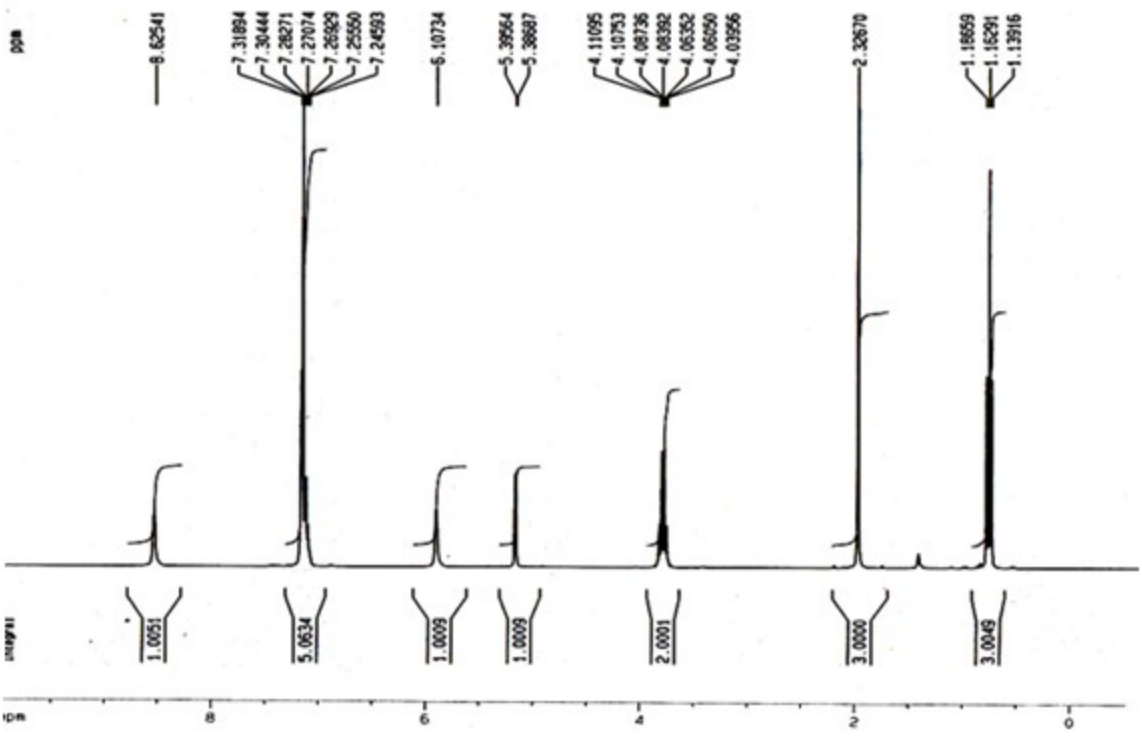


Fig. 2. ^{1}H-NMR spectrum of ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry1).

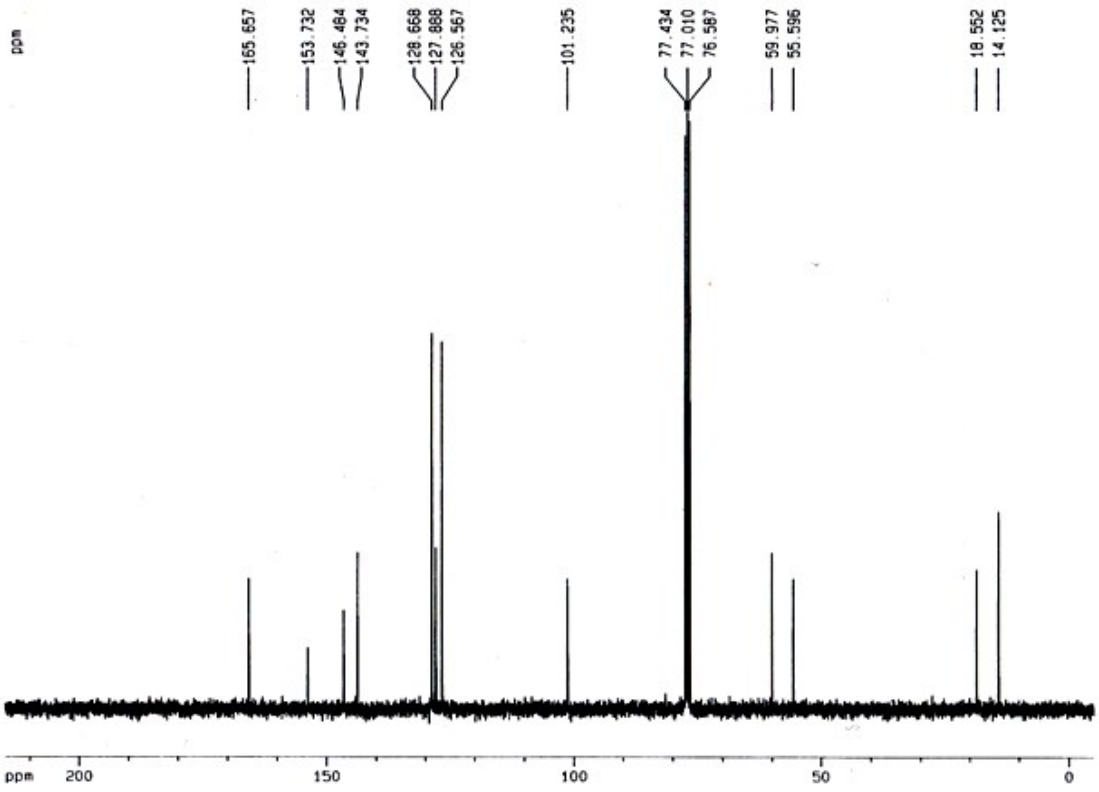
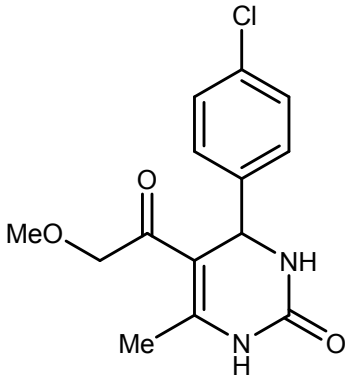


Fig. 3. ^{13}C-NMR spectrum of ethyl 6-methyl-2-oxo-4-phenyl-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry1).

Ethyl 4-(4-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 2).



Melting point: 215-216. FT-IR (KBr), ν.max (cm^{-1}): 3240.19, 3116.75, 2977.89, 1704.96, 1650.95, 1419.51, 1226.64, 1091.63, 779.19. ^{1}H-NMR (300 MHz; $CDCl_3$): δ_H (ppm): 8.44 (s, 1H, NH), 7.22-7.29 (m, 4H, ArH), 6.1 (s, 1H, NH), 5.36 (s, 1 H, CH), 4.04 (q, 2 H, OCH_2), 2.32 (s, 3 H, CH_3) , 1.15 (t, 3H, OCH_2CH_3). ^{13}C-NMR (75 MHz; $CDCl_3$): δ_C (ppm): 14.15, 18.63, 55.02, 60.14, 101.02, 127.99, 128.84, 133.69, 142.19, 146.54, 153.48, 165.45.

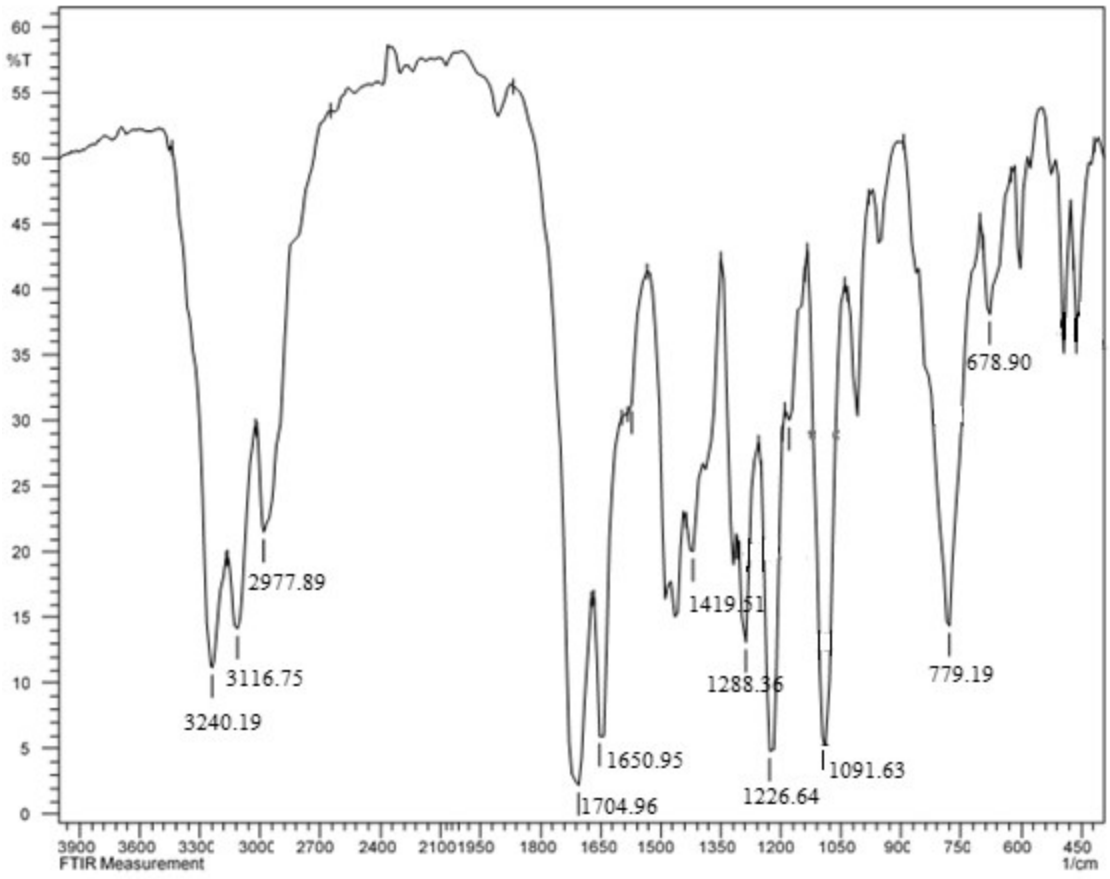


Fig. 4. FT-IR (KBr discs) spectrum of ethyl 4-(4-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 2).

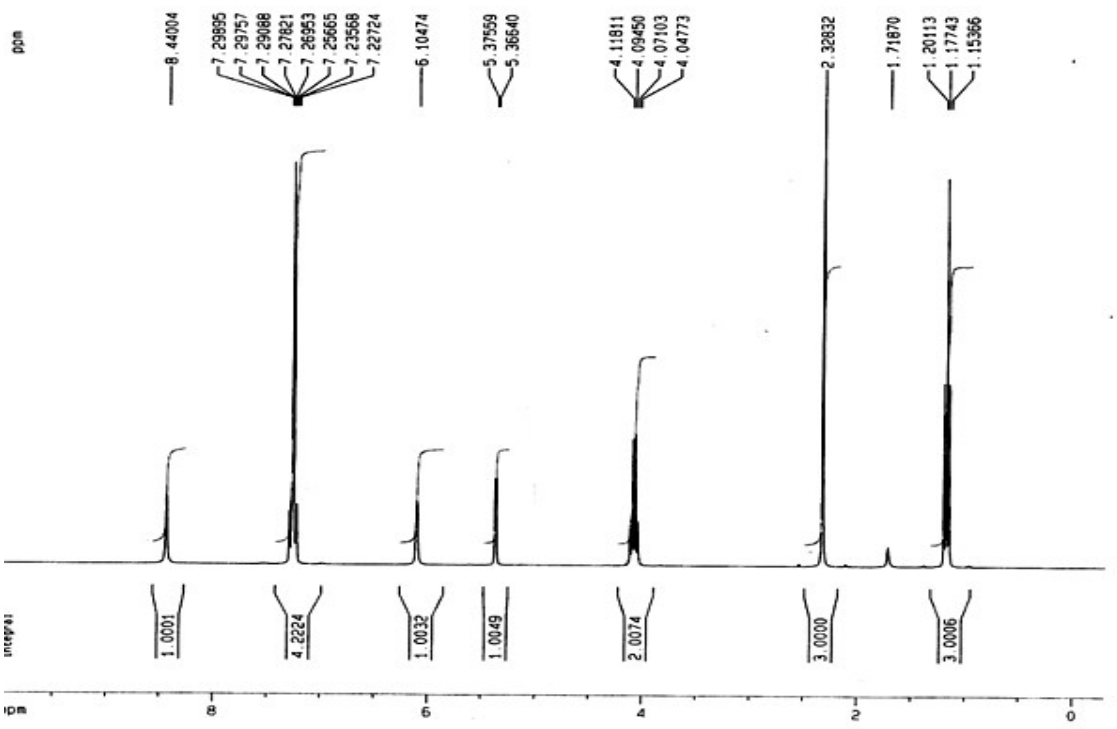


Fig. 5. ^{1}H-NMR spectrum of ethyl 4-(4-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry2).

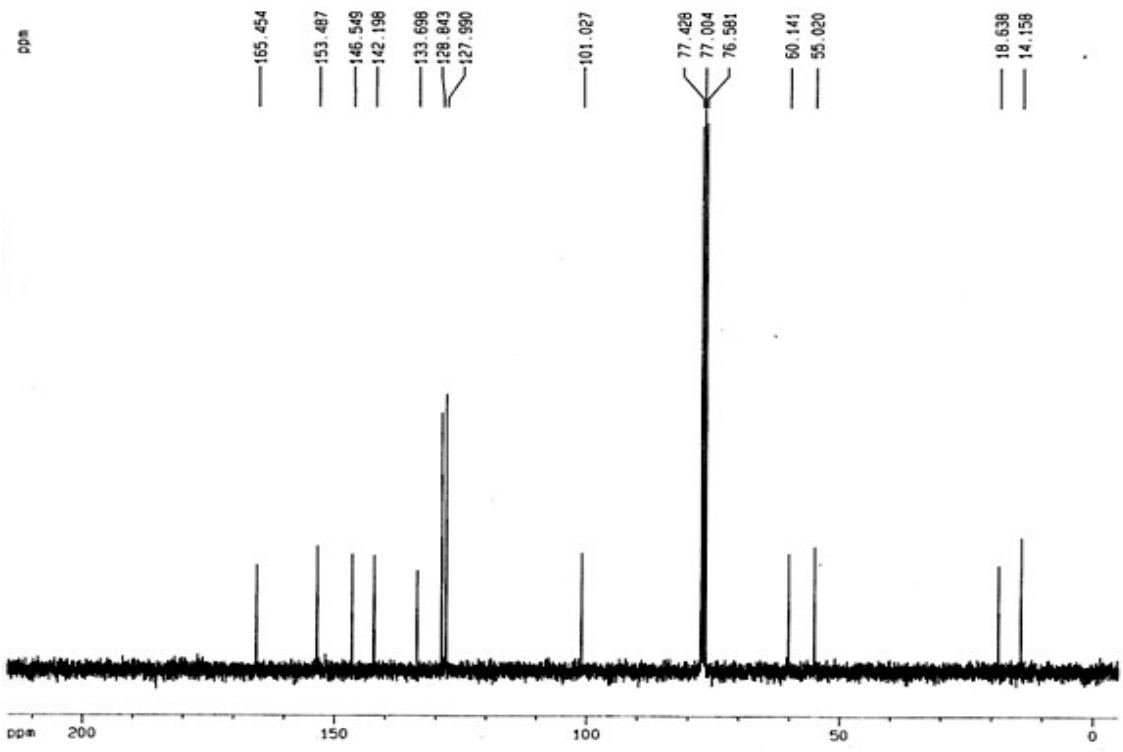
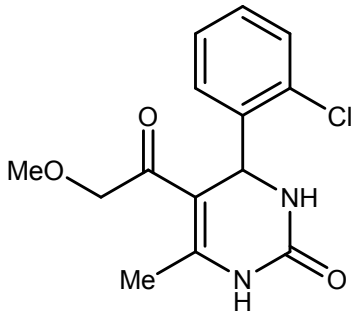


Fig. 6. ^{13}C-NMR spectrum of ethyl 4-(4-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry2).

Ethyl 4-(2-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 3).



Melting point: 214-216. FT-IR (KBr), ν. max (cm-1): 3234.40, 3110.97, 2977.89, 1701.10, 1645.17, 1454.23, 1222.79, 1081.99, 761.83. ^{1}H-NMR ($CDCl_3$, 300 MHz): δ_H (ppm): 9.08 (s, 1 H, NH), 7.19-7.37 (m, 4 H, ArH), 5.98 (s, 1 H, NH), 5.86 (s, 1H, CH), 3.97 (q, 2 H, OCH_2), 2.41 (s, 3 H, CH_3), 1.02(t, 3H, OCH_2CH_3). ^{13}C-NMR (75 MHz; CDCl3) δ_C (ppm): 13.97, 18.23, 52.06, 59.93, 98.8, 127.51, 128.03, 129.23, 129.75, 132.55, 139.58, 148.56, 153.42, 165.33.

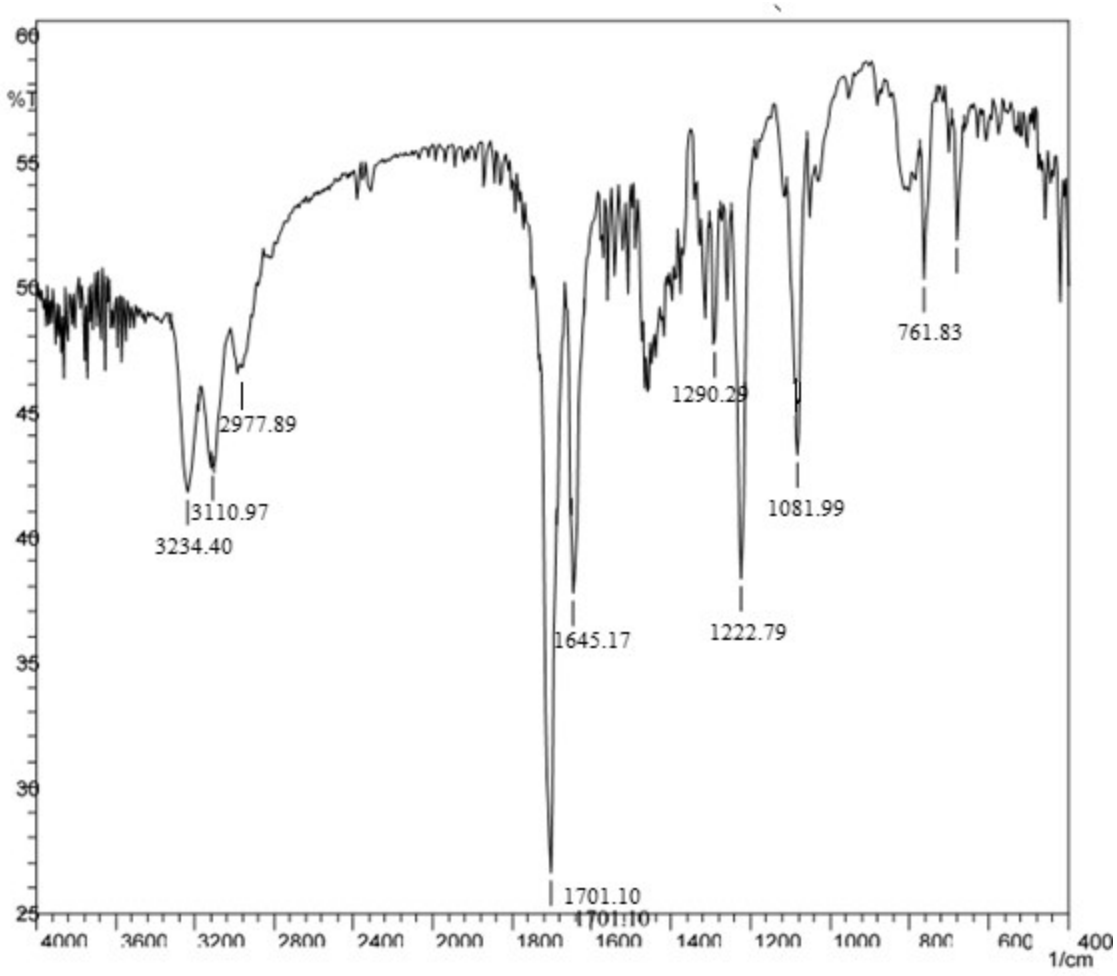


Fig. 7. FT-IR (KBr discs) spectrum of ethyl 4-(2-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 3).

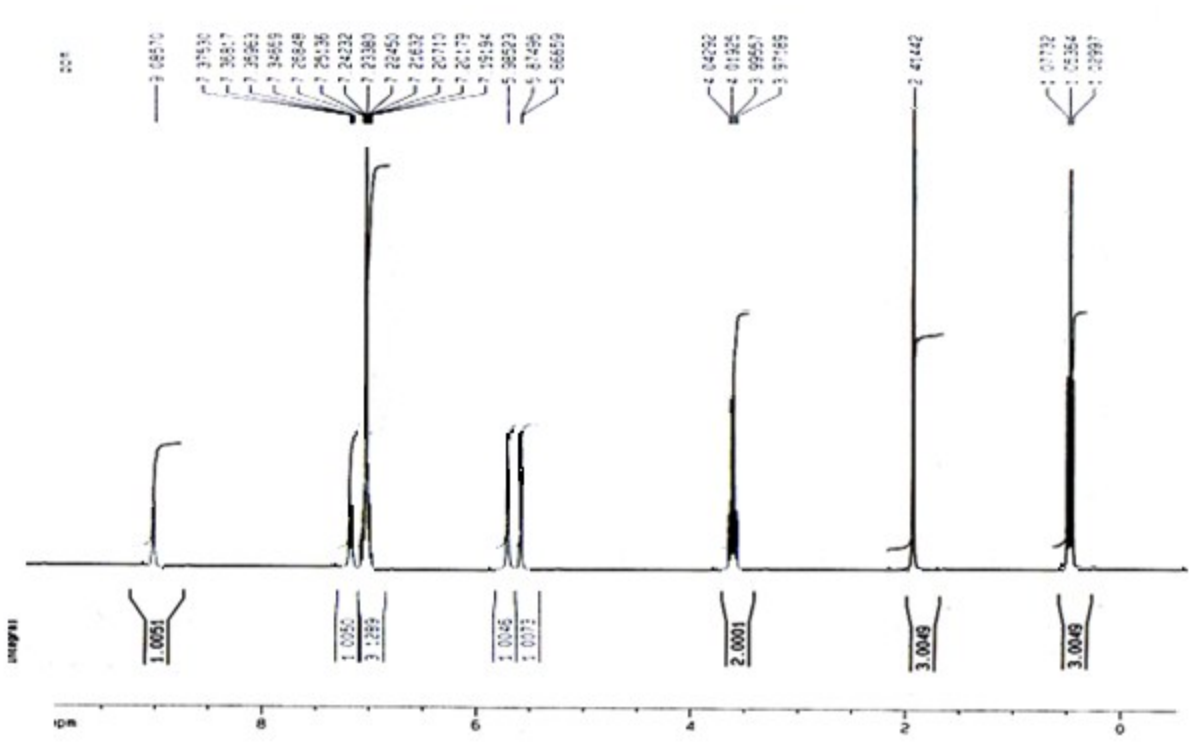


Fig. 8. ^{1}H-NMR spectrum of ethyl 4-(2-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry 3).

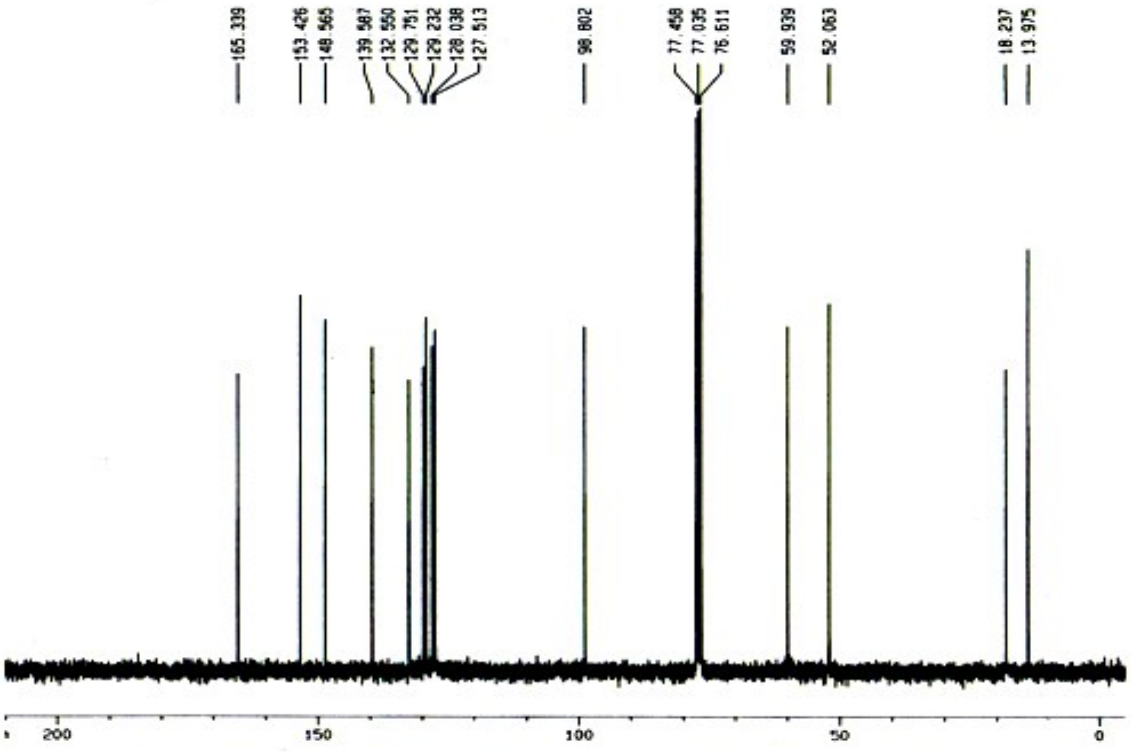
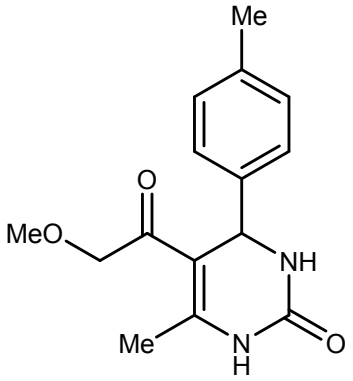


Fig. 9. ^{13}C-NMR spectrum of ethyl 4-(2-chlorophenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry 3).

Ethyl 6-methyl-2-oxo-4-(p-tolyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate(Table3, entry 11).



Melting point: 203-204. FT-IR (KBr), ν. max (cm^{-1}): 3245.97, 3114.82, 2979.82, 1724.24, 1649.02, 1460.01, 1222.79, 1089.71, 786.90. ^{1}H-NMR ($CDCl_3$, 300 MHz) δ_H (ppm): 8.75 (s, 1 H, NH), 7.09-7.21 (m, 4 H, ArH), 6.22 (s, 1 H, NH), 5.34 (s, 1 H, CH), 4.04 (q, 2 H, OCH_2), 2.3 (s, 3 H, CH_3), 1.15 (t, 3H, OCH_2CH_3). ^{13}C-NMR (75 MHz; $CDCl_3$) δ_C (ppm): 14.16, 18.50, 21.09, 55.18, 59.93, 101.35, 126.45, 129.30, 137.52, 140.91, 146.41, 153.99, 165.74.

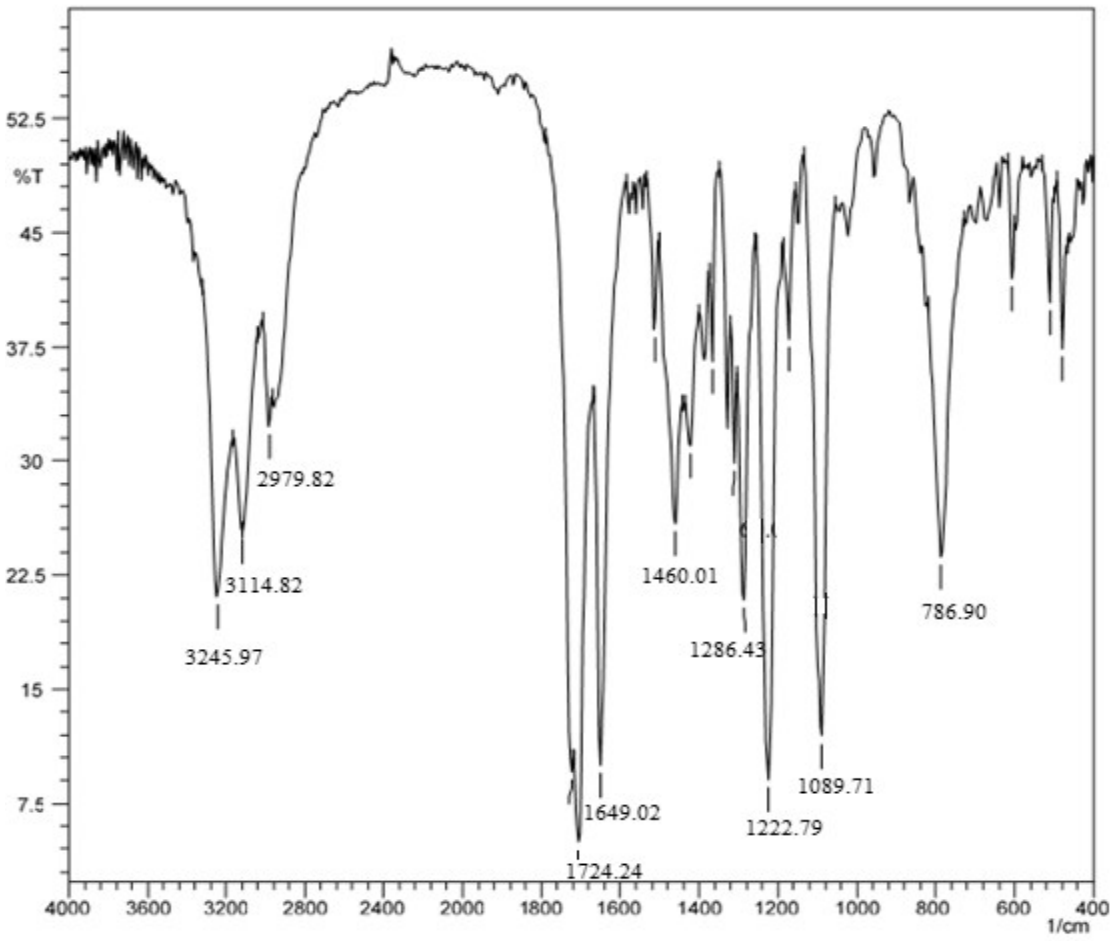


Fig.10. FT-IR (KBr discs) spectrum of ethyl 6-methyl-2-oxo-4-(p-tolyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table3, entry 11).

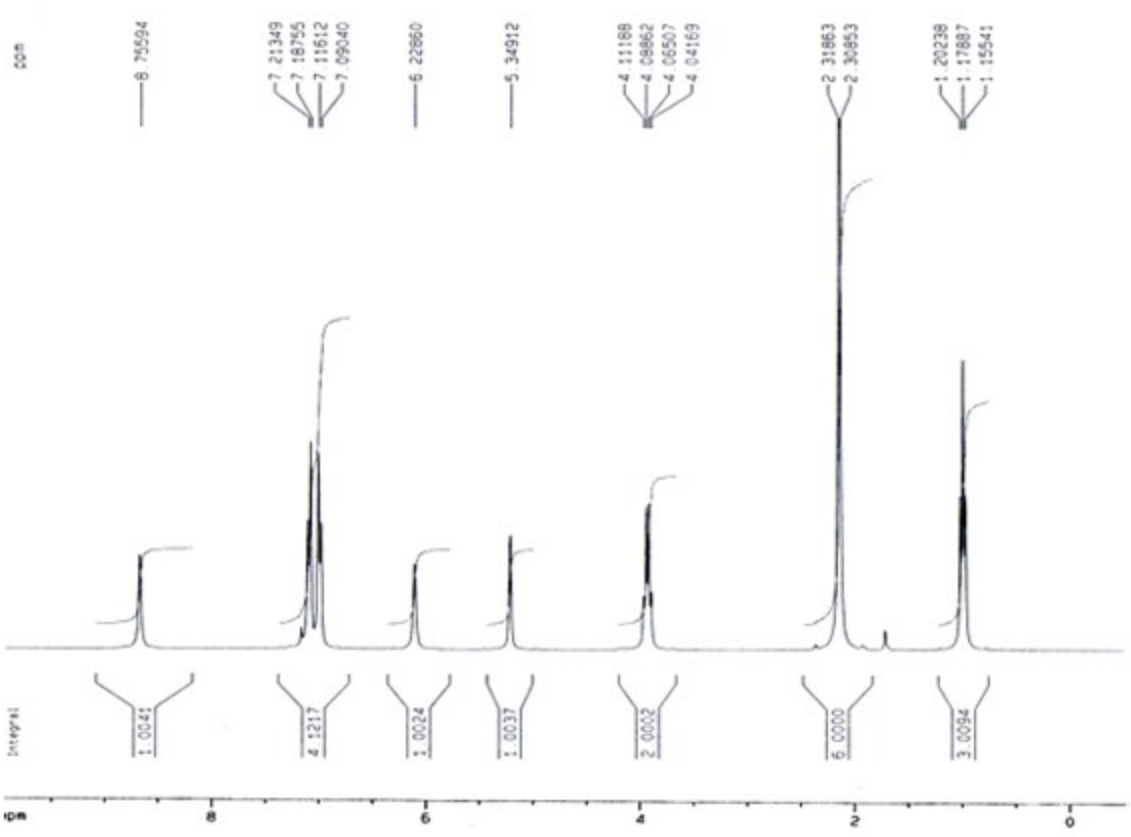


Fig. 11. ^{1}H-NMR spectrum of ethyl 6-methyl-2-oxo-4-(p-tolyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table3, entry 11).

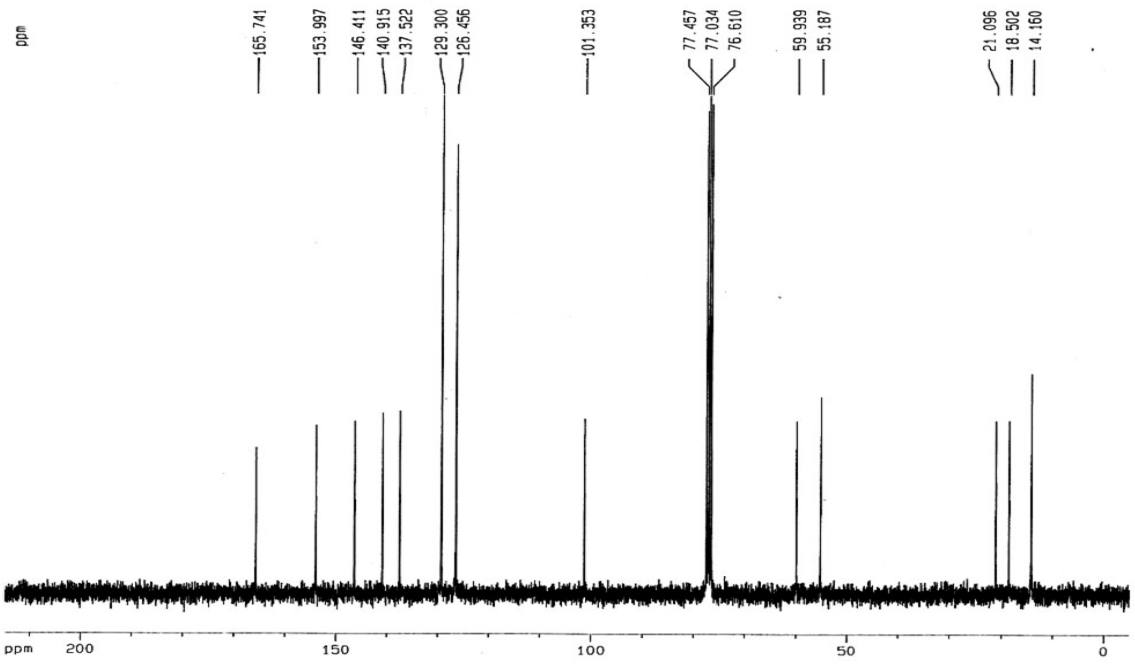
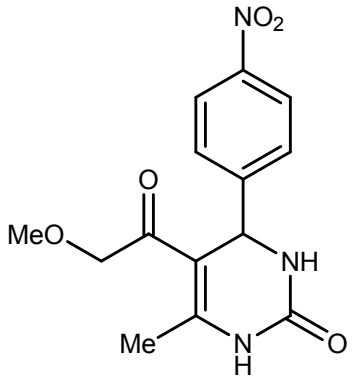


Fig. 12. ^{13}C-NMR spectrum of ethyl 6-methyl-2-oxo-4-(p-tolyl)-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table3, entry 11).

Ethyl 6-methyl-4-(4-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5 carboxylate(table 3, entry 6).



Melting point: 209-211. FT-IR (KBr), ν. max (cm^{-1}): 3247.90, 3116.75, 2977.89, 1720.39, 1643.24, 1519.80, 1348.15, 1218, 1097.42, 856.34, 779.19. ^{1}H-NMR ($CDCl_3$, 300 MHz) δ_H (ppm): 7.94 (s, 1H, NH), 5.91 (s, 1H, NH), 8.18 (d, 2H, Ar-H), 7.5 (d, 2H, Ar-H), 5.52 (s, 1H, CH), 4.07 (q, 2H,CH_2O), 2.37 (s, 3H, CH_3), 1.17 (t, 3H,OCH_2-CH_3). ^{13}C-NMR (75 MHz; $CDCl_3$) δ_C (ppm): 14.18, 18.94, 55.18, 60.43, 100.56, 124.1, 127.57, 147.56, 148.03, 149.71, 150.34, 165.15.

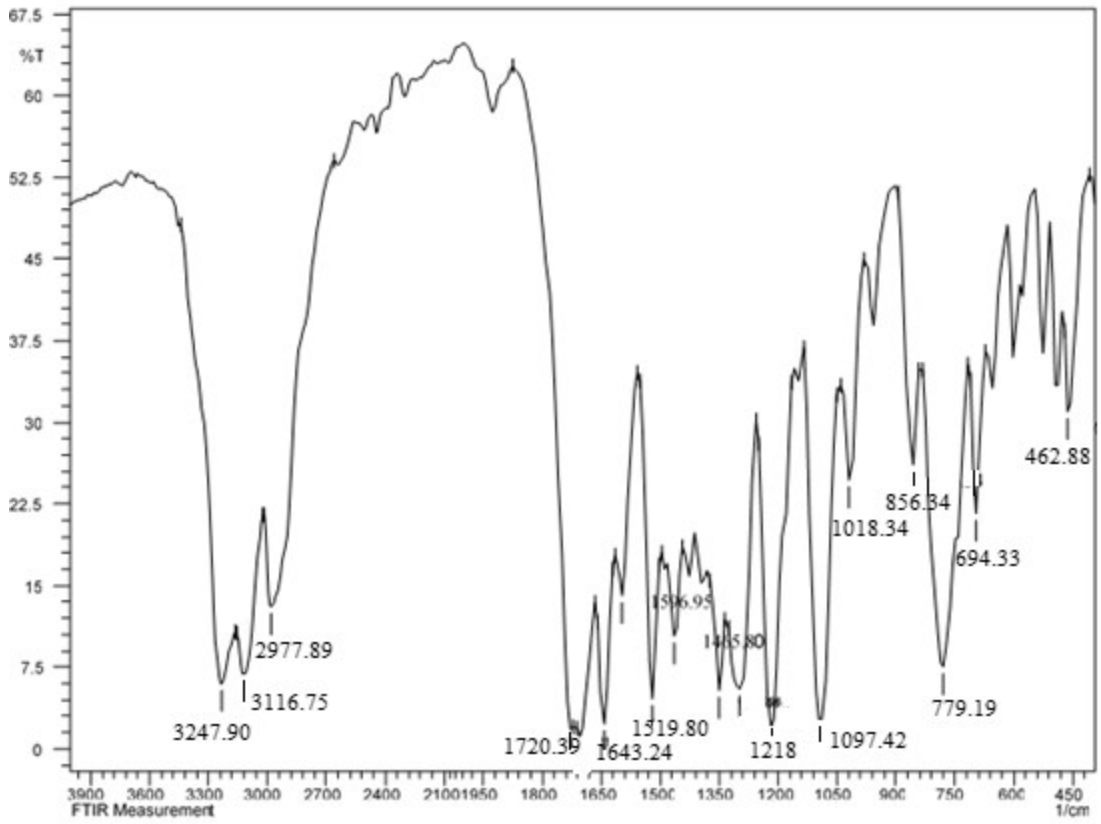


Fig.13. FT-IR (KBr discs) spectrum of ethyl 6-methyl-4-(4-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5 carboxylate in $CDCl_3$ (table 3, entry 6).

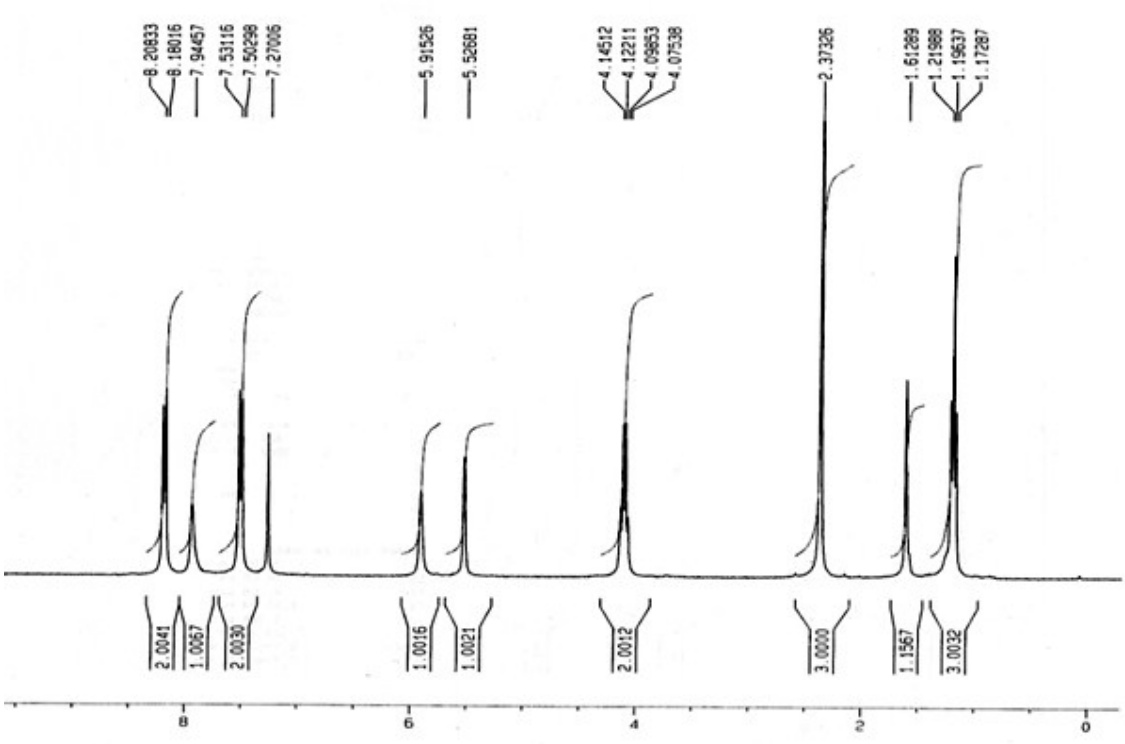


Fig.14. ^{1}H-NMR spectrum of ethyl 6-methyl-4-(4-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5 carboxylate in $CDCl_3$ (table 3, entry 6).

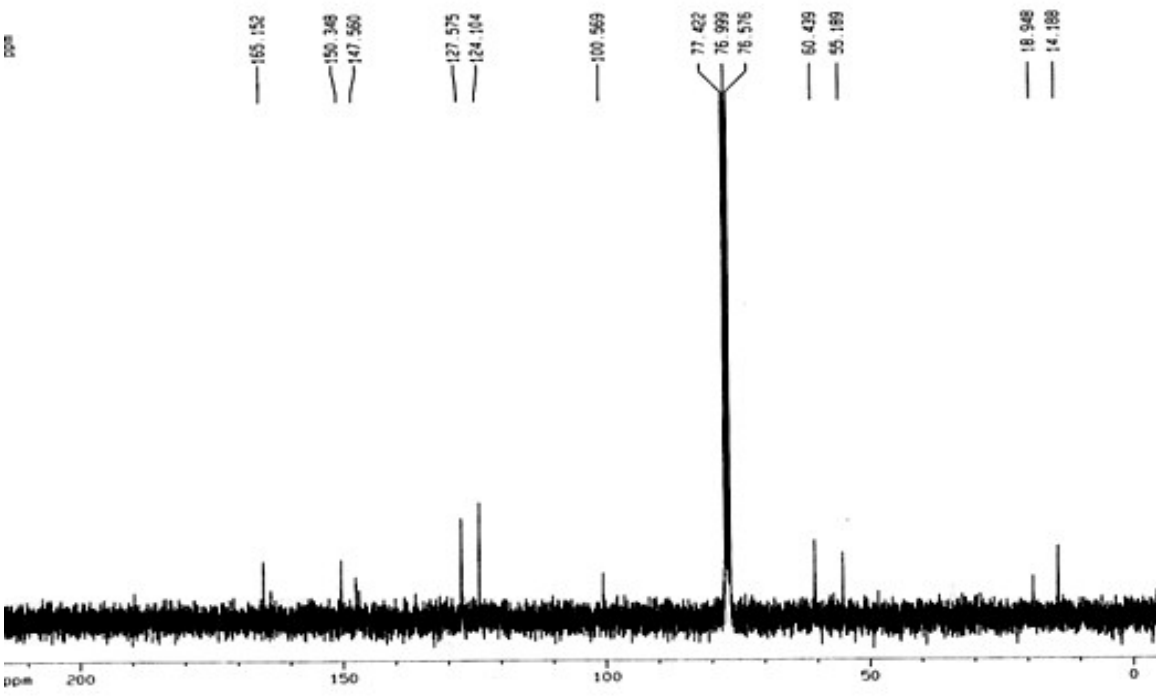
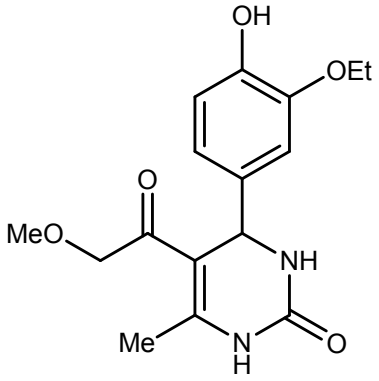


Fig.15. ^{13}C-NMR spectrum of ethyl 6-methyl-4-(4-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5 carboxylate in $CDCl_3$ (table 3, entry 6).

Ethyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 12).



Melting point: 232-234. FT-IR (KBr), ν. max (cm^{-1}): 3417, 3263.33, 2985.60, 1704.96, 1650.95, 1515.94, 1226.61, 1095.49, 786.90.

^{1}H-NMR ($CDCl_3$, 300 MHz) δ_H (ppm): 6.79 (m, 3 H, ArH), 5.31 (S, 1 H, CH), 4.03 (q, 2 H, OCH_2), 2.33(s, 3 H, CH_3), 1.39(t, 3 H, OCH_2CH_3), 1.15(t, 3H, OCH_2CH_3). ^{13}C-NMR (75 MHz; $CDCl_3$) δ_C (ppm): 14.13, 14.77, 17.74, 53.55, 59.15, 63.93, 99.64, 112.3, 115.38, 118.45, 135.9, 146.13, 146.32, 147.84, 152.31, 165.47.

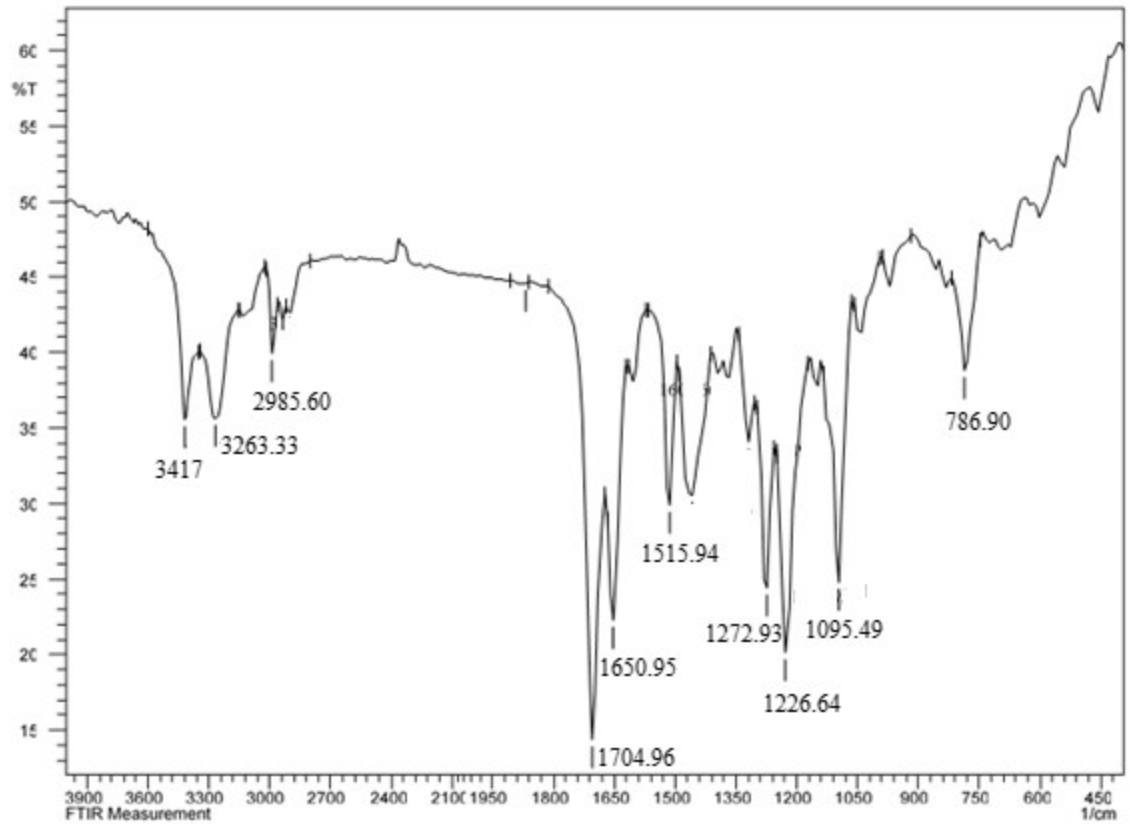


Fig.16. FT-IR (KBr discs) spectrum of ethyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 12).

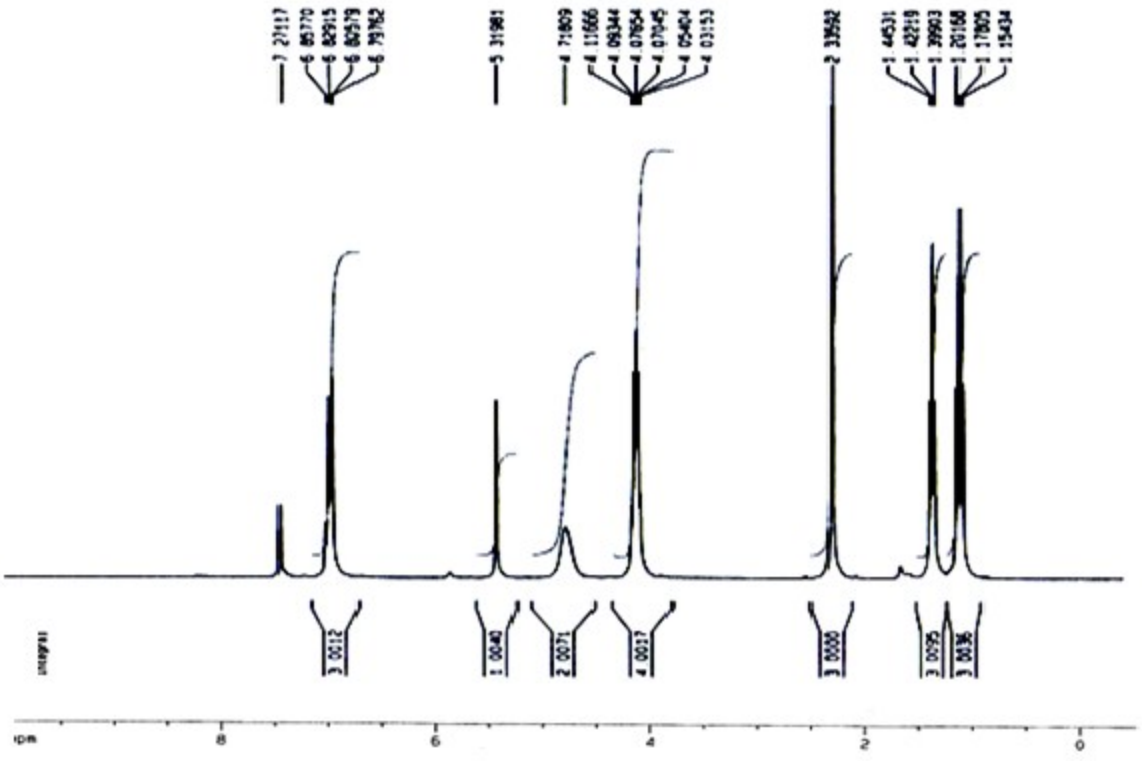


Fig.17. ^{1}H-NMR spectrum of ethyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry 12).

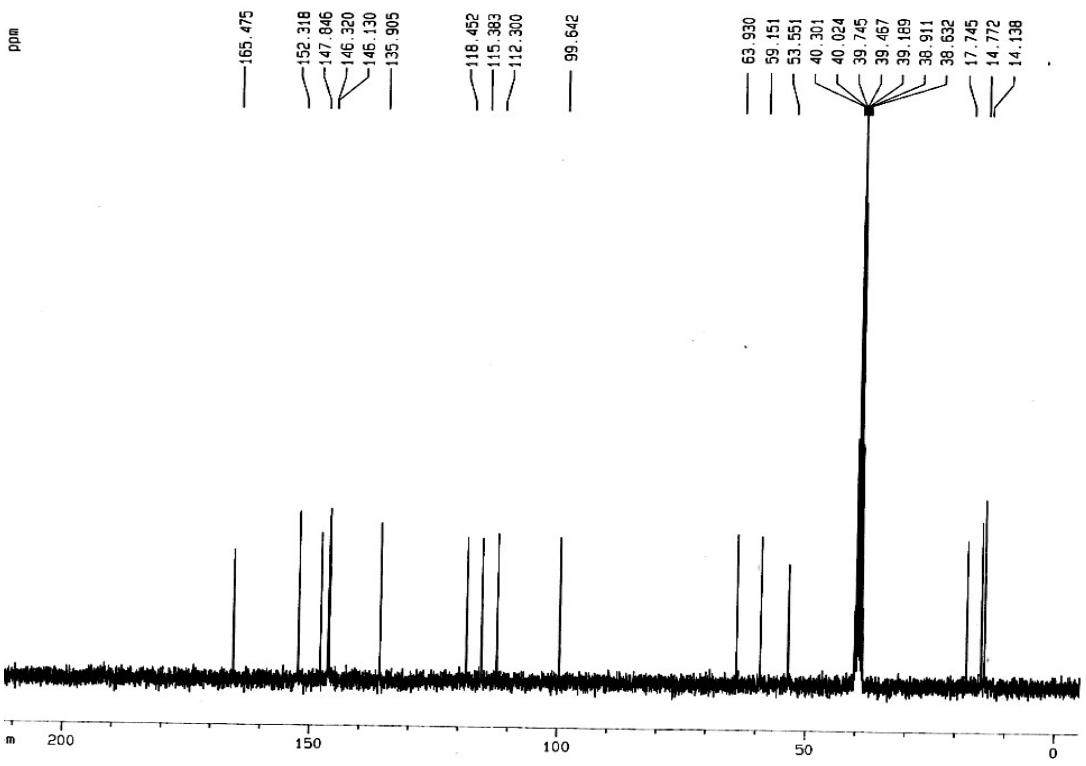
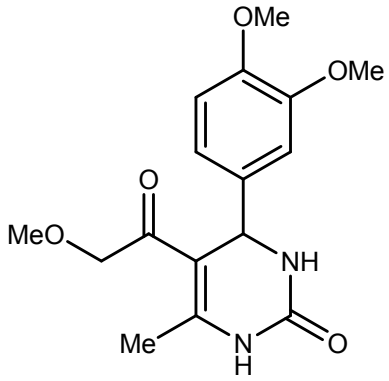


Fig.18. ^{13}C-NMR spectrum of ethyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry 12).

Ethyl 4-(3,4-dimethoxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 13).



Melting point: 175-177. FT-IR (KBr), ν. max (cm^{-1}): 3247.90, 3116.75, 2940.34, 1712.67, 1650.95, 1519.80, 1234.36, 1095.49, 786.90. ^{1}H-NMR ($CDCl_3$, 300 MHz) δ_H (ppm): 9.15 (s, 1 H, NH), 7.68 (s, 1 H, NH), 5.09 (s, 1 H, CH), 6.70-6.89(m, 3H, ArH), 3.95 (q, 2 H, OCH_2CH_3), 3.37 (s, 3 H, CH_3), 3.95 (q, 2 H, OCH_2CH_3), 2.24 (s, 3 H, CH_3). ^{13}C-NMR (75 MHz; $CDCl_3$) δ_C (ppm): 14.15, 17.76, 53.49, 55.4, 55.52, 59.19, 99.39, 110.45, 111.72, 117.9, 137.35, 148.06, 148.15, 148.48, 152.29, 165.43.

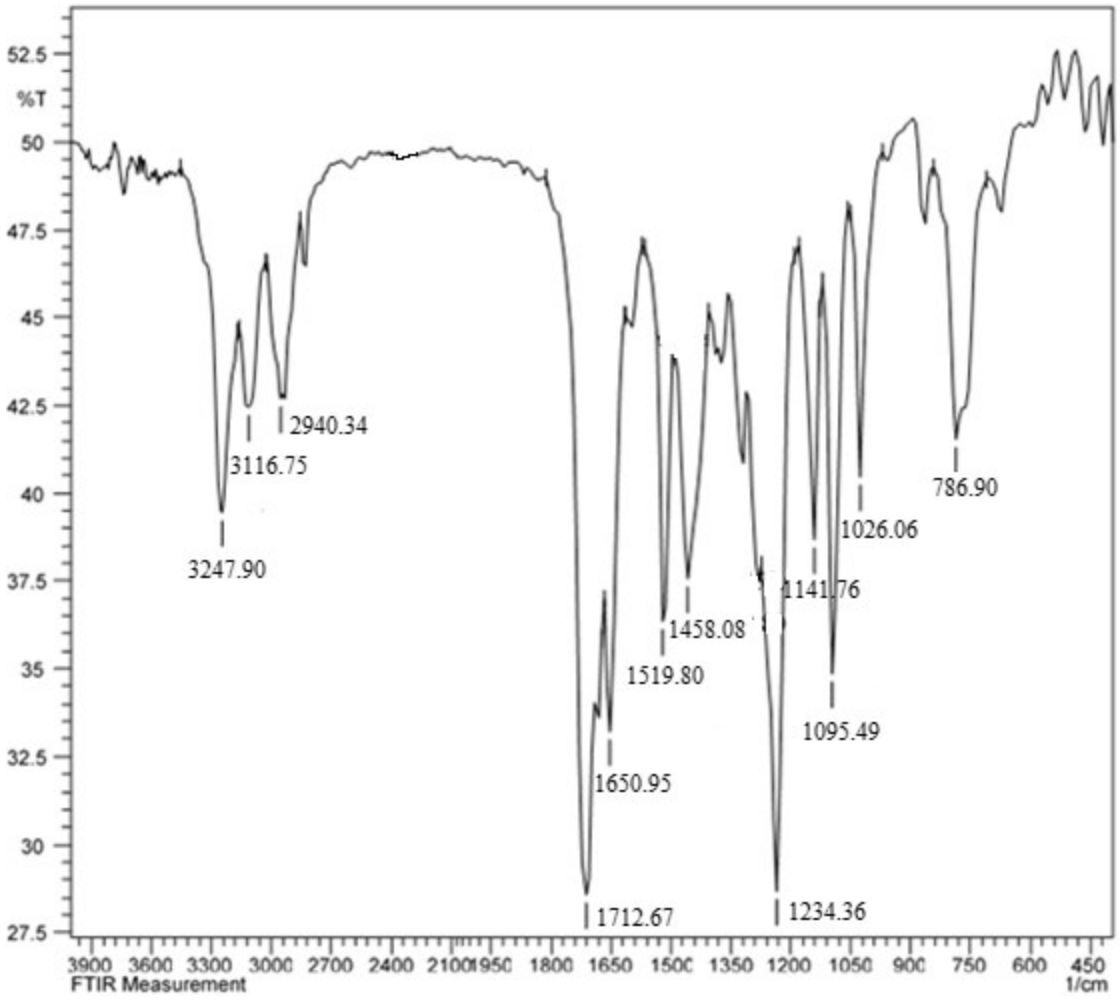


Fig.19. FT-IR (KBr discs) spectrum of ethyl 4-(3,4-dimethoxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 13).

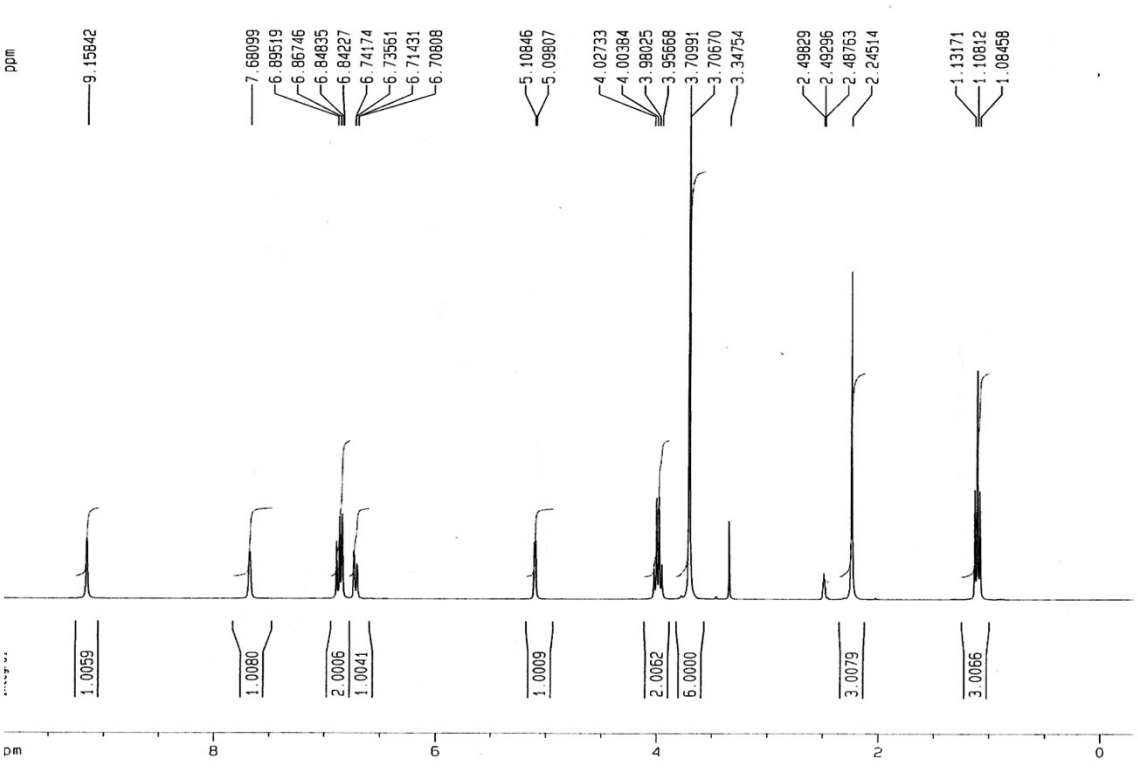


Fig.20. ^{1}H-NMR spectrum of ethyl 4-(3,4-dimethoxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry 13).

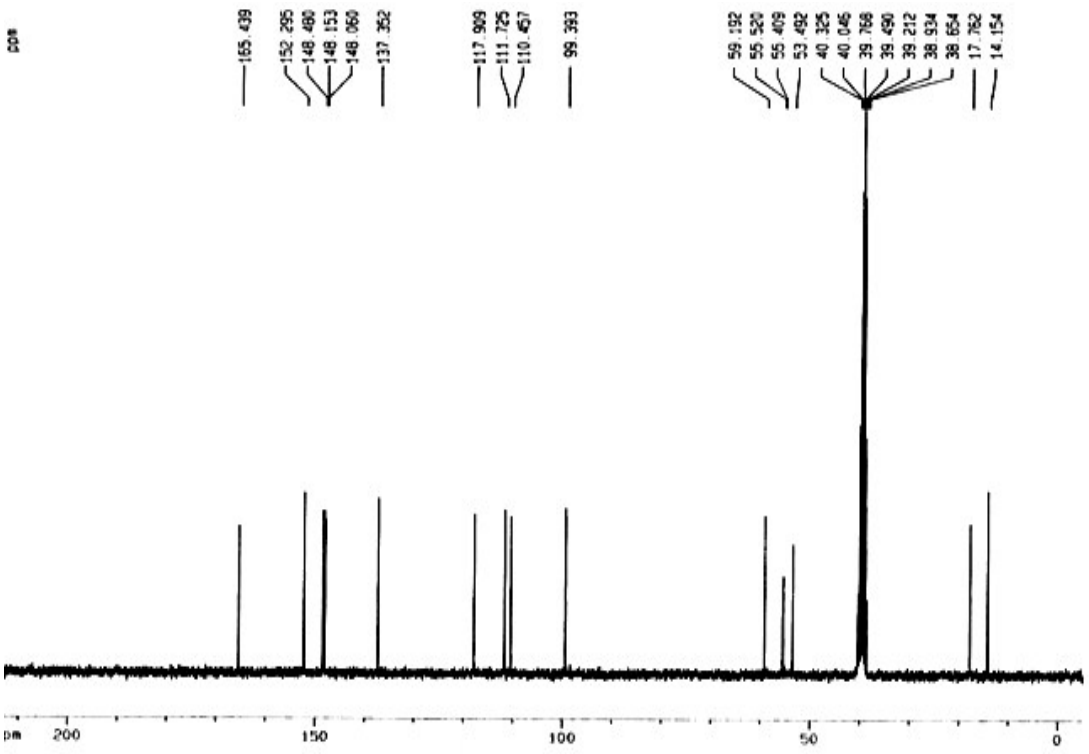
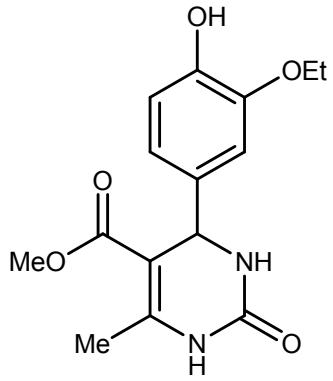


Fig.21. ^{13}C-NMR spectrum of ethyl 4-(3,4-dimethoxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in $CDCl_3$ (Table 3, entry 13).

Methyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 19).



Melting point: 254-256. FT-IR (KBr), ν. max (cm^{-1}): 3317.34, 3249.76, 2989.34, 1704.96, 1685.67, 1438.80, 1238.2, 1095.49, 759.90. ^{1}H-NMR (DMSO, 300 MHz) δ_H (ppm): 9.12 (S, 1 H, NH), 8.79 (S, 1 H, NH), 7.61 (S, 1 H, OH), 6.57-6.77 (m, 3 H, ArH), 5.02 (S, 1 H, CH), 3.92 (q, 2H, OCH_2), 3.51 (S, 3H, OCH_3), 2.22 (S, 3H, CH_3), 1.27 (t, 3H, CH_3). ^{13}C-NMR (75 MHz; DMSO) δ_C (ppm): 14.76, 17.78, 50.75, 53.42, 63.92, 99.34, 112.26, 115.39, 118.33, 135.7, 146.15, 146.37, 148.15, 152.29, 165.95.

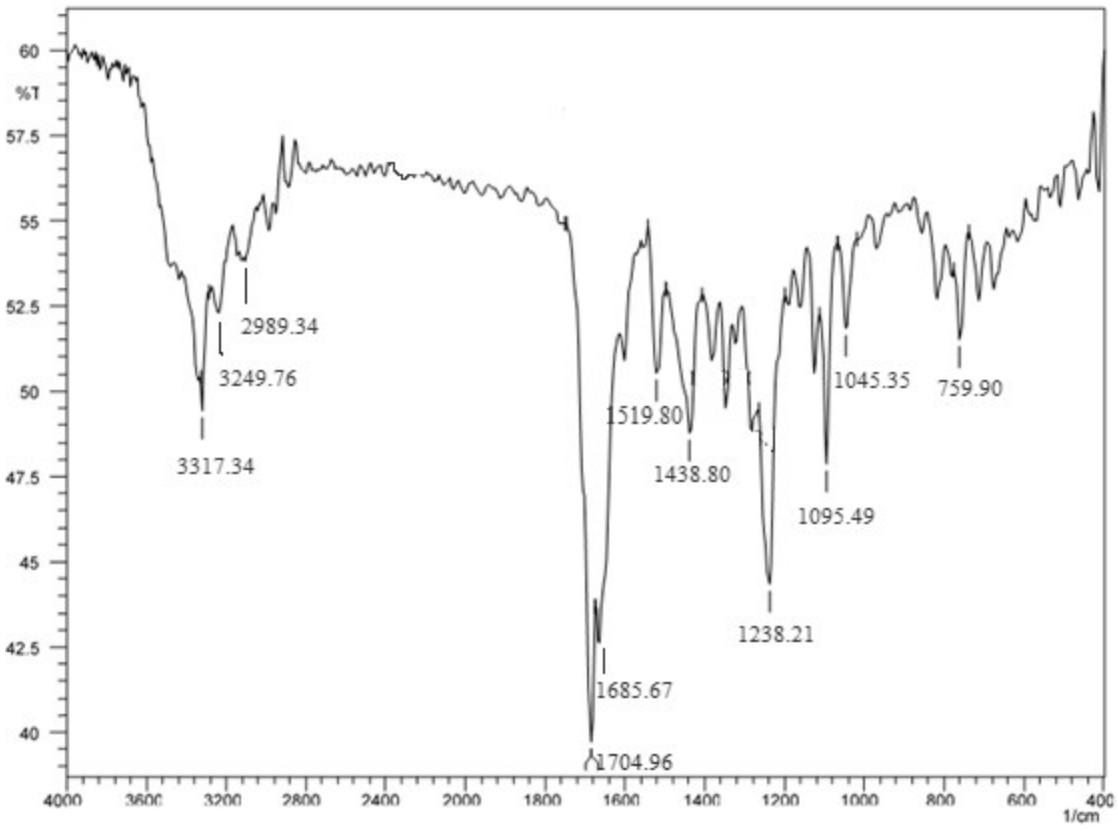


Fig.22. FT-IR (KBr discs) spectrum of methyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (Table 3, entry 19).

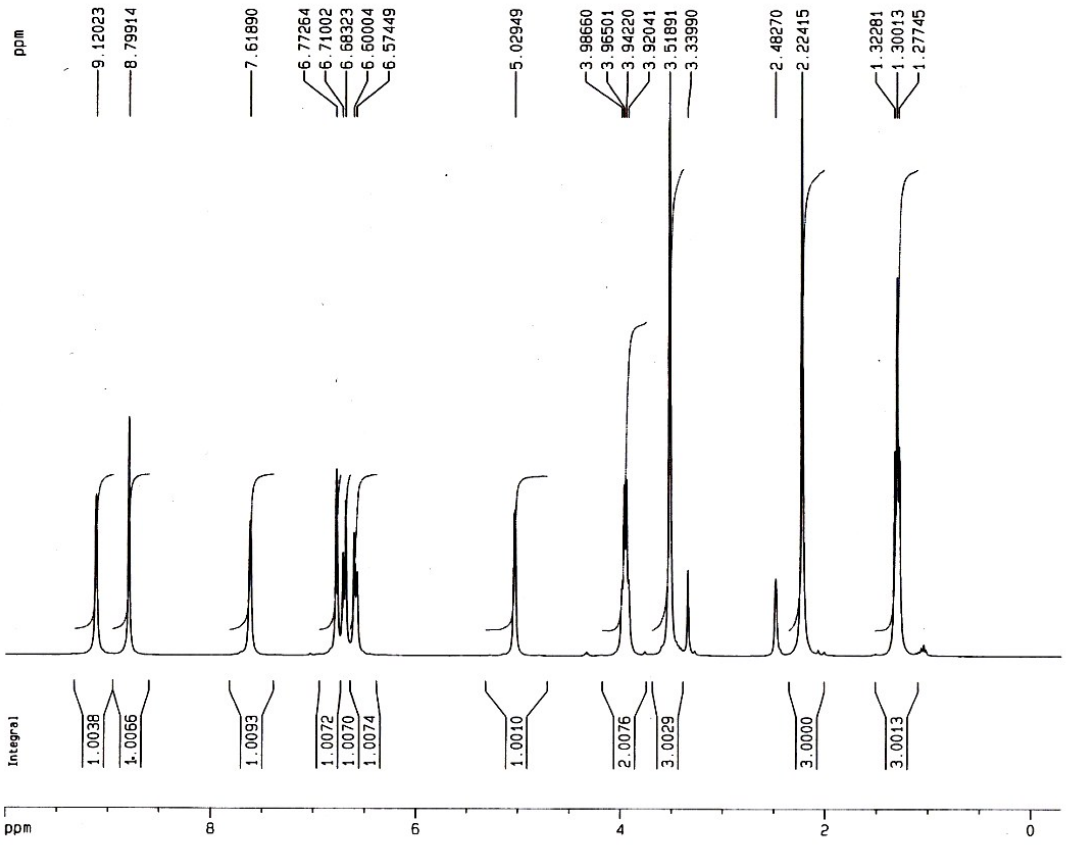


Fig.23. ^{1}H-NMR spectrum of methyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in DMSO (Table 3, entry 19).

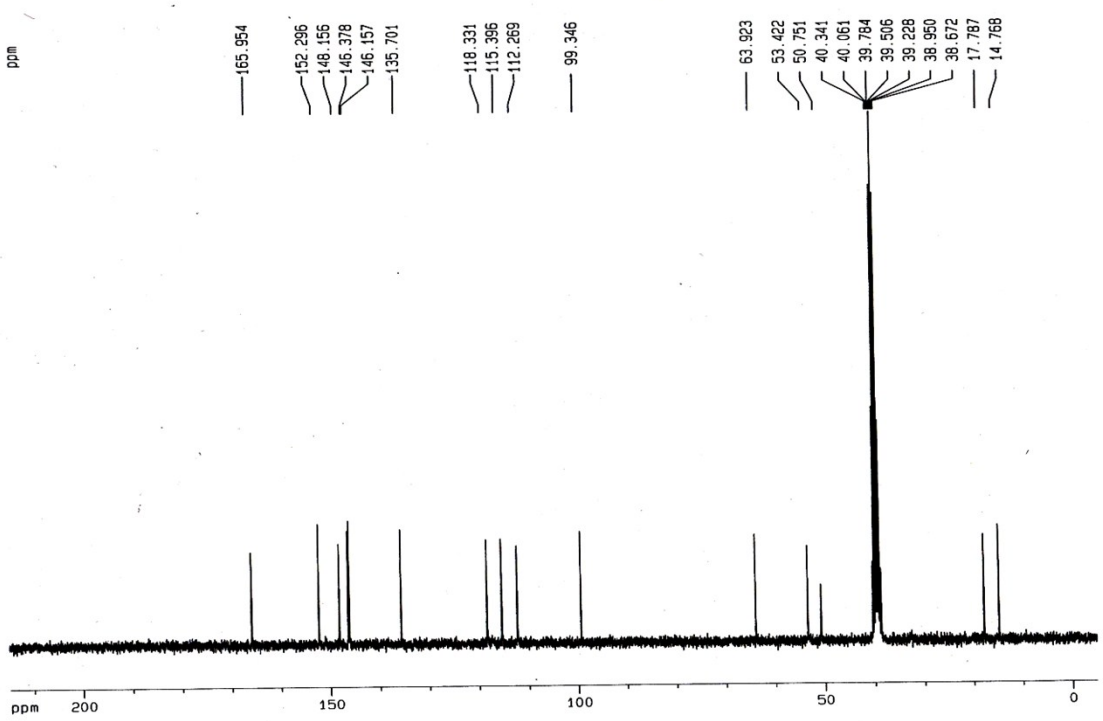
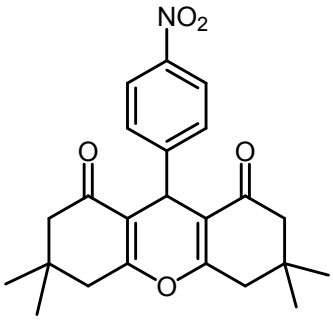


Fig.24. ^{13}C-NMR spectrum of methyl 4-(3-ethoxy-4-hydroxyphenyl)-6-methyl-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate in DMSO (Table 3, entry 19).

Spectruml data of some selected compounds from table 5.

3,3,6,6-tetramethyl-9-(4-nitrophenyl)-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione (Table 5, entry 6).



Melting point: 226-228. FT-IR (KBr), ν. max (cm^{-1}): 2958.60, 1662.52, 1514.02, 1361.65, 1201.57. ^{1}H-NMR (DMSO, 300 MHz) δ_H (ppm): 0.99 (S, 6 H), 1.12 (S, 6 H), 2.14-2.27 (q, 4 H), 2.49 (S, 4 H), 4.82 (S, 1H), 7.46-7.48 (d, 2H), 8.08-8.11 (d, 2H).

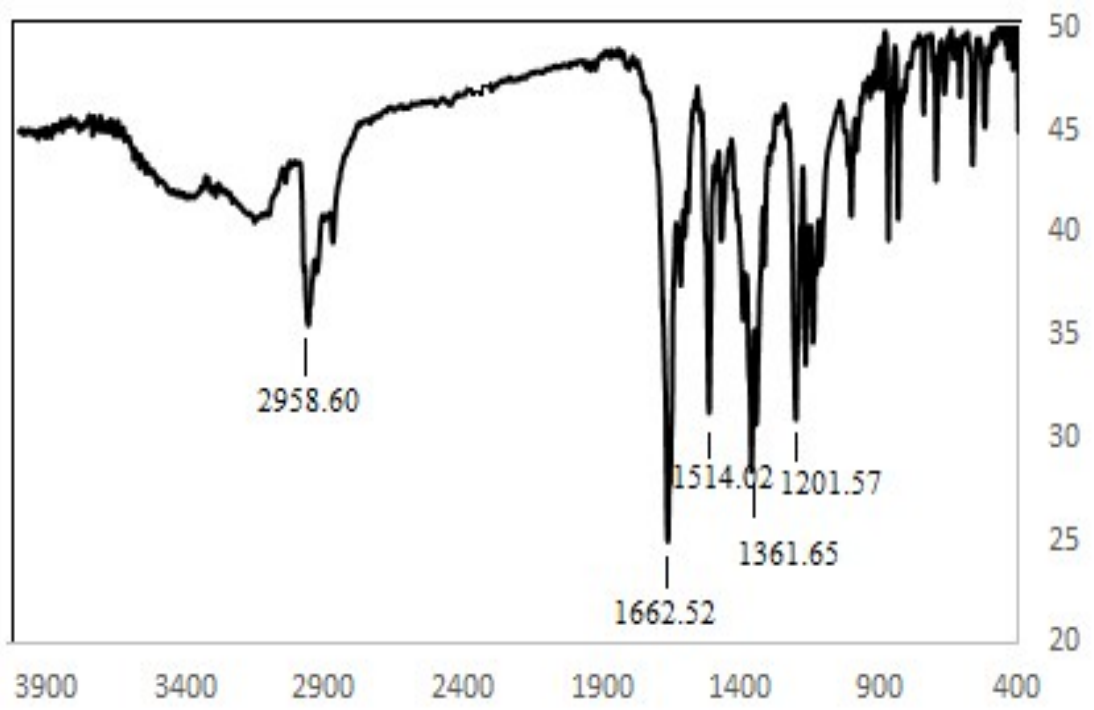


Fig.25. FT-IR (KBr discs) spectrum of 3,3,6,6-tetramethyl-9-(4-nitrophenyl)-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione (Table 5, entry 6).

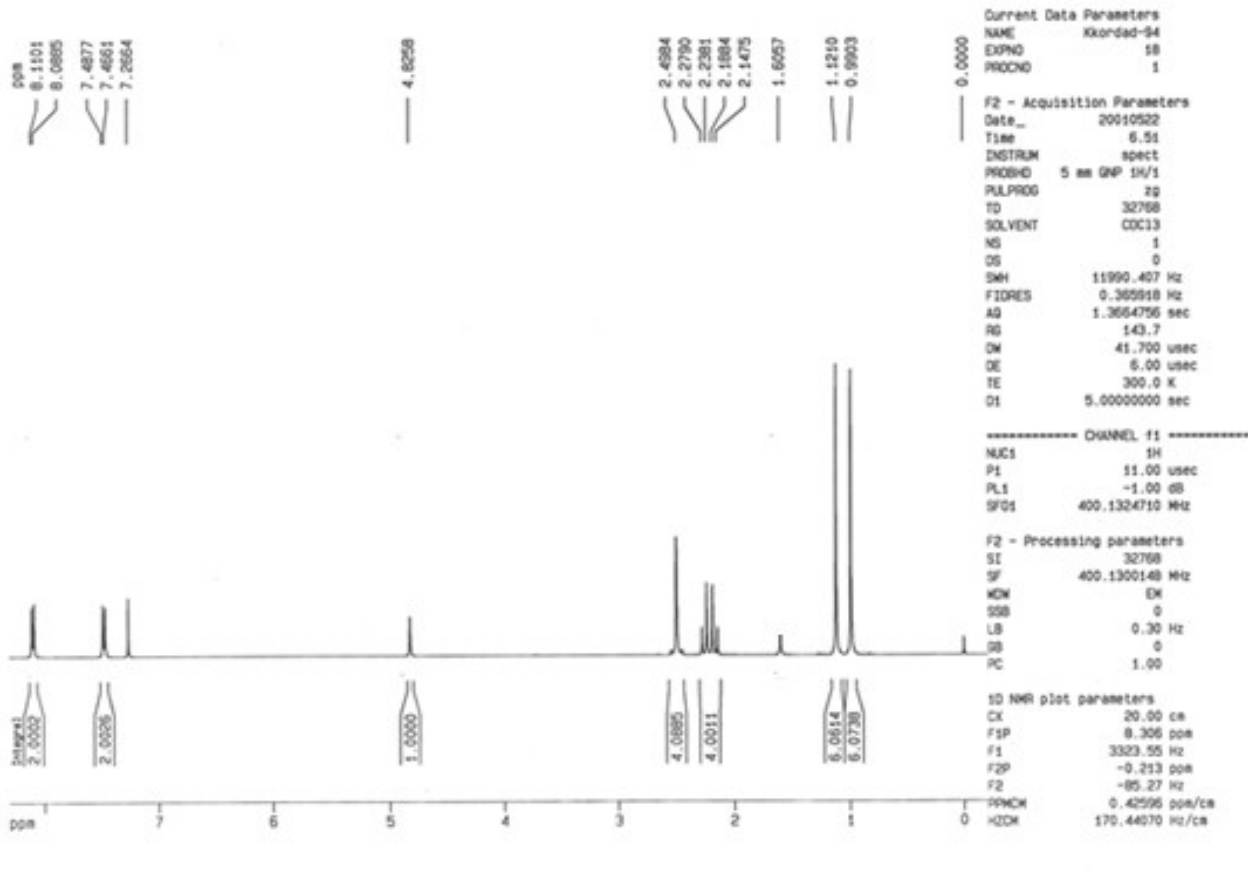
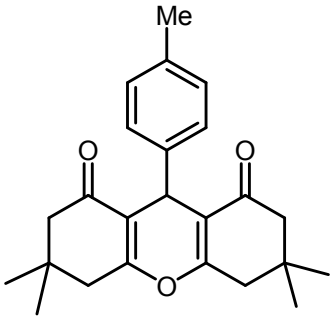


Fig.26. ^{1}H-NMR spectrum of 3,3,6,6-tetramethyl-9-(4-nitrophenyl)-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione in DMSO (Table 5, entry 6).

3,3,6,6-tetramethyl-9-(p-tolyl)-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione (Table 5, entry 14).



Melting point: 215-217. FT-IR (KBr), ν. max (cm^{-1}): 2958.60, 1664.45, 1357.79, 1232.42,1164.92, 999.057, 840.90. ^{1}H-NMR (DMSO, 300 MHz) δ_H (ppm): 0.99 (S, 6 H), 1.095 (S, 6 H), 2.13-2.23(q, 4 H), 2.41 (S, 3H), 2.45 (S, 4H), 4.70 (S, 1H), 7.005-7.025 (d, 2H), 7.16-7.18 (d, 2H).

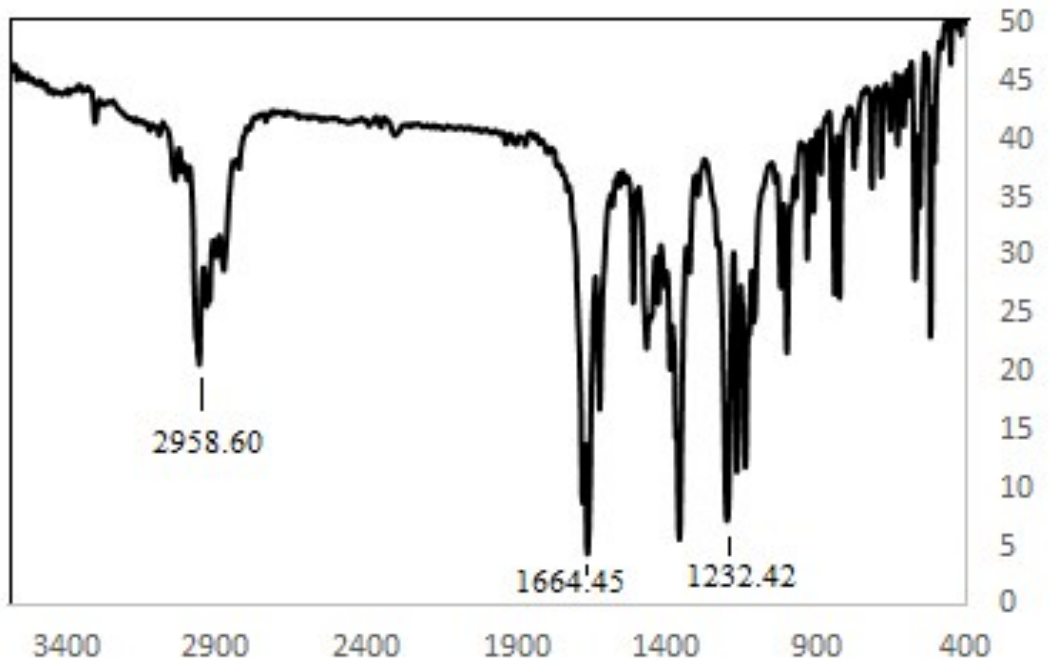


Fig.27. FT-IR (KBr discs) spectrum of 3,3,6,6-tetramethyl-9-(p-tolyl)-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione (Table 5, entry 14).

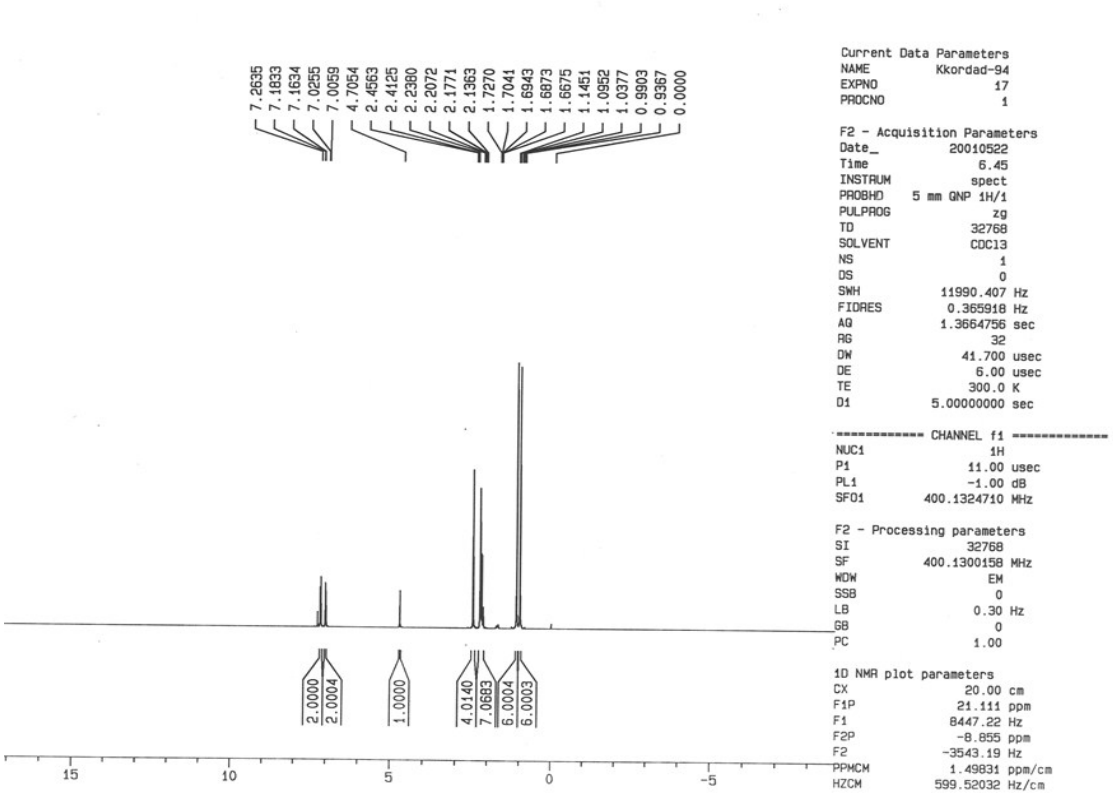
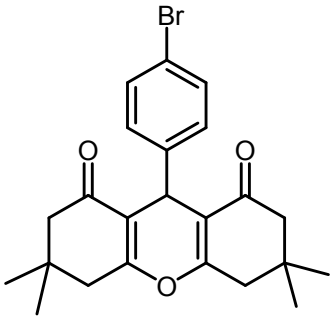


Fig.28. ^{1}H-NMR spectrum of of 3,3,6,6-tetramethyl-9-(p-tolyl)-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione in DMSO (Table 5, entry 14).

9-(4-bromophenyl)-3,3,6,6-tetramethyl-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione (Table 5, entry 8).



Melting point: 239-241. FT-IR (KBr), ν. max (cm^{-1}): 2950.88, 1660.59, 1361.65, 1191.97, 1008.70, 852.47. ^{1}H-NMR (DMSO, 300 MHz) δ_H (ppm): 0.98 (S, 6 H), 1.10 (S, 6 H), 2.14-2.25 (q, 4 H), 2.46 (S, 4 H), 4.69 (S, 1H), 7.16-7.18 (d, 2H), 7.32-7.34 (d, 2H).

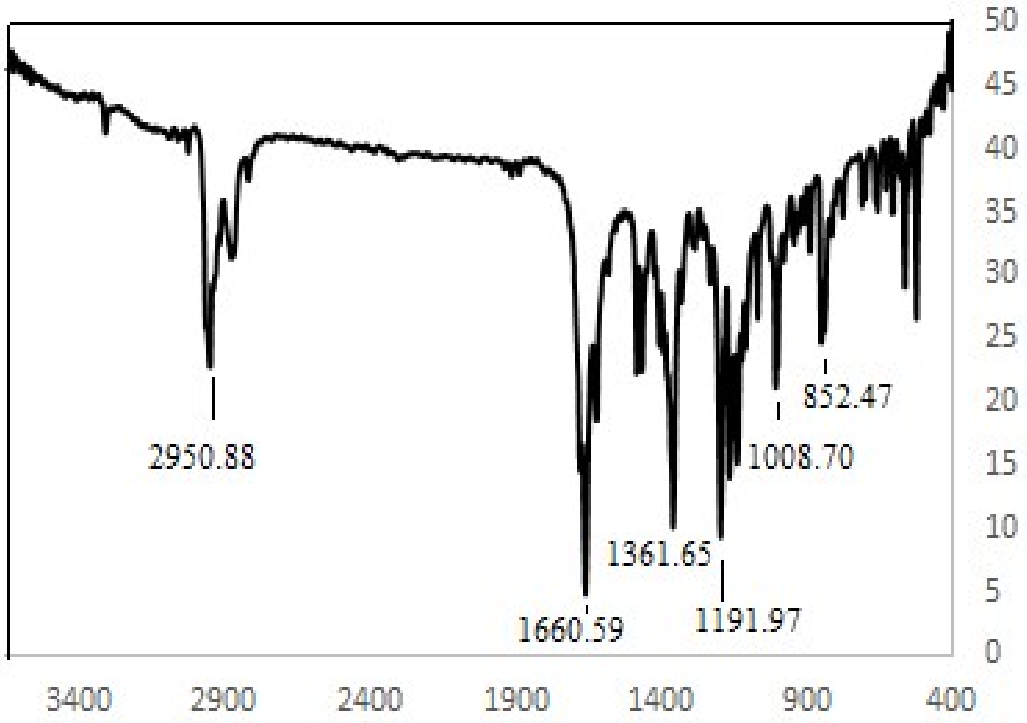


Fig.29. FT-IR (KBr discs) spectrum of 9-(4-bromophenyl)-3,3,6,6-tetramethyl-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione (Table 5, entry 8).

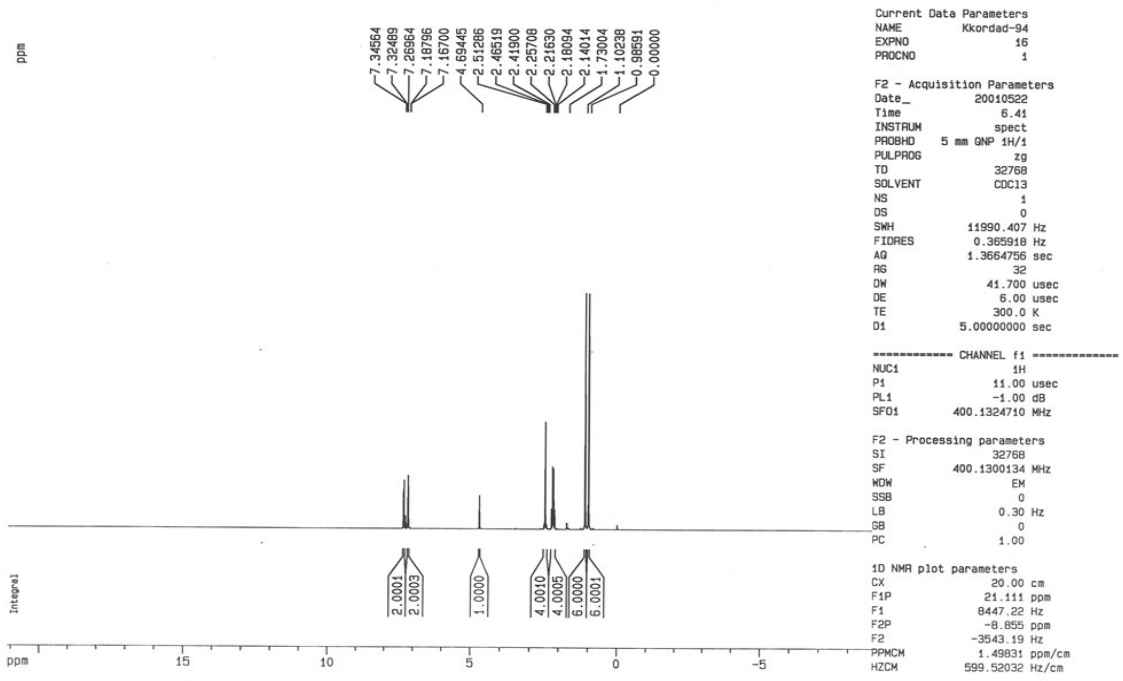


Fig.30. ^{1}H-NMR spectrum of of 9-(4-bromophenyl)-3,3,6,6-tetramethyl-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione in DMSO (Table 5, entry 8).