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Supporting Information

$CuSO_4$-D-glucose an inexpensive and eco-efficient catalytic system: direct access to diverse quinolines through modified Friedländer approach involving S_NAr/reduction/annulation cascade in one-pot

Namrata Anand, Tanmoy Chanda, Suvajit Koley, Sushobhan Chowdhury and Maya Shankar Singh*

Department of Chemistry, Faculty of Science, Banaras Hindu University, Varanasi-221005, India

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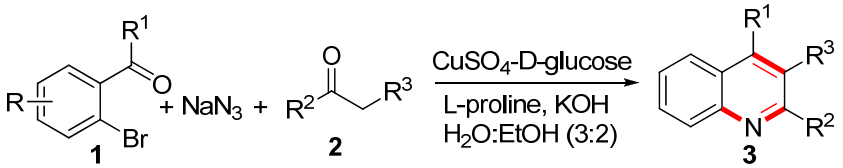
Experimental Section

1. General Experimental Details

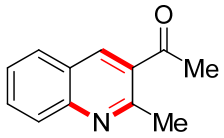
^{1}H and ^{13}C NMR spectra were recorded at 300 and 75 MHz, respectively. Chemical shift (δ) values are given in parts per million (ppm) with reference to tetramethylsilane (TMS) as the internal standard. Coupling constant (*J*) values are given in Hertz (Hz). The IR spectra were recorded on Varian 3100 FT-IR spectrophotometer. Melting points were determined with Buchi B-540 melting point apparatus and are uncorrected. Commercially obtained reagents were used after further purification when needed. All the reactions were monitored by TLC with silica gel coated plates. Column chromatography was carried out whenever needed, using silica gel of 100/200 mesh. Mixture of hexane/ethyl acetate in appropriate proportion (determined by TLC analysis) was used as eluent.

2. a. General procedure for the synthesis of compound 3



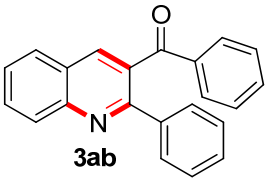
A mixture of 2-bromobenzaldehyde/2-bromoacetophenone **1** (1 mmol), NaN_3 (2 mmol) and cyclic/acyclic ketones **2** (1.1 mmol) in H_2O + EtOH (3:2, 5 mL) was placed in a 50 mL round bottom flask. To a stirring solution of above mixture added $CuSO_4$ (0.3 mmol), D-glucose (0.3 mmol), L-proline (0.2 mmol) and KOH (1 mmol). The reaction mixture was allowed to stir at 90 ºC for 3-10 h. After completion of reaction (monitored on TLC), solvent was removed under reduced pressure and extracted with ethyl acetate. The combined organic layer was dried over anhydrous sodium sulphate, filtered and the solvent was removed under reduced pressure. The crude residue thus obtained was purified by column chromatography to give the desired quinolines **3**.

2. b. Characterization of Compounds 3



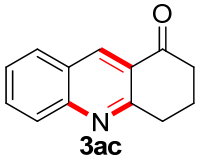
3aa

3-Acetyl-2-methyl quinoline (3aa)[1]: Pale yellow solid, mp 74-75 ºC; IR (KBr) cm^{-1}: 3053, 1788, 1624, 1579, 1456, 818 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.48 (s, 1H, ArH), 8.05 (d, *J* = 8.4 Hz, 1H, ArH), 7.87-7.76 (m, 2H, ArH), 7.57-7.52 (m, 1H, ArH), 2.91 (s, 3H, $COCH_3$) 2.72 (s, 3H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$): δ 199.9, 157.5, 138.2, 138.1, 131.6, 131.1, 128.5, 128.2, 126.6, 125.5, 29.2, 25.6.



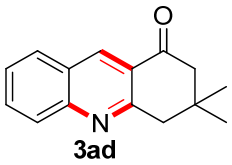
3ab

Phenyl(2-phenylquinolin-3-yl)methanone (3ab)[2]: Yellow solid, mp 135-137 ºC; IR (KBr) cm^{-1}: 3163, 2960, 1756, 1684, 1562 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.23-8.15 (m, 5H, ArH), 8.00 (d, *J* = 6.9 Hz, 1H, ArH), 7.89-7.81 (m, 2H, ArH), 7.75-7.70 (m, 1H, ArH), 7.55-7.43 (m, 6H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 175.7, 157.3, 148.2, 139.6 (2C), 136.7, 132.4, 129.6, 129.2 (2C), 128.8 (3C), 128.6 (3C), 127.4 (2C), 127.1 (2C), 126.2, 118.9.



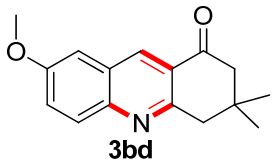
3ac

3,4-Dihydroacridin-1(2*H*)-one (3ac)[1]: White solid, mp 103-105 ºC; IR (KBr) cm^{-1}: 3463, 2926, 1737, 1452, 1230, 835 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.85 (s, 1H, ArH), 8.06 (d, *J* = 8.4 Hz, 1H, ArH), 7.94 (d, *J* = 8.1 Hz, 1H, ArH), 7.83-7.78 (m, 1H, ArH), 7.57 (t, *J* = 7.2 Hz, 1H, ArH), 3.34 (t, *J* = 6.0 Hz, 2H, CH_2), 2.82 (t, *J* = 6.0 Hz, 2H, CH_2), 2.32 (dd, J_1 = 6.0 Hz, J_2 = 12.6 Hz, 2H, CH_2); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 197.8, 161.9, 137.1, 132.3, 129.7, 128.4, 126.7, 126.6, 126.2, 39.0, 33.3, 21.7.



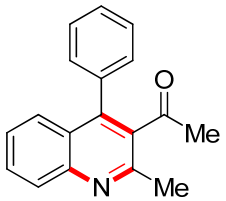
3ad

3,3-Dimethyl-3,4-dihydroacridin-1(2*H*)-one (3ad)[1]: White solid, mp 116-118 ºC; IR (KBr) cm^{-1}: 3062, 1768, 1594, 1488, 1231 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.82 (s, 1H, ArH), 8.06 (d, *J* = 8.7 Hz, 1H, ArH), 7.94 (d, *J* = 8.1 Hz, 1H, ArH), 7.82-7.77 (m, 1H, ArH), 7.57-7.52 (m, 1H, ArH), 3.20 (s, 2H, CH_2), 2.65 (s, 2H, CH_2), 1.15 (s, 6H, 2xCH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 197.9, 160.7, 149.9, 136.4, 132.1, 129.7, 128.5, 126.6 (2C), 125.2, 52.4, 47.1, 32.7, 28.3(2C).



3bd

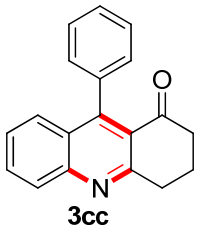
7-Methoxy-3,3-dimethyl-3,4-dihydroacridin-1(2*H*)-one (3bd)[3]: Yellow solid, mp 98-100 ºC; IR (KBr) cm^{-1}: 3062, 1768, 1594, 1488, 1231 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.73 (s, 1H, ArH), 7.97 (d, *J* = 9.0 Hz, 1H, ArH), 7.47-7.43 (m, 1H, ArH), 7.167 (s, 1H, ArH), 3.93 (s, 3H, OCH_3), 3.16 (s, 2H, CH_2), 2.63 (s, 2H, CH_2), 1.14 (s, 6H, 2xCH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 198.1, 158.2, 157.7, 146.1, 135.0, 129.8 (2C), 127.7, 125.3, 106.3, 55.6, 52.4, 46.7, 32.8, 28.3(2C).



3ca

3-Acetyl-2-methyl-4-phenyl quinoline (3ca)[4]: Yellow solid, mp 112-114 ºC; IR (KBr) cm^{-1}: 3053, 1788, 1624, 1579, 1456, 818 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 8.4 Hz, 1H, ArH), 7.72-7.67 (m, 1H, ArH), 7.62 (d, *J* = 8.4 Hz, 1H, ArH), 7.49-7.44 (m, 3H, ArH), 7.42-7.34 (m, 3H, ArH), 2.70 (s, 3H, CH_3), 2.00 (s, 3H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ: δ 205.5, 153.3, 147.3, 143.7, 135.0, 134.6, 129.9, 129.8 (2C), 128.8, 128.7, 128.5

(2C), 126.3, 126.0, 124.8, 31.8, 23.7.

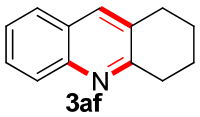


3cc

9-Phenyl-3,4-dihydroacridin-1(2*H*)-one (3cc)[4]: Pale yellow solid, mp 153-156 ºC; IR (KBr) cm^{-1}: 3407, 3048, 2924, 1737, 1498, 1230, 749 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.08 (d, J = 8.4 Hz, 1H, ArH), 7.78 (m, 1H, ArH), 7.50-7.37 (m, 5H, ArH), 7.19-7.16 (m, 2H, ArH), 3.40 (t, J = 6.3 Hz, 2H, CH_2), 2.72 (t, J = 6.3 Hz, 2H, CH_2), 2.29 (dd, J_1 = 6.6 Hz, J_2 = 12.6 Hz, 2H, CH_2); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 197.9, 162.2, 151.4, 148.5, 137.5, 131.7, 128.4 (2C), 128.1, 128.0 (2C), 127.9, 127.5 (2C), 126.4, 123.8, 40.6, 34.5, 21.3.

3ae

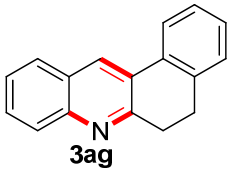
2,3-Dihydro-1*H*-cyclopenta[*b*]quinoline (3ae)[1]: White solid, mp 55-57 ºC; IR (KBr) cm^{-1}: 3053, 1646, 1562, 1212 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.02 (d, J = 8.4 Hz, 1H, ArH), 7.70 (s, 1H, ArH), 7.67-7.64 (m, 1H, ArH), 7.60-7.55 (m, 1H, ArH), 7.43-7.38 (m, 1H, ArH), 3.14 (t, J = 7.5 Hz, 2H, CH_2), 3.02 (t, J = 7.2 Hz, 2H, CH_2), 2.19-2.11 (dd, J_1 = 7.5 Hz, J_2 = 15.0 Hz, 2H, CH_2); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 157.6, 147.2, 135.3, 130.0, 128.3, 128.2, 128.0, 127.1, 125.2, 34.3, 30.2, 23.3.



3af

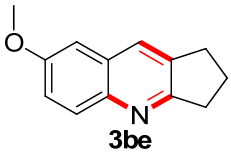
1,2,3,4-Tetrahydroacridine (**3af**)[1,5]: White solid, mp 85-87 ºC; IR (KBr) cm^{-1}: 3058, 1624, 1557, 1453, 1214 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 7.97 (d, J = 8.4 Hz, 1H, ArH), 7.70 (s, 1H, ArH), 7.67-7.64 (m, 1H, ArH), 7.60-7.55 (m, 1H, ArH), 7.42-7.37 (m, 1H, ArH), 3.13 (t,

J = 6.3 Hz, 2H, CH_2), 2.96 (t, *J* = 6.3 Hz, 2H, CH_2), 1.99-1.95 (m, 2H, CH_2), 1.88-1.84 (m, 2H, CH_2); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 159.1, 146.4, 134.8, 130.8, 128.3, 128.1, 127.0, 126.7, 125.3, 33.4, 29.1, 23.1, 22.7.



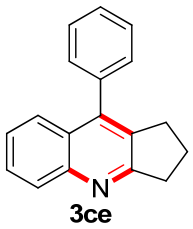
3ag

5,6-Dihydrobenzo[*a*]acridine (3ag)[6]: Yellow solid, mp 63-65 ºC; IR (KBr) cm^{-1}: 3417, 2929, 1498, 1278, 1033, 789 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.58 (d, *J* = 7.5 Hz, 1H, ArH), 8.13 (d, *J* = 8.4 Hz, 1H, ArH),7.84 (s, 1H, ArH), 7.69-7.59 (m, 2H, ArH), 7.45-7.31 (m, 3H, ArH), 7.24 (d, *J* = 7.2 Hz, 1H, ArH), 3.08-3.04 (m, 2H, CH_2), 2.97-2.93 (m, 2H, CH_2); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 153.2, 147.5, 139.3, 134.6, 133.6, 130.4, 129.5, 129.3, 128.5, 127.8, 127.7, 127.2, 126.8, 126.0, 125.9, 28.7, 28.3.



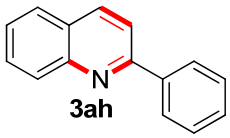
3be

7-Methoxy-2,3-dihydro-1*H*-cyclopenta[*b*]quinoline (3be)[7]**:** White solid, mp 97-99 ºC; IR (KBr) cm^{-1}: 3407, 3048, 2924, 1595, 1498, 1230, 749 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 7.91 (d, *J* = 9.3 Hz, 1H, ArH), 7.77 (s, 1H, ArH), 7.28-7.24 (m, 1H, ArH), 7.00 (d, *J* = 2.7 Hz, 1H, ArH), 3.90 (s, 3H, OCH_3), 3.24 (t, *J* =7.5 Hz, 2H, CH_2), 3.14-3.02 (m, 4H, 2xCH_2), 2.23-2.13 (m, 2H, CH_2); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 165.2, 157.0, 143.3, 135.9, 129.7, 129.3, 128.2, 120.4, 105.5, 55.4, 34.2, 30.5, 23.6.



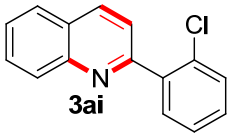
3ce

9-Phenyl-2,3-diydro-1-cyclopenta[*b*]quinoline (3ce)[4]: Yellow solid, mp 133-135 ºC; IR (KBr) cm^{-1}: 3053, 1625, 1586, 1230, 1033, 836 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 8.4 Hz, 1H, ArH), 7.63 (m, 2H, ArH), 7.51-7.45 (m, 3H, ArH), 7.37-7.34 (m, 3H, ArH), 3.24 (t, *J* = 7.5 Hz, 2H, CH_2), 2.90 (t, *J* = 7.2 Hz, 2H, CH_2), 2.21-2.11 (m, 2H, CH_2); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 167.3, 147.7, 142.8, 136.7, 133.6, 129.2 (2C), 128.6, 128.4, 128.2, 127.9 (2C), 126.2, 125.6, 125.5, 35.1, 30.3, 23.5.



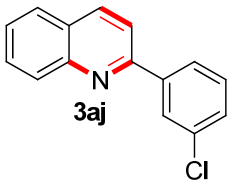
3ah

2-Phenylquinoline (3ah)[5,6]: White solid, mp 85-87 ºC; IR (KBr) cm^{-1}: 3056, 1612, 1598, 1557, 1478 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ: 8.21-8.14 (m, 3H, ArH), 7.88-7.80 (m, 2H, ArH), 7.74-7.69 (m, 1H, ArH), 7.55-7.43 (m, 5H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 157.3, 148.2, 139.6, 129.6, 129.2 (2C), 128.8 (2C), 127.5 (2C), 127.4, 127.1, 126.2, 118.9.

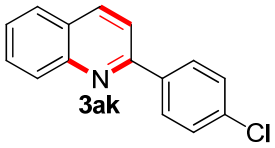


3ai

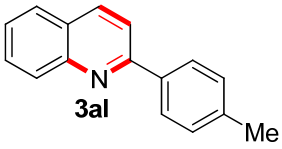
2-(2-Chlorophenyl)quinoline (3ai)[8]: White solid, mp 72-75 ºC; IR (KBr) cm^{-1}: 3063, 1614, 1574, 1512, 1423 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ: 8.20-8.17 (m, 2H, ArH), 8.13-8.08 (m, 2H, ArH), 7.81-7.69 (m, 2H, ArH), 7.54-7.45 (m, 3H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 155.9, 148.1, 137.9, 136.9, 135.5, 129.9, 129.8, 128.9 (2C), 128.7 (2C), 127.4, 127.1, 126.4, 118.6.



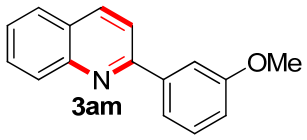
2-(2-Chlorophenyl)quinoline (3aj)[9]: White solid, mp 65-67 ºC; IR (KBr) cm^{-1}: 3025, 2915, 1664, 1574, 1497, 1431, 815 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.24-8.16 (m, 3H, ArH), 8.03-7.97 (m, 1H, ArH), 7.85-7.71 (m, 3H, ArH), 7.56-7.51 (m, 2H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 155.7, 137.0, 134.9, 132.6, 130.8, 130.2, 129.9, 129.7, 129.3, 128.5, 127.7, 127.4, 126.6, 125.6, 118.6.



2-(4-Chlorophenyl)quinoline (3ak)[8]: White solid, mp 110-113 ºC; IR (KBr) cm^{-1}: 3065, 1610, 1553, 1525, 1412 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.20-8.08 (m, 4H, ArH), 7.81-7.69 (m, 3H, ArH), 7.54-7.46 (3H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 155.9, 148.1, 138.0, 136.9, 135.5, 129.7, 129.6, 128.9 (2C), 128.7 (2C), 127.4, 127.1, 126.4, 118.4.

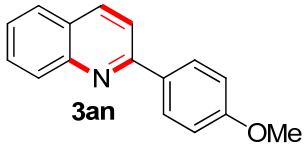


2-*p*-Tolylquinoline (3al)[6]: White solid, mp 80-82 ºC; IR (KBr) cm^{-1}: 3422, 2915, 1668, 1618, 1596, 1497, 815, 788 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.15 (d, J = 8.4 Hz, 2H, ArH), 8.06 (d, J = 8.1 Hz, 2H, ArH), 7.83-7.68 (m, 3H, ArH), 7.49-7.47 (m, 1H, ArH), 7.32 (d, J = 7.8 Hz, 2H, ArH), 2.41 (s, 3H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 157.2, 148.2, 139.3, 136.8, 136.5, 129.6 (2C), 129.4 (2C), 127.3 (3C), 127.0, 126.0, 118.7, 21.2.



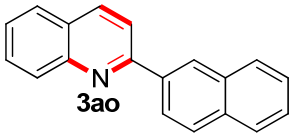
3am

2-(3-Methoxyphenyl)quinoline (3am)[9]: Yellow oil, IR (Neat) cm^{-1}: 3152, 1604, 1563, 1498 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.17 (d, *J* = 8.4 Hz, 1H, ArH), 8.10 (d, *J* = 8.7 Hz, 1H, ArH), 7.78-7.65 (m, 5H, ArH), 7.47-7-35 (m, 2H, ArH), 6.99 (d, *J* = 8.1 Hz, 1H, ArH), 3.86 (s, 3H, OCH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 160.0, 156.8, 148.0, 140.9, 136.5, 129.6, 129.5, 129.4, 127.3, 127.1, 126.1, 119.8, 118.8, 115.2, 112.6, 55.2.



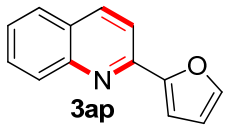
3an

2-(4-Methoxyphenyl)quinoline (3an)[6]: White solid, mp 117-120 ºC; IR (KBr) cm^{-1}: 3039, 2921, 2840, 1604, 1499, 1251, 1029, 818 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.14-8.11 (m, 4H, ArH), 7.80-7.75 (m, 2H, ArH), 7.71-7.65 (m, 1H, ArH), 7.49-7.44 (m, 1H, ArH), 7.03 (d, *J* = 8.7 Hz, 2H, ArH), 3.85 (s, 3H, OCH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 160.7, 156.8, 148.2, 136.5, 132.1, 129.5, 129.4, 128.8, 127.3, 126.8, 125.8, 118.4, 114.1 (2C), 55.3.



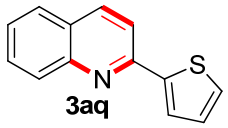
3ao

2-(Naphthalen-2-yl)quinoline (3ao)[6]: White solid, mp 163-165 ºC; IR (KBr) cm^{-1}: 3058, 1622, 1567 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.59 (s, 1H, ArH), 8.37 (d, *J* = 8.7 Hz, 1H, ArH), 8.22 (d, *J* = 8.4 Hz, 2H, ArH), 8.00-7.96 (m, 3H, ArH), 7.89-7.86 (m, 1H, ArH), 7.82 (d, *J* = 8.1 Hz, 1H, ArH), 7.75-7.70 (m, 1H, ArH), 7.53-7.49 (m, 2H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 157.1, 148.3, 136.7, 133.8, 133.4, 129.6, 128.9, 128.7 (2C), 128.5, 127.6, 127.4, 127.2, 127.1, 126.6, 126.2 (2C), 125.0, 119.0.



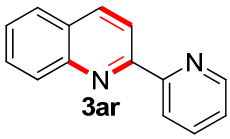
3ap

2-(Furan-2-yl)quinoline (3ap)[6]: White solid, mp 90-92 ºC; IR (KBr) cm^{-1}: 3152, 1618, 1523 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.15-8.12 (m, 2H, ArH), 7.81-7.61 (m, 4H, ArH), 7.47 (t, *J* = 7.5 Hz, 1H, ArH), 7.22-7.21 (m, 1H, ArH), 6.57 (bs, 1H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 153.6, 148.9, 148.0, 144.0, 136.6, 129.8, 129.3, 127.5, 127.1, 126.1, 117.4, 112.1, 110.0.



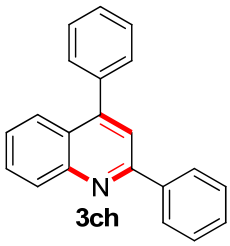
3aq

2-(Thiophen-2-yl)quinoline (3aq)[6]: White solid, mp 125-128 ºC; IR (KBr) cm^{-1}: 3101, 3054, 1624, 1578, 1223 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.11-8.06 (m, 2H, ArH), 7.77-7.65 (m, 4H, ArH), 7.48-7.43 (m, 2H, ArH), 7.15-7.12 (m, 1H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 152.2, 148.0, 145.3, 136.5, 129.7, 129.2, 128.5, 128.0, 127.4, 127.1, 126.0, 125.7, 117.5.



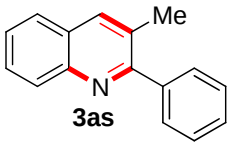
3ar

2-(Pyridin-3-yl)quinoline (3ar)[10]: White solid, mp 93-95 ºC; IR (KBr) cm^{-1}: 3059, 2924, 1599, 1095, 787 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.51 (d, *J* = 7.8 Hz, 1H, ArH), 8.25 (d, *J* = 8.7 Hz, 1H, ArH), 8.18 (d, *J* = 8.4 Hz, 1H, ArH), 7.86-7.71 (m, 4H, ArH), 7.56-7.47 (m, 3H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 154.5, 150.0, 148.6, 148.2, 137.0 (2C), 134.8, 129.9, 129.6, 127.4, 127.2, 126.7 (2C), 118.4.



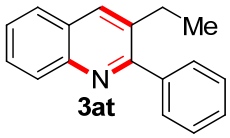
3ch

2,4-Diphenylquinoline (3ch)[11]**:** White solid, mp 112-115 ºC; IR (KBr) cm^{-1}: 3423, 3086, 2955, 1589, 1095, 846 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 7.81 (d, *J* = 7.2 Hz, 4H, ArH), 7.67-7.56 (m, 4H, ArH), 7.51-7.38 (m 5H, ArH), 7.35-7.31 (m, 2H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 163.1, 140.5, 137.5, 136.2, 136.0, 133.6, 133.0, 132.3, 131.8, 131.0, 130.0, 129.9, 129.0, 128.8, 128.5, 128.2, 128.1, 127.1, 119.4, 118.5, 118.5.



3as

3-Methyl-2-phenylquinoline (3as)[5,6]: Yellow oil; IR (Neat) cm^{-1}: 3052, 1618, 1553, 1431, 1097, 756 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.13 (d, *J* = 8.4 Hz, 1H, ArH), 7.96 (s, 1H, ArH), 7.74 (d, *J* = 8.1 Hz, 1H, ArH), 7.65-7.56 (m, 3H, ArH), 7.46-7.40 (m, 4H, ArH), 2.43 (s, 3H, CH_3) ; ^{13}C NMR (75 MHz, $CDCl_3$) δ: 160.4, 146.5, 140.8, 136.6, 129.2, 129.0, 128.7 (2C), 128.6, 128.1 (2C), 128.0, 127.5, 126.6, 126.2, 20.5.



3at

3-Ethyl-2-phenylquinoline (3at)[12]: Yellow oil. IR (Neat) cm^{-1}: 3048, 2924, 1595, 1432, 749 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ: 8.14 (d, *J* = 8.4 Hz, 1H, ArH), 8.01 (s, 1H, ArH), 7.79 (d, *J* = 7.8 Hz, 1H, ArH), 7.66-7.61 (m, 1H, ArH), 7.54-7.52 (m, 2H, ArH), 7.48-7.41 (m, 4H, ArH), 2.81-2.73 (m, 2H, CH_2), 1.19 (t, *J* = 7.8 Hz, 3H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 160.5, 146.2, 140.8, 135.1, 134.8, 129.1, 128.7, 128.6, 128.1, 127.9, 127.6, 126.8, 126.2, 25.9, 14.6.

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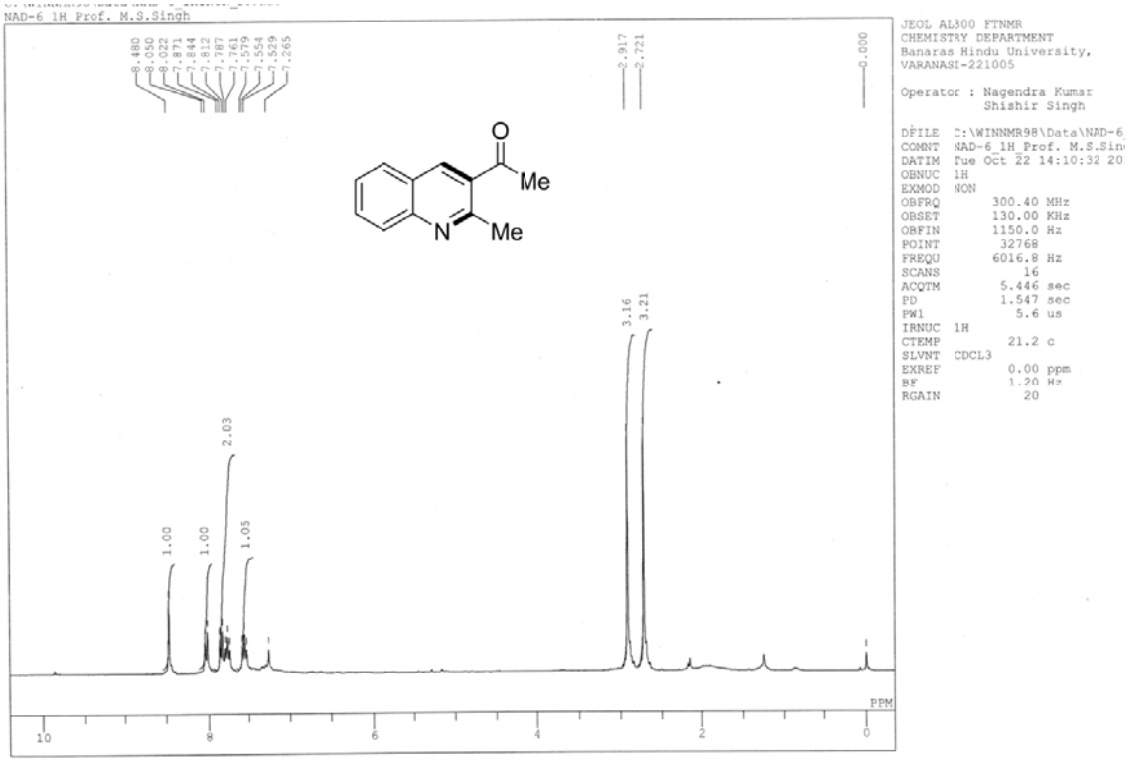
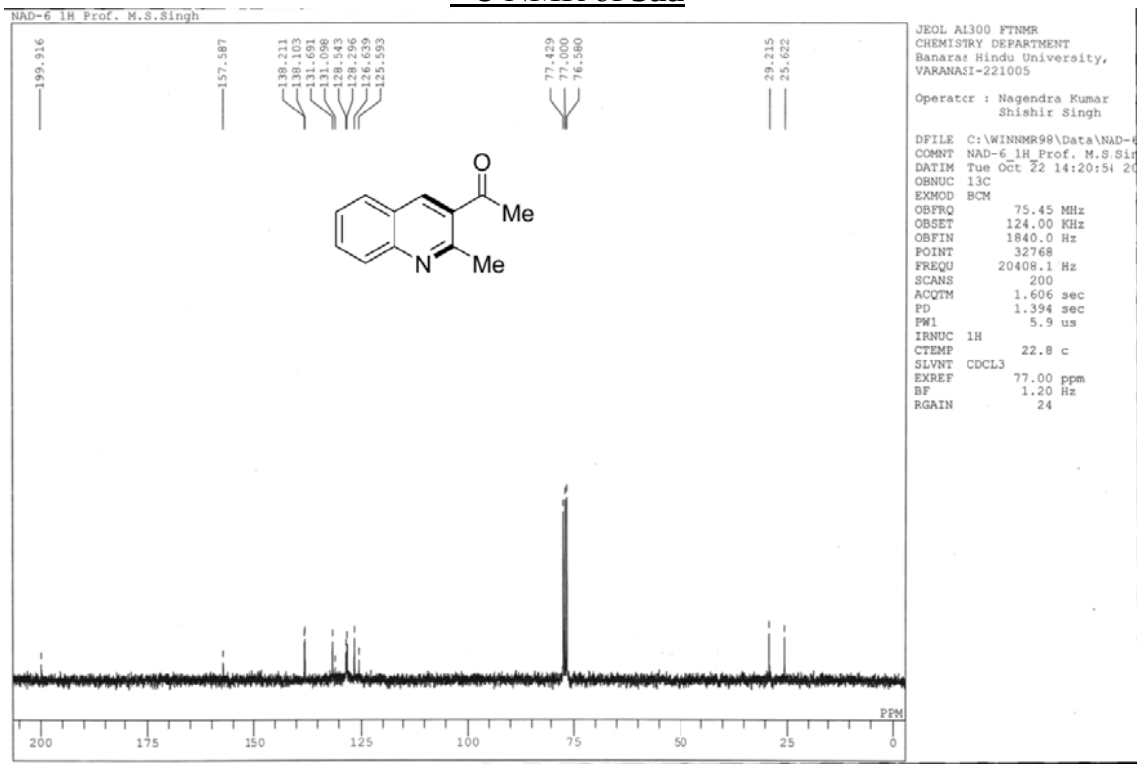
^{1}H NMR of **3aa**



^{13}C NMR of **3aa**



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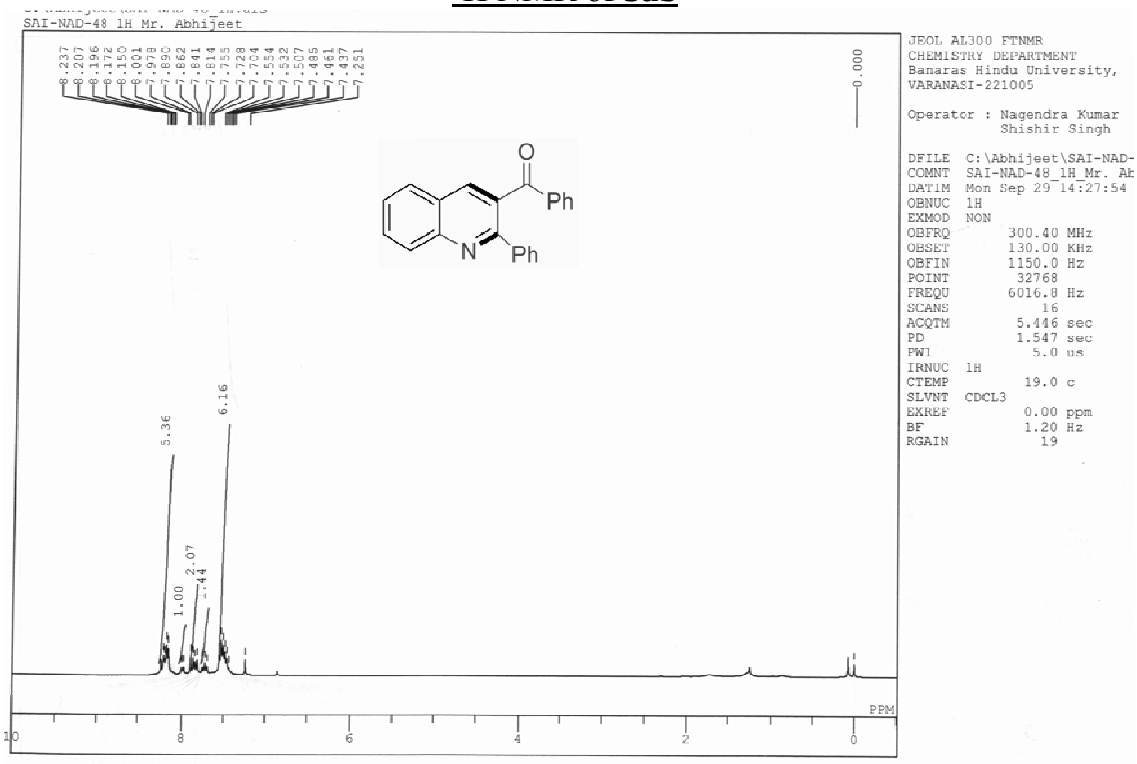
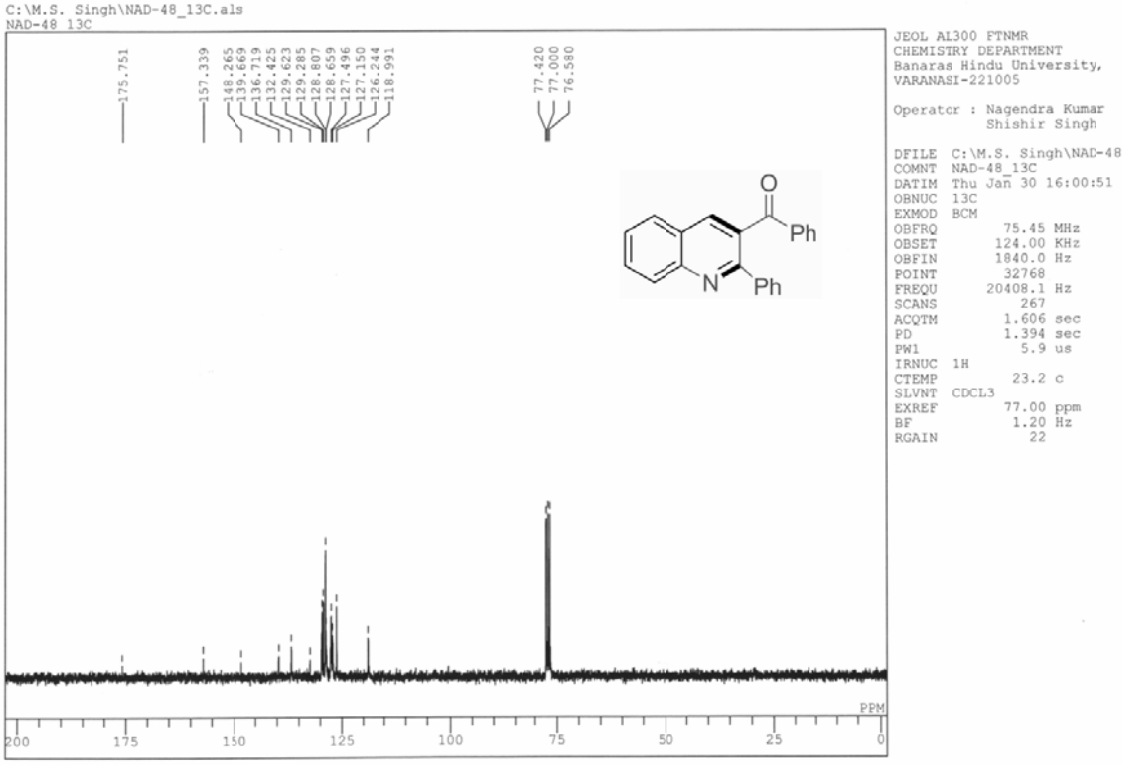
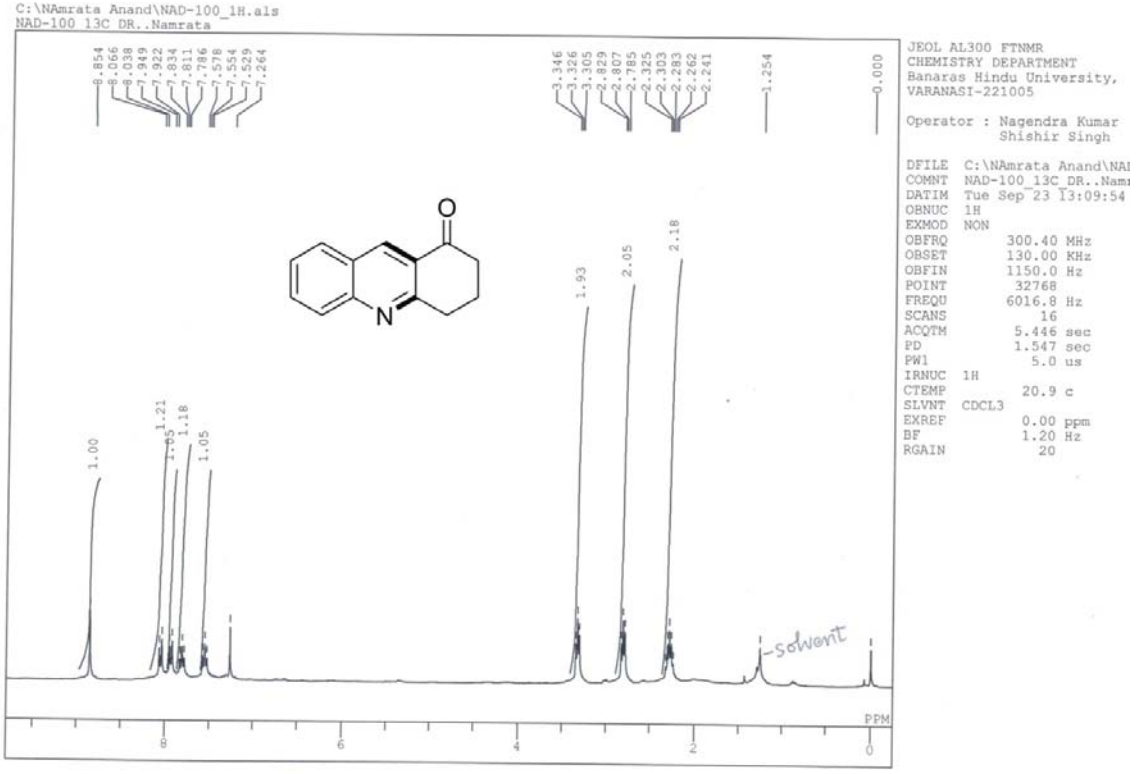


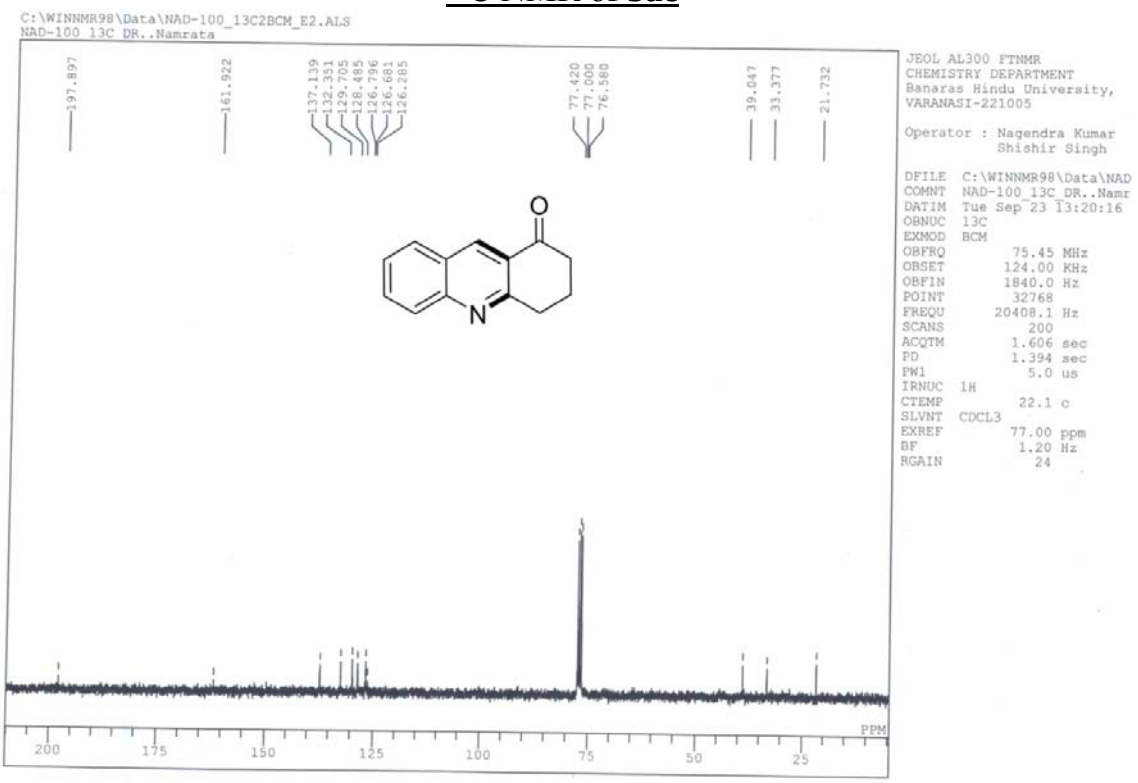
^{13}C NMR of **3ab**



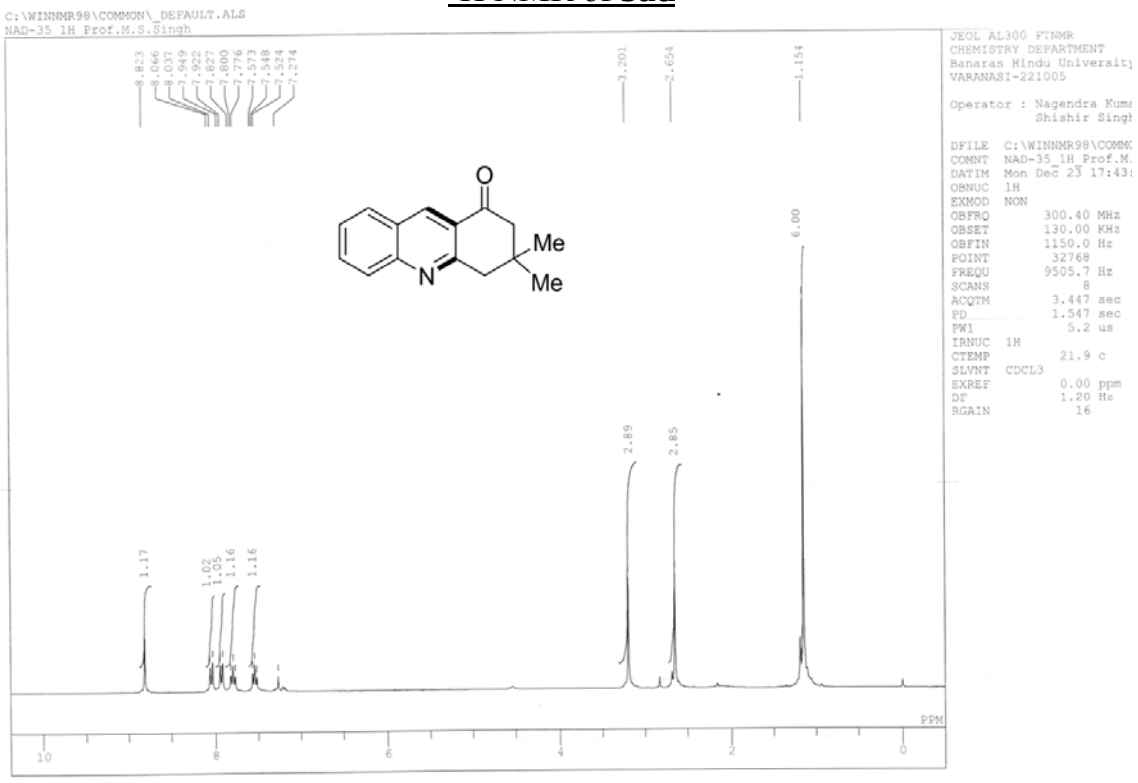
^{1}H NMR of **3ac**



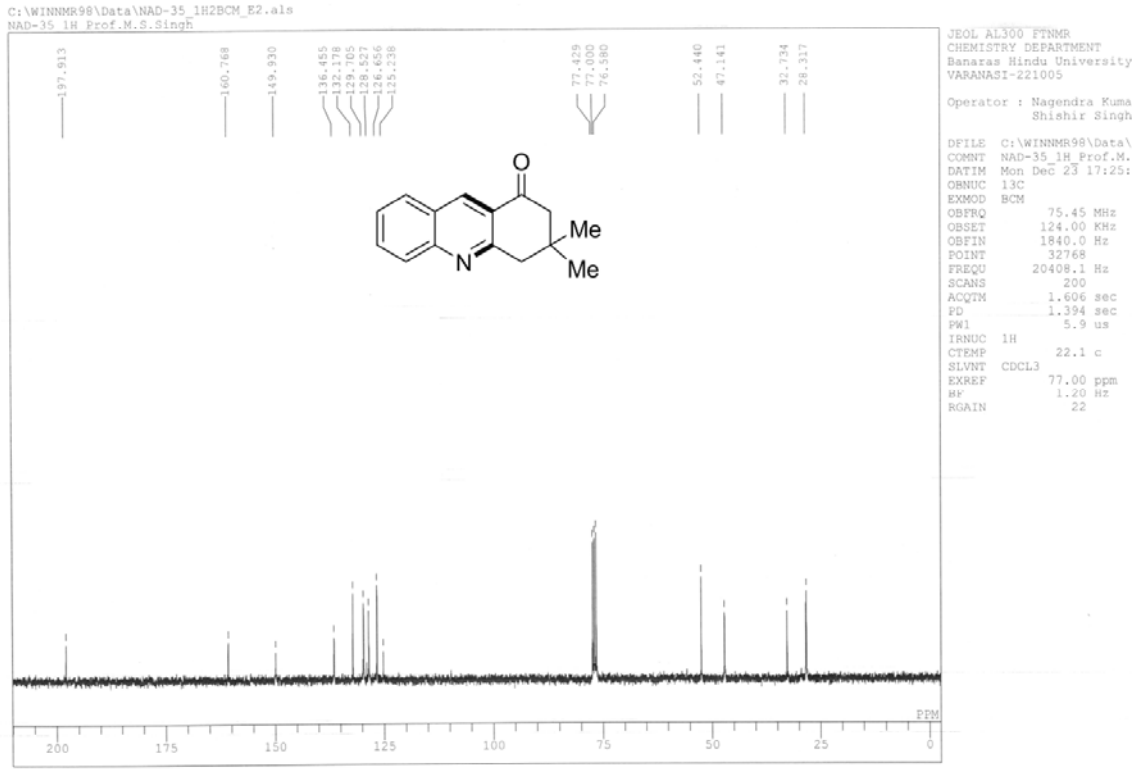
^{13}C NMR of **3ac**



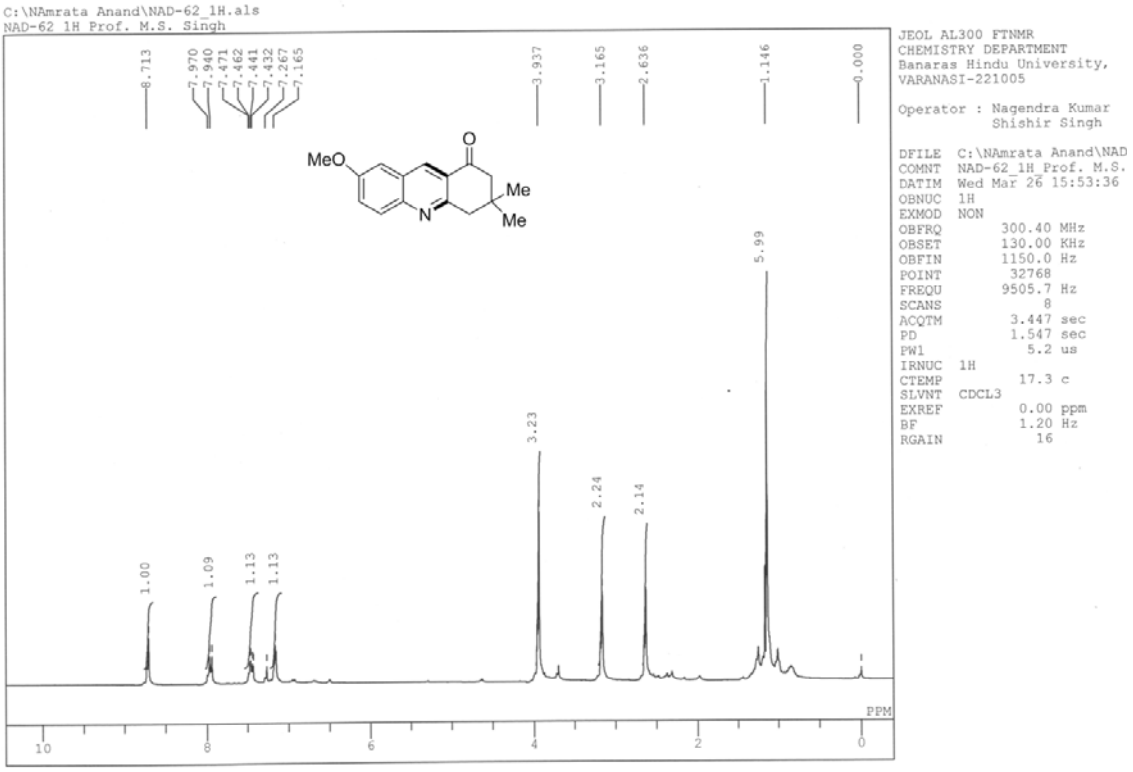
^{1}H NMR of **3ad**



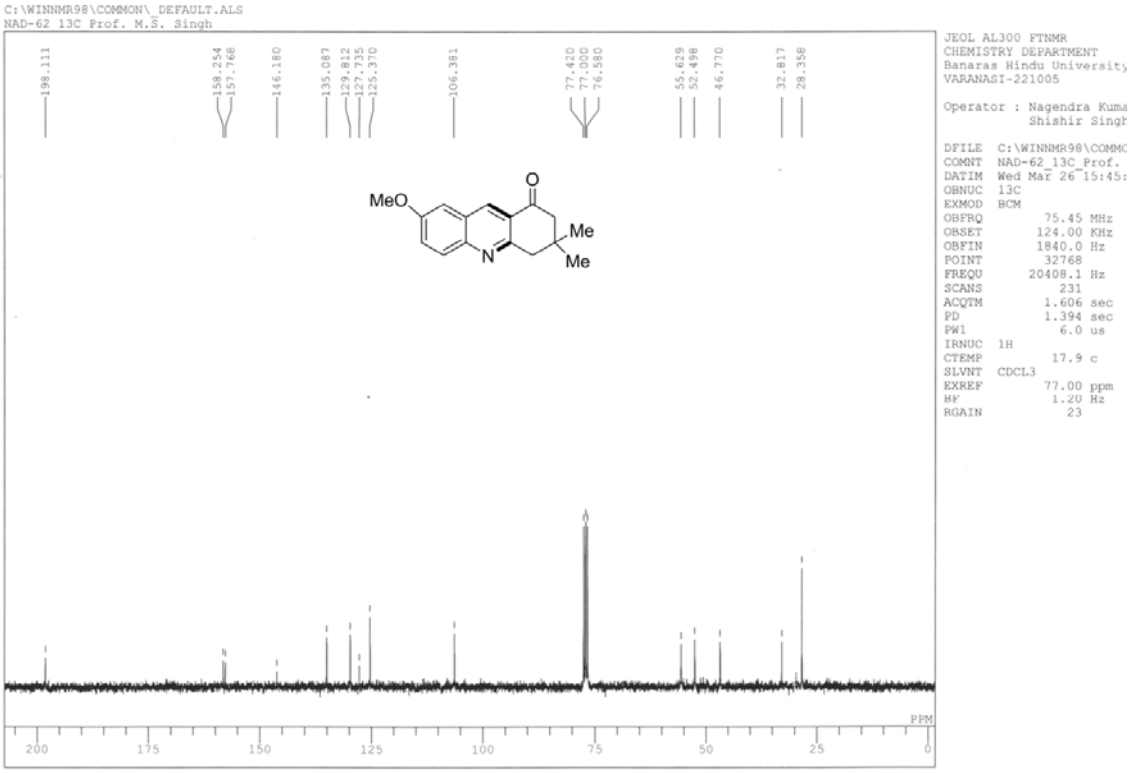
^{13}C NMR of **3ad**



^{1}H NMR of **3bd**



^{13}C NMR of **3bd**



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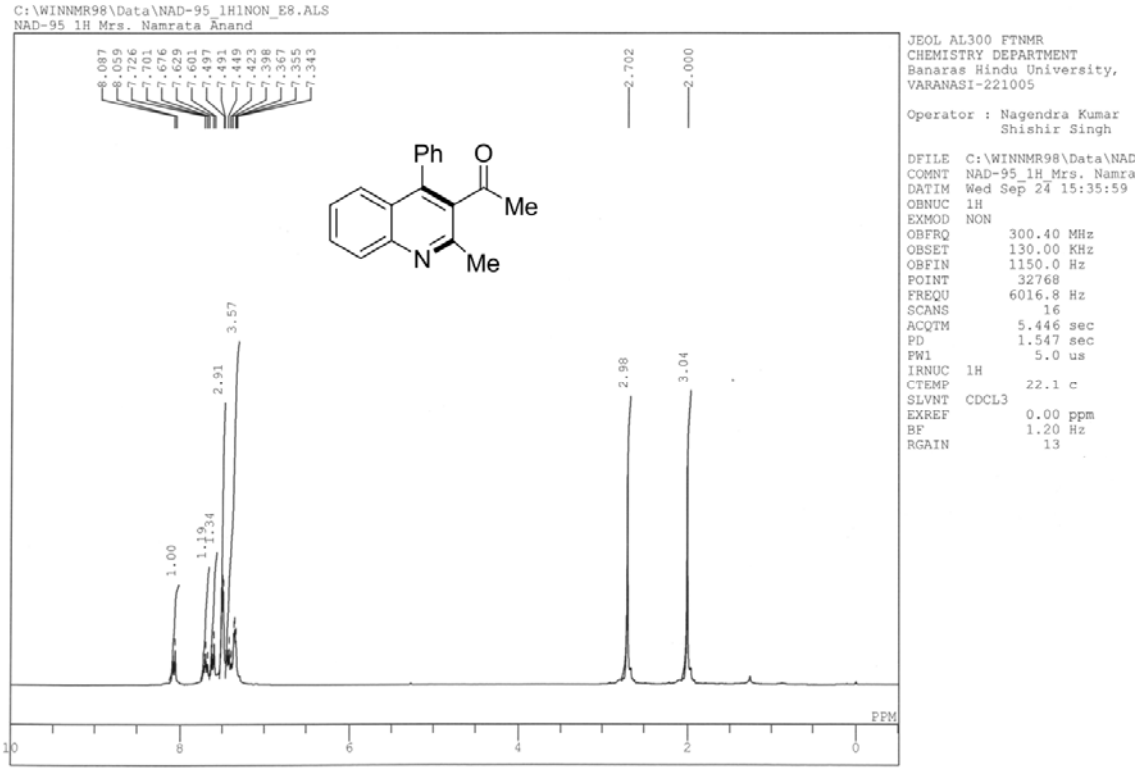
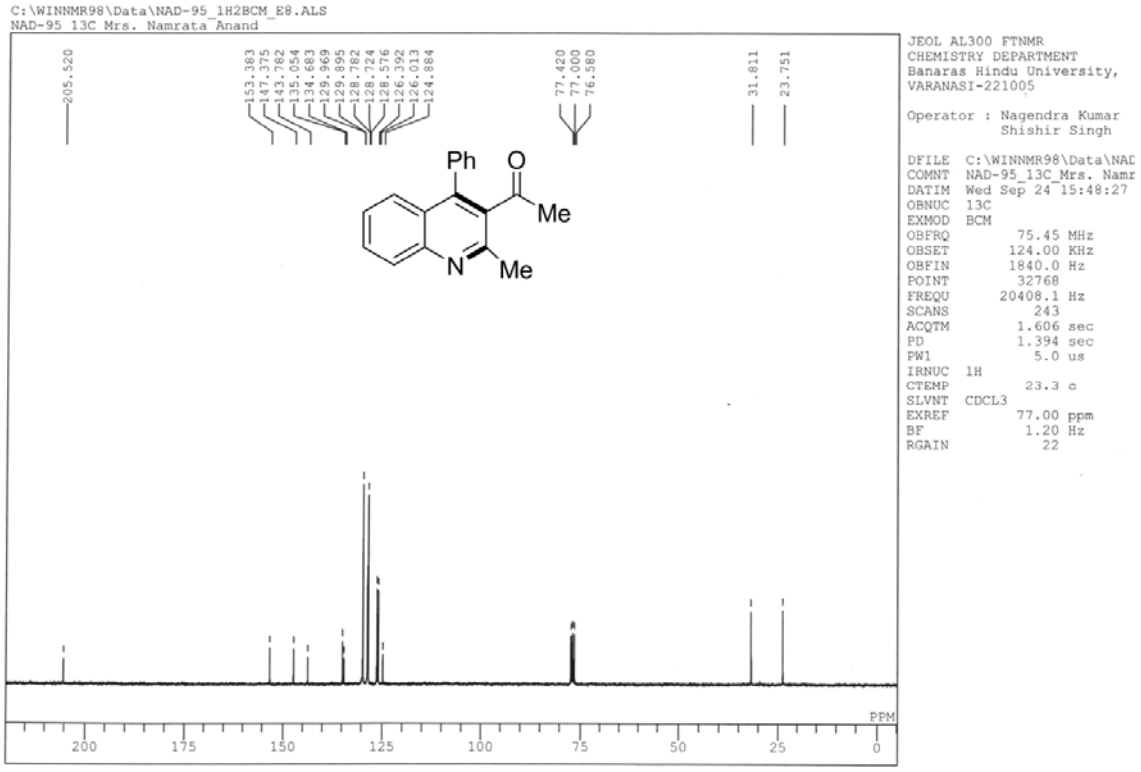
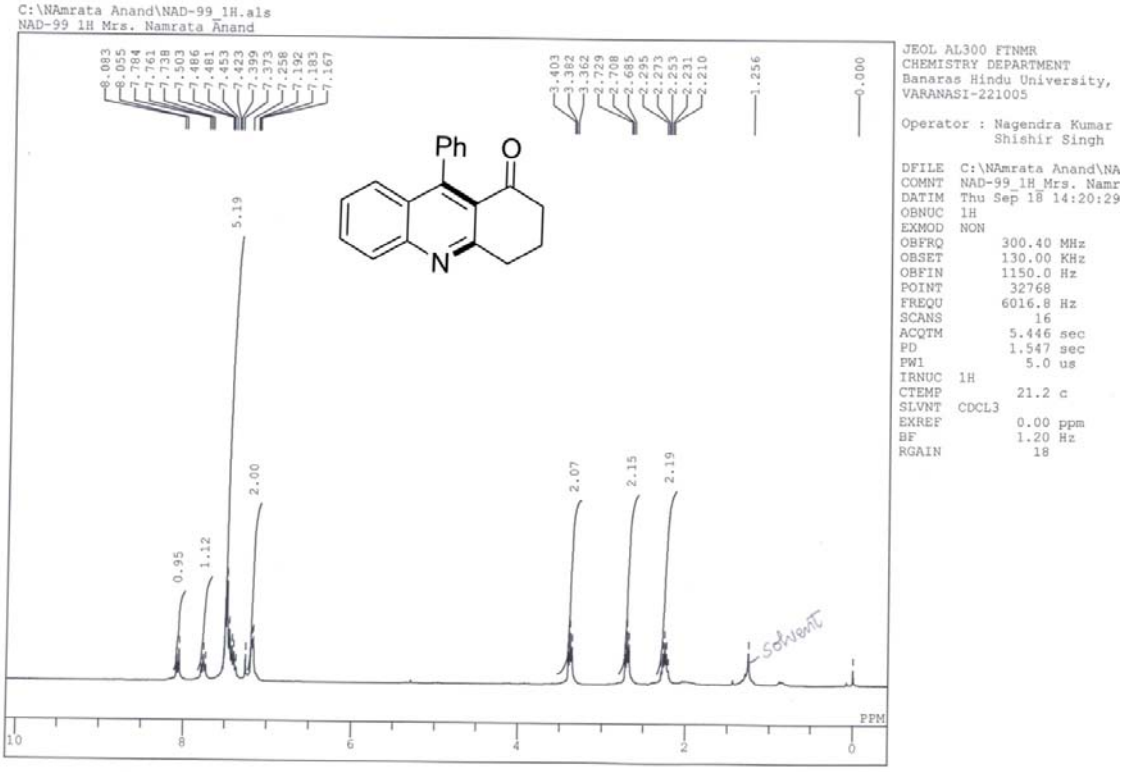


^{13}C NMR of **3ca**



^{1}H NMR of **3cc**



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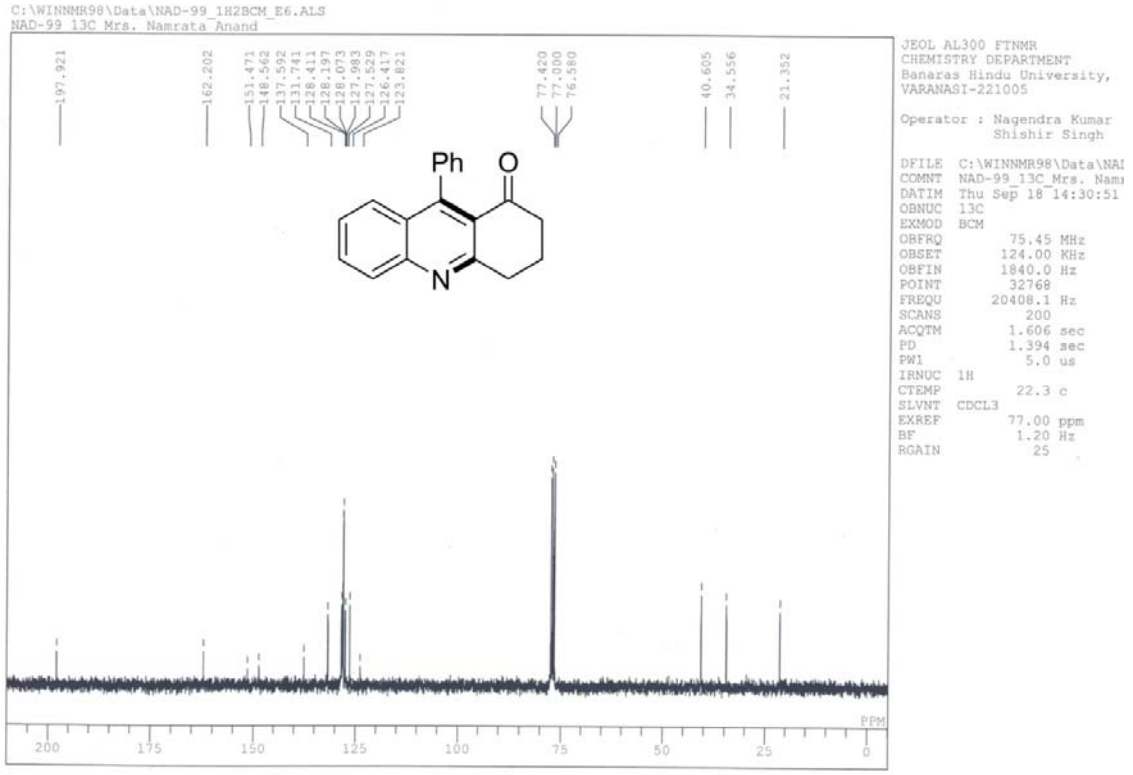
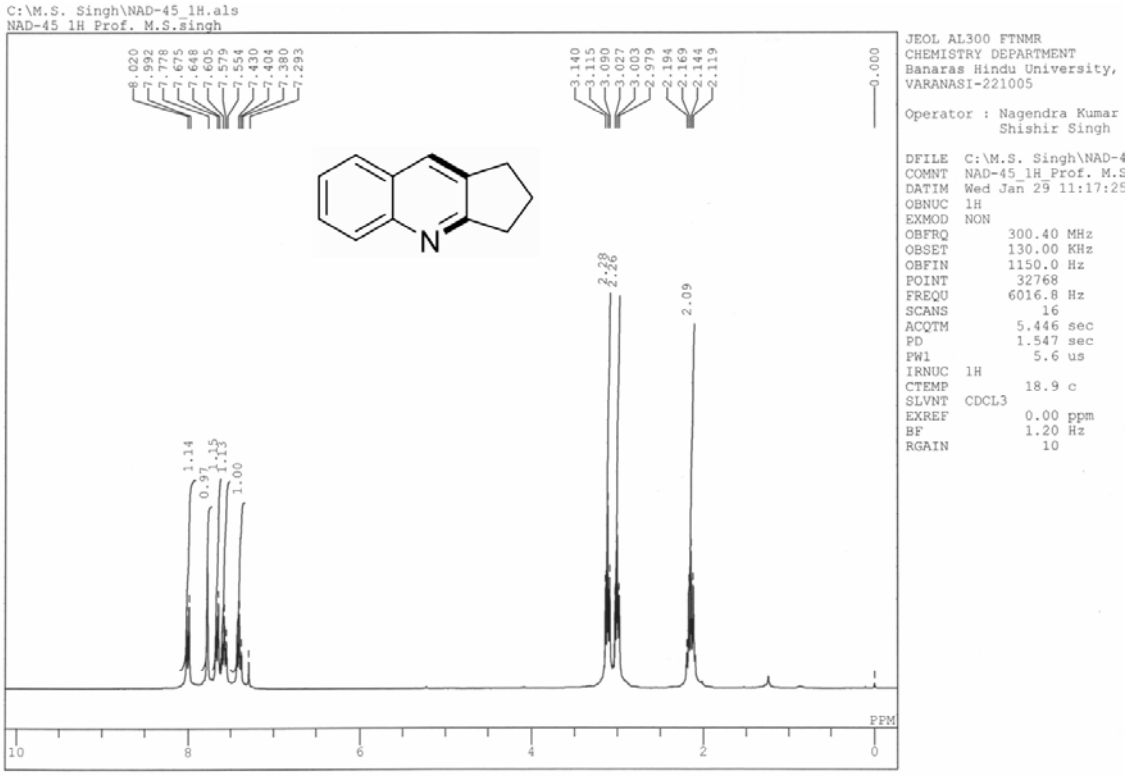


^{1}H NMR of **3ae**



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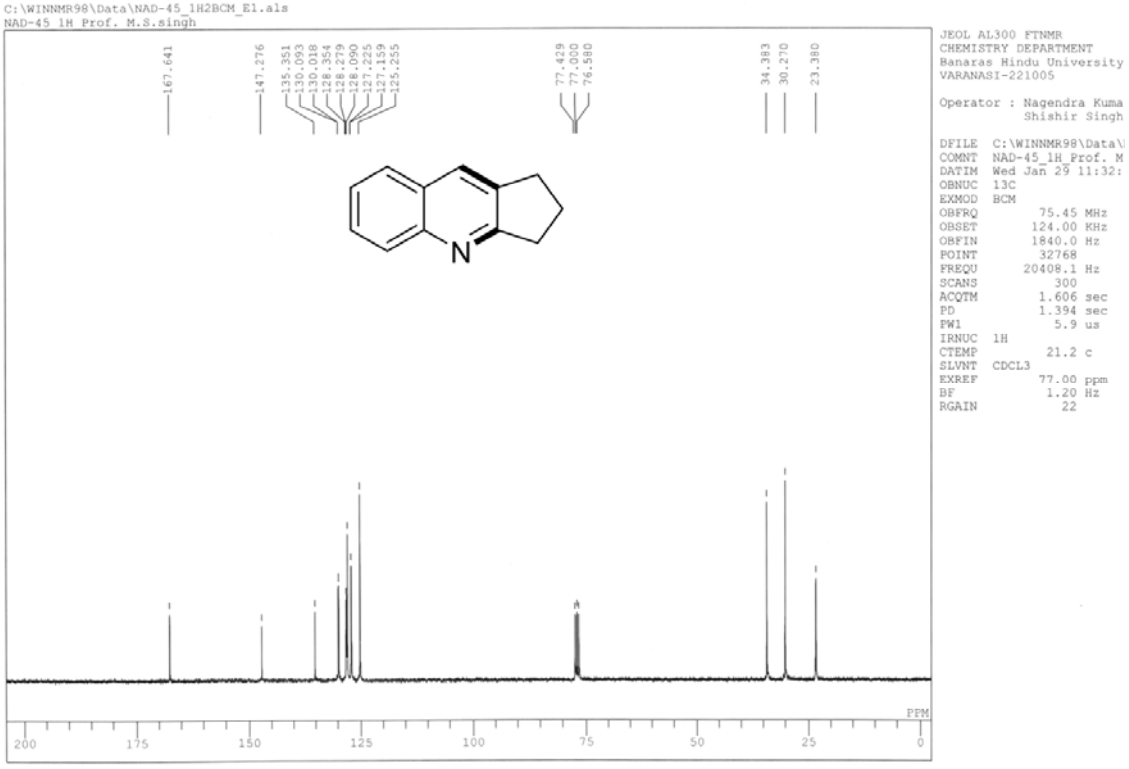
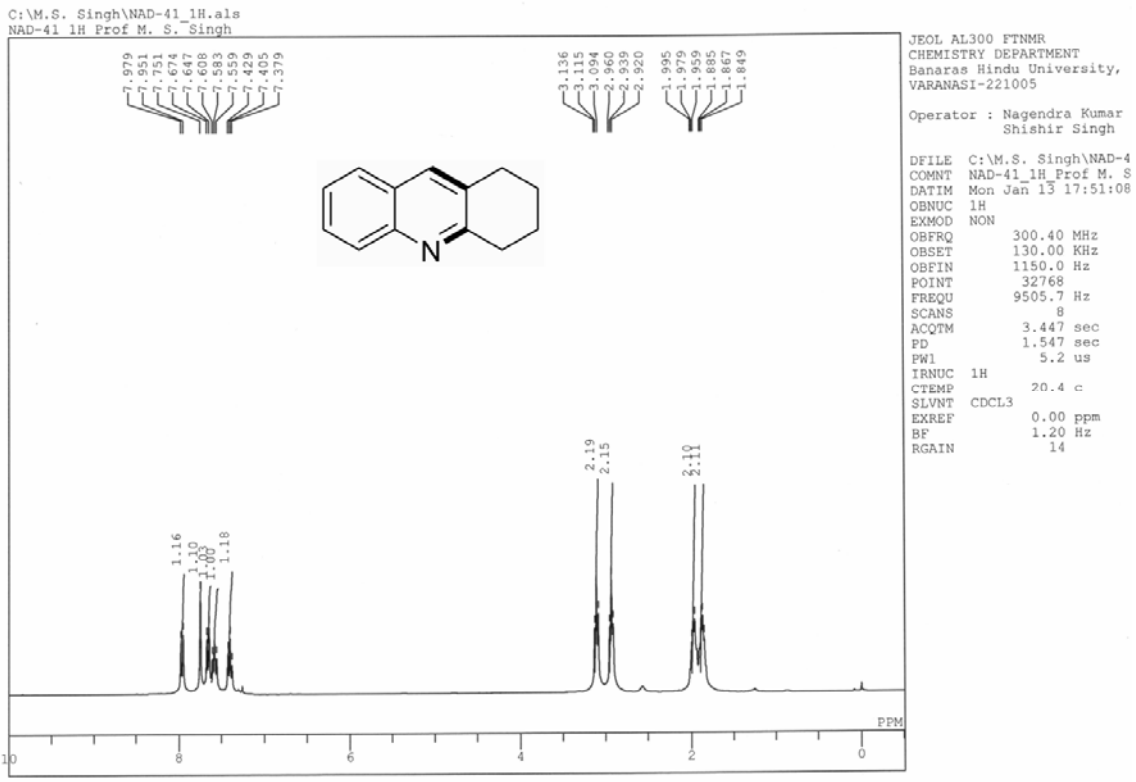
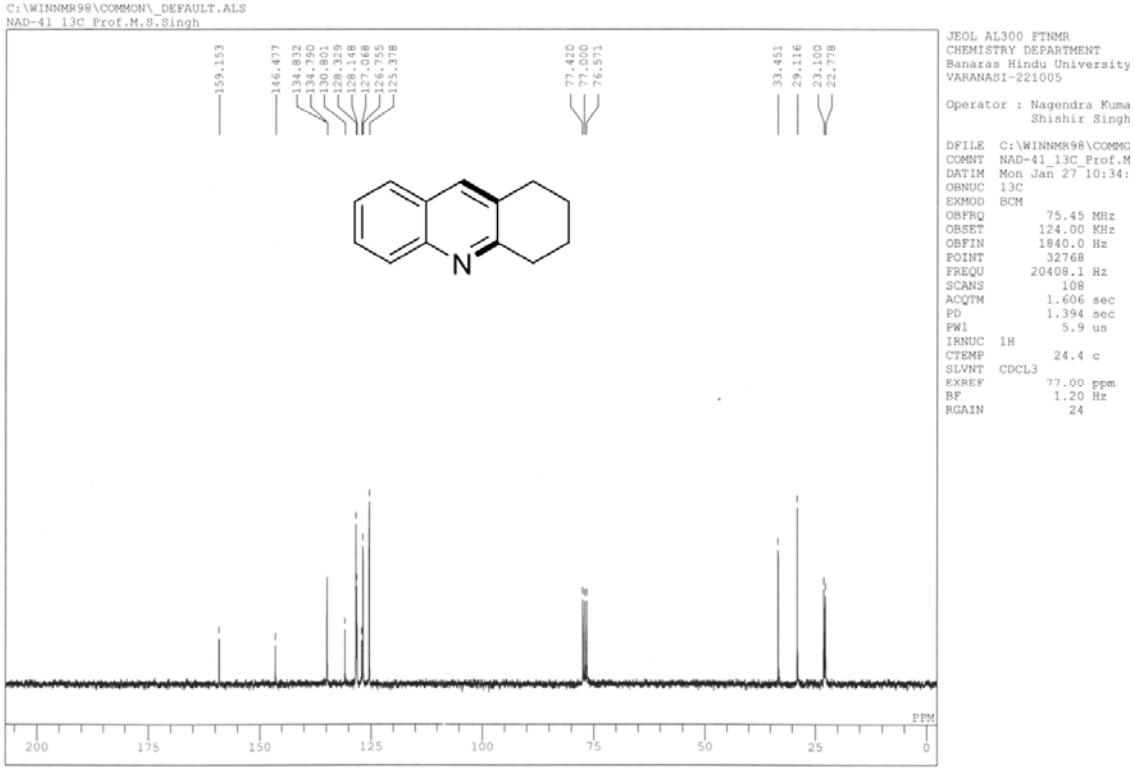


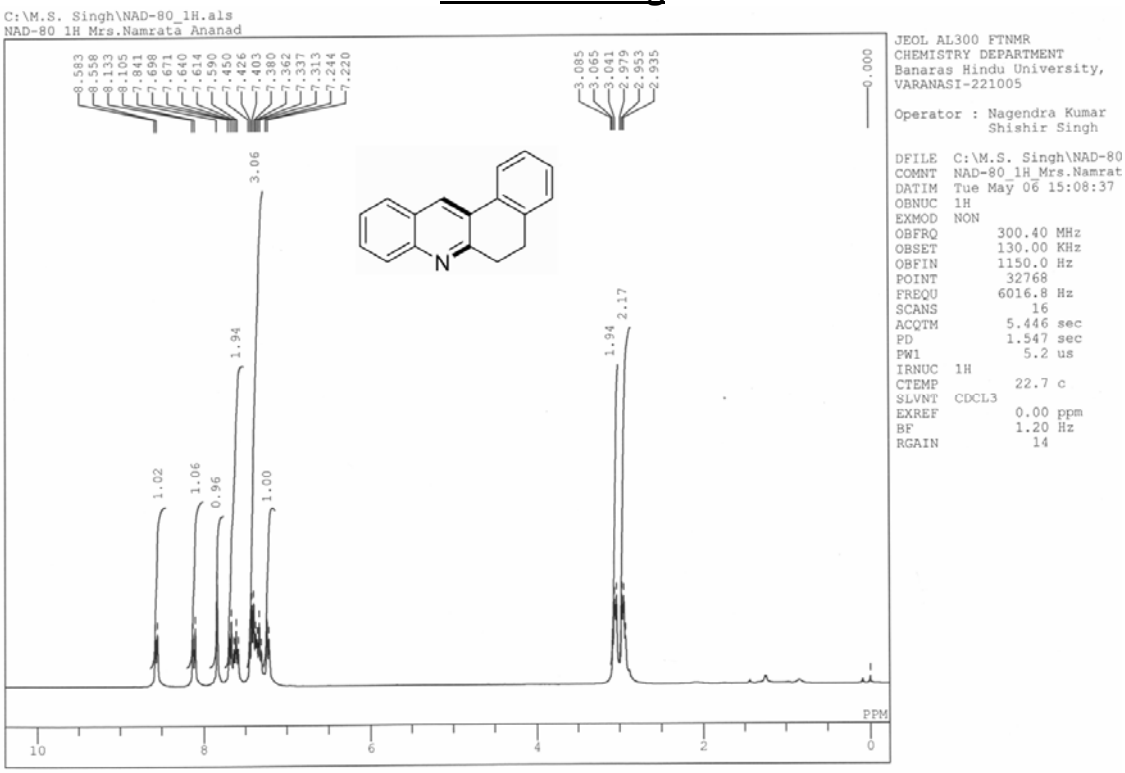
^{1}H NMR of **3af**



^{13}C NMR of **3af**



^{1}H NMR of **3ag**



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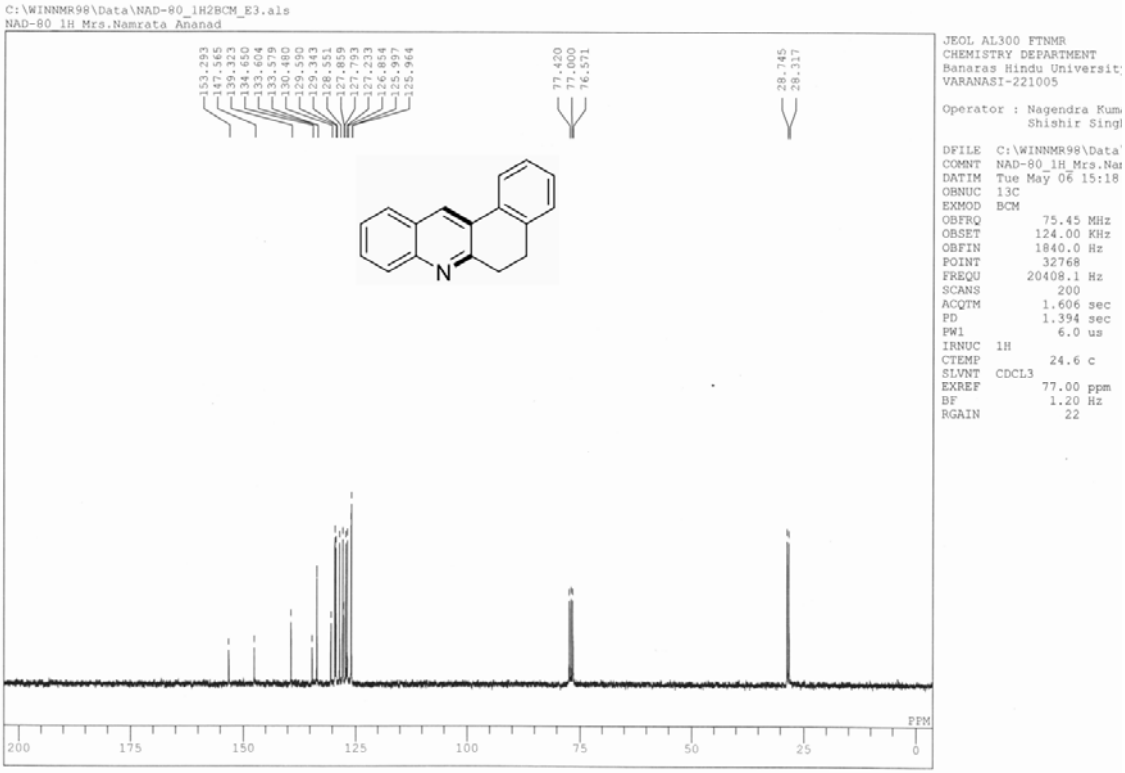
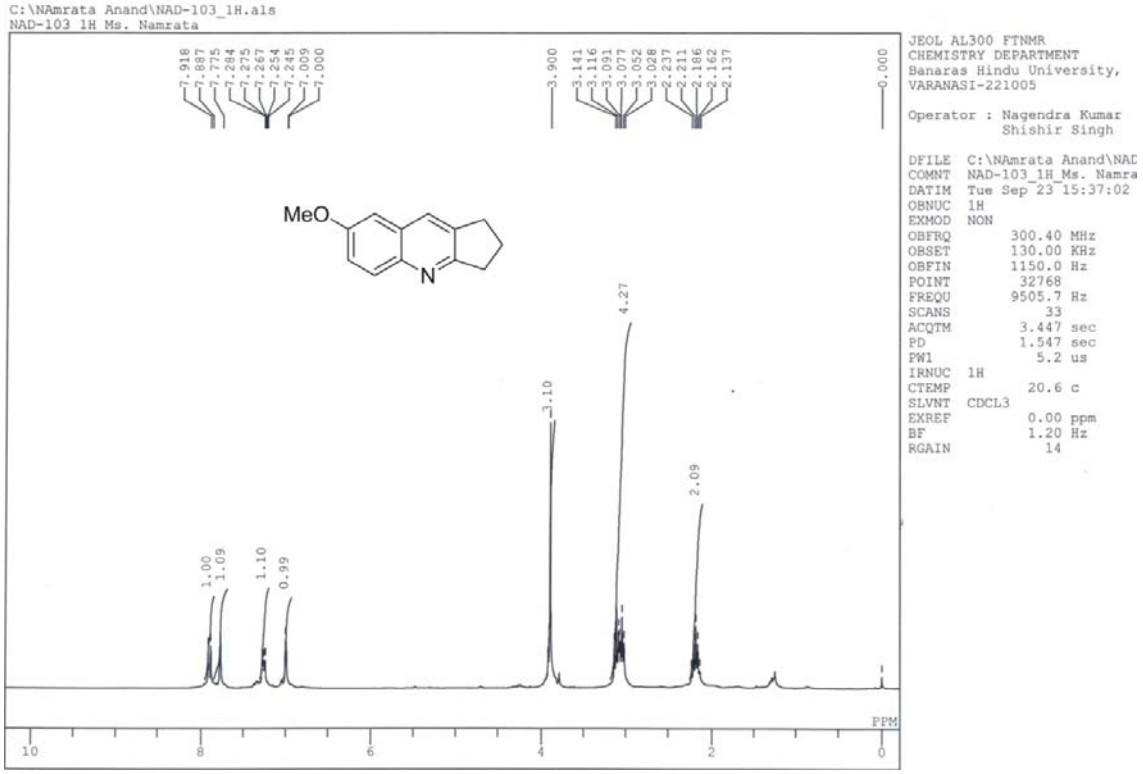


^{1}H NMR of **3be**



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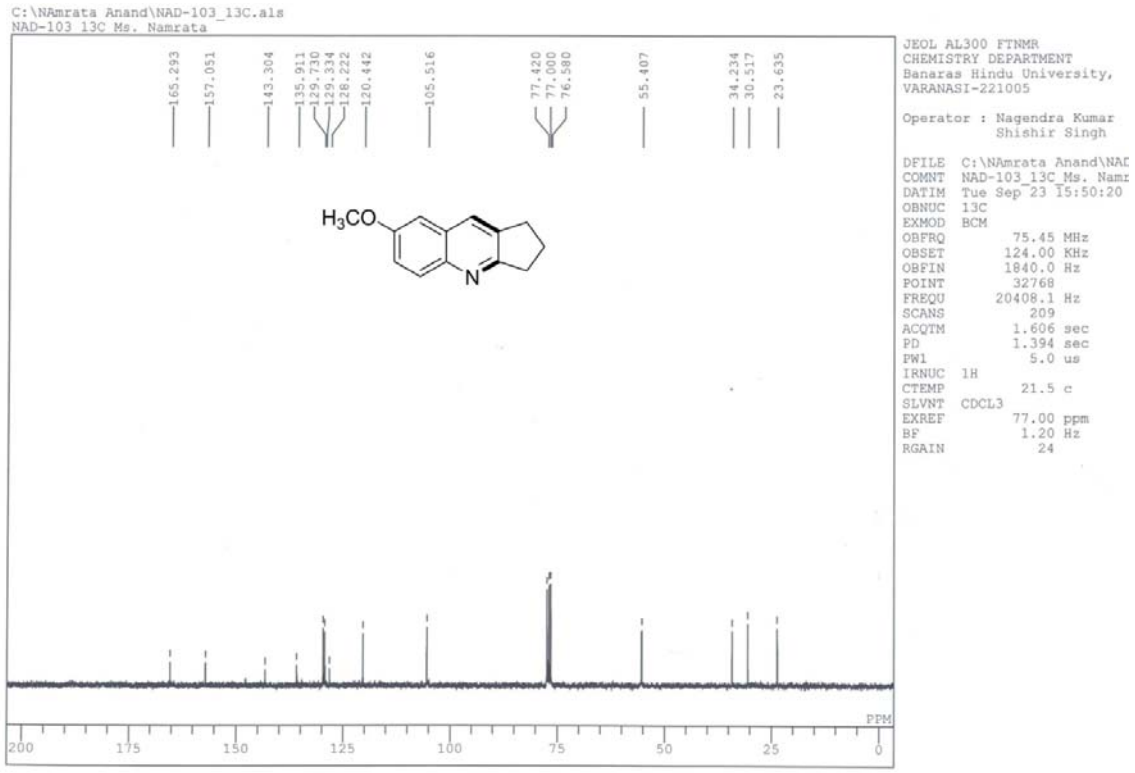
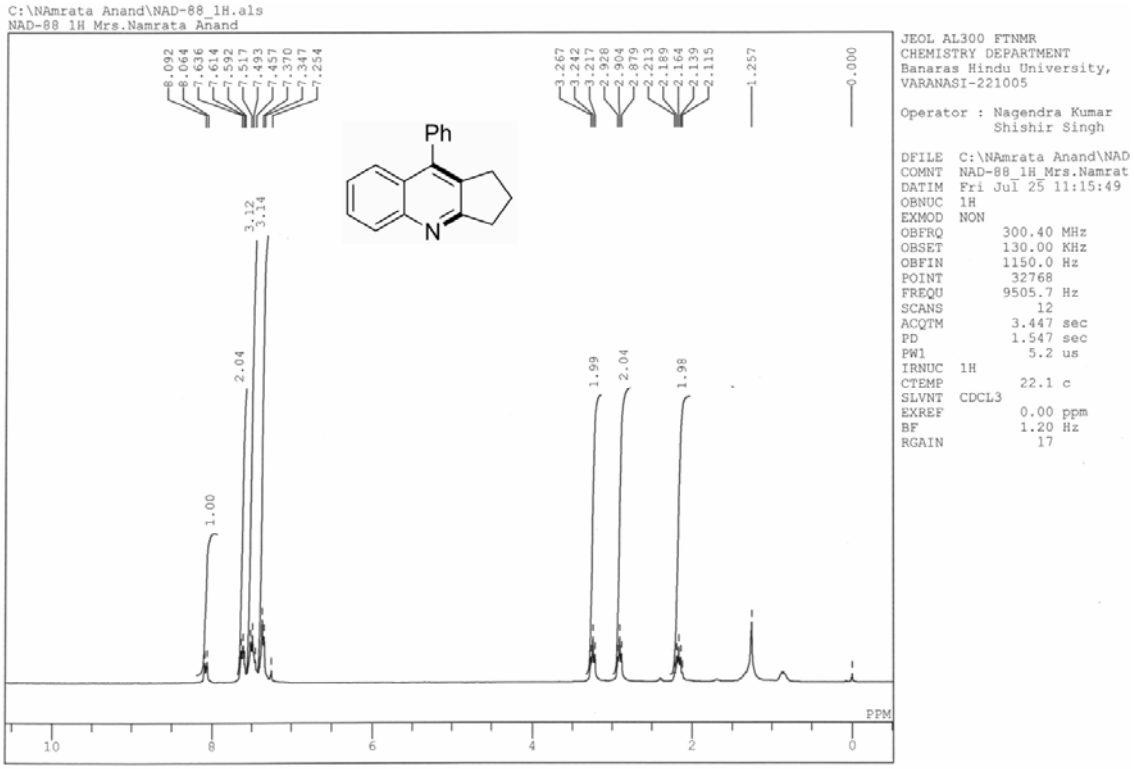


^{1}H NMR of **3ce**



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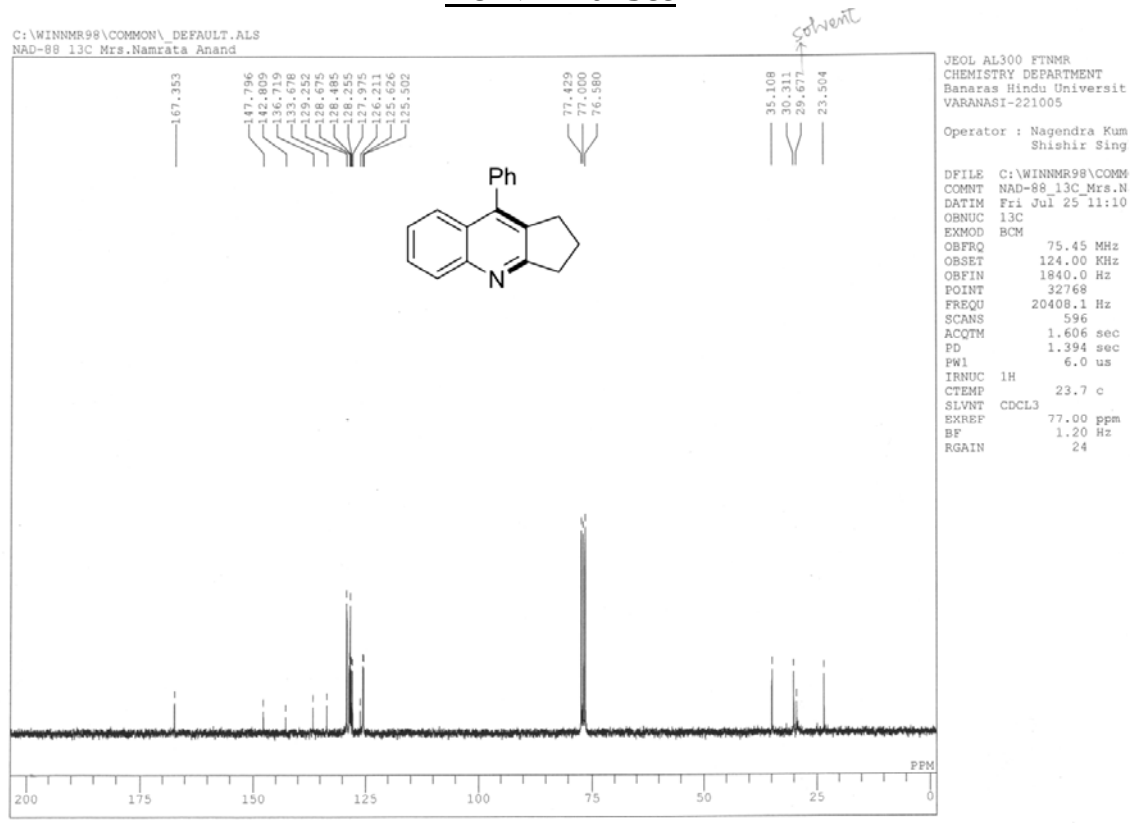
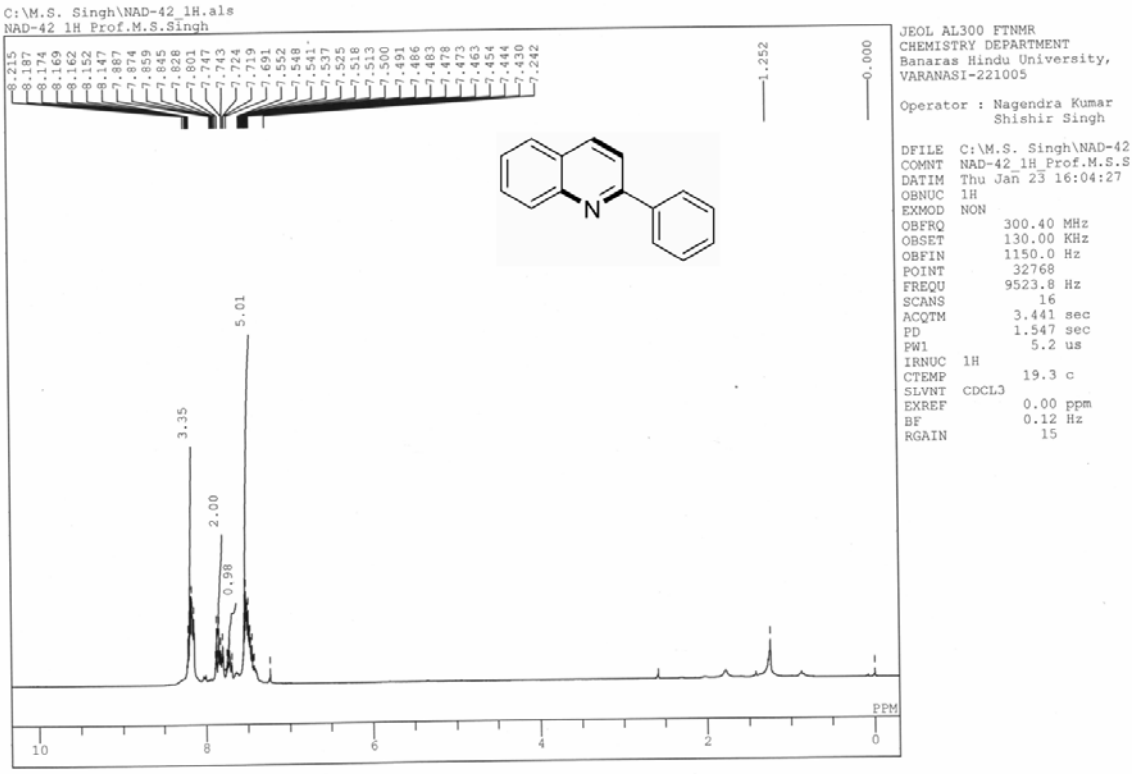


^{1}H NMR of **3ah**



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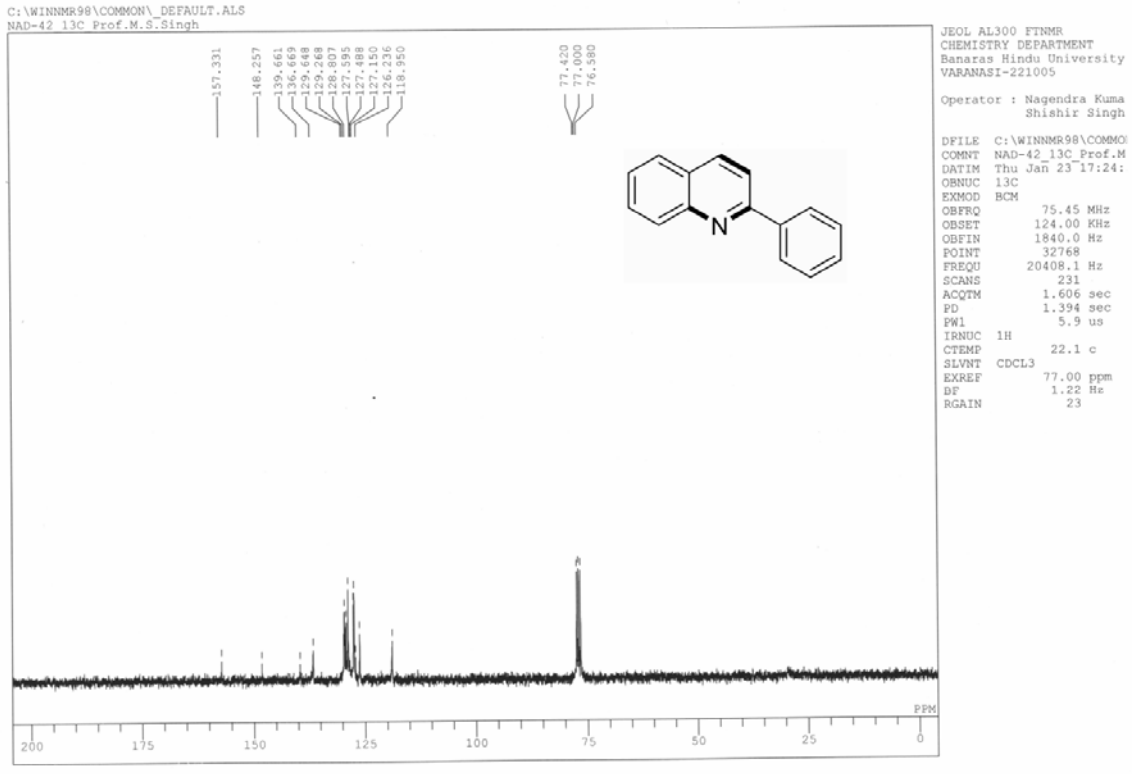

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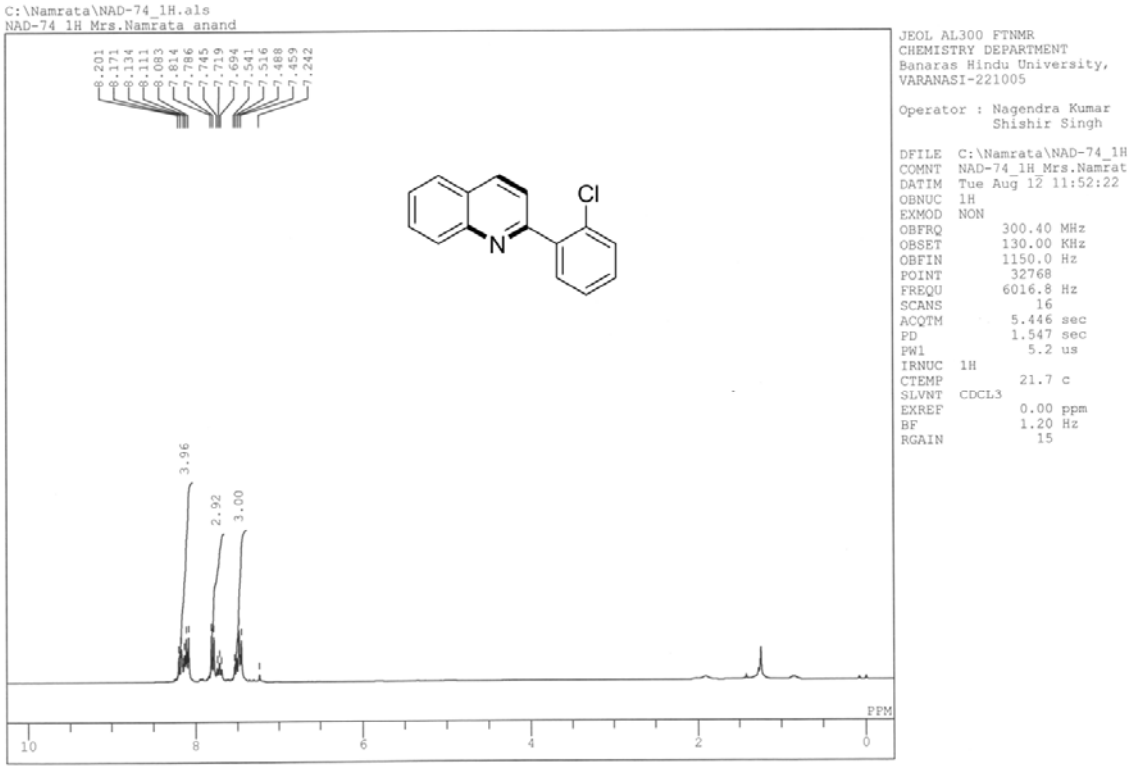

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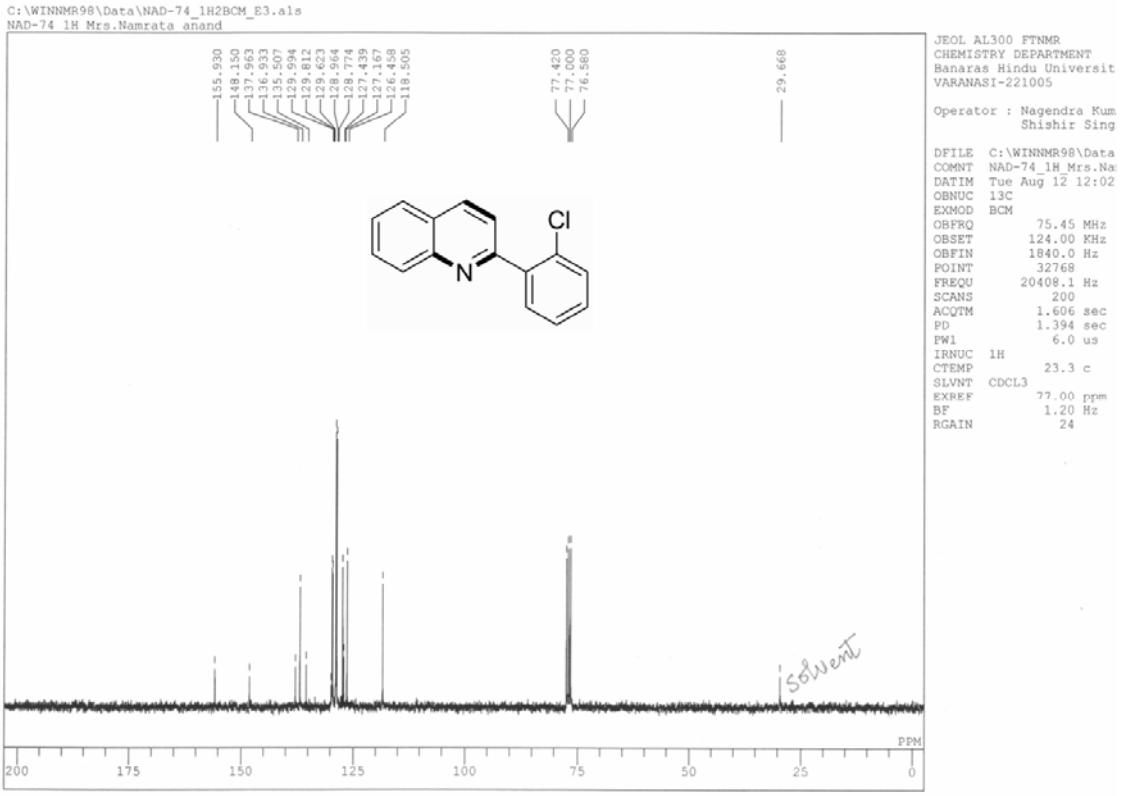
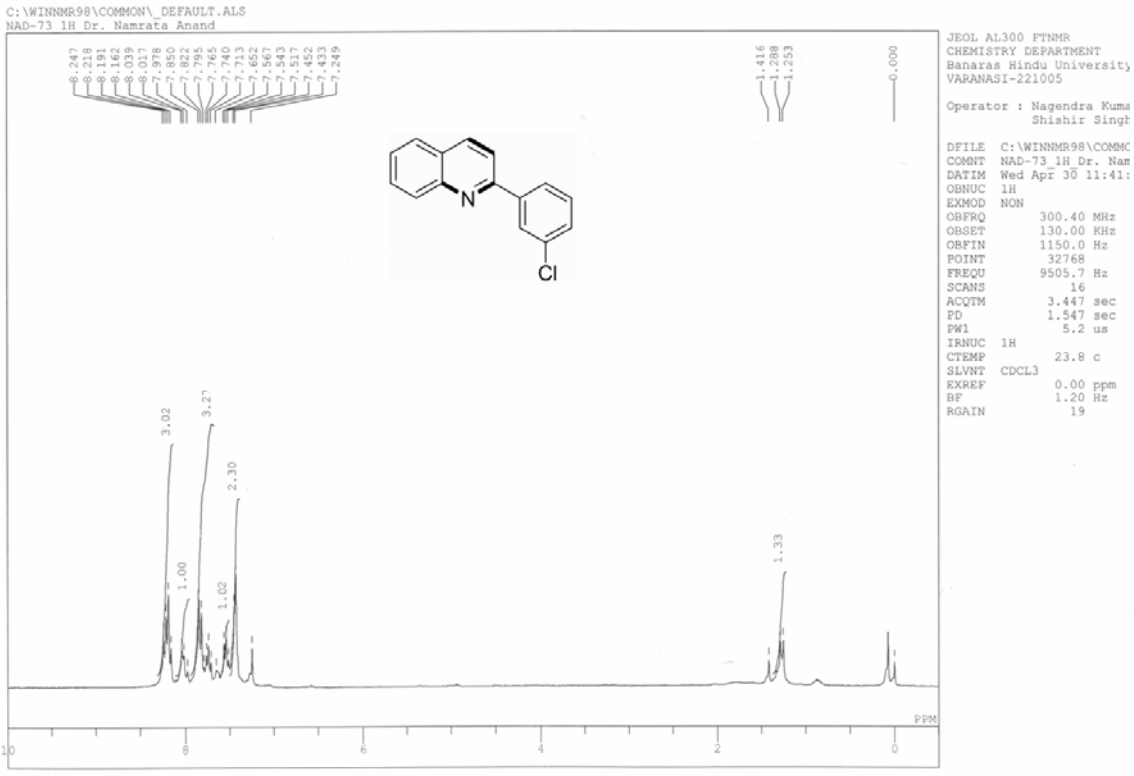
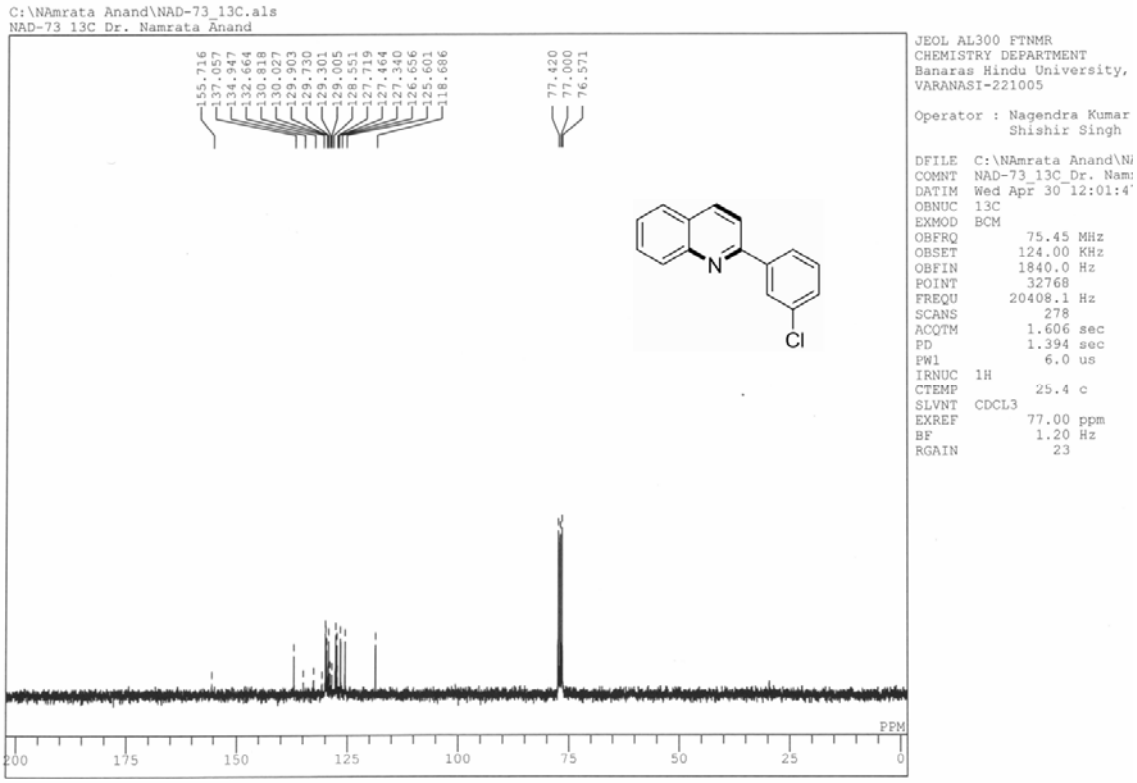


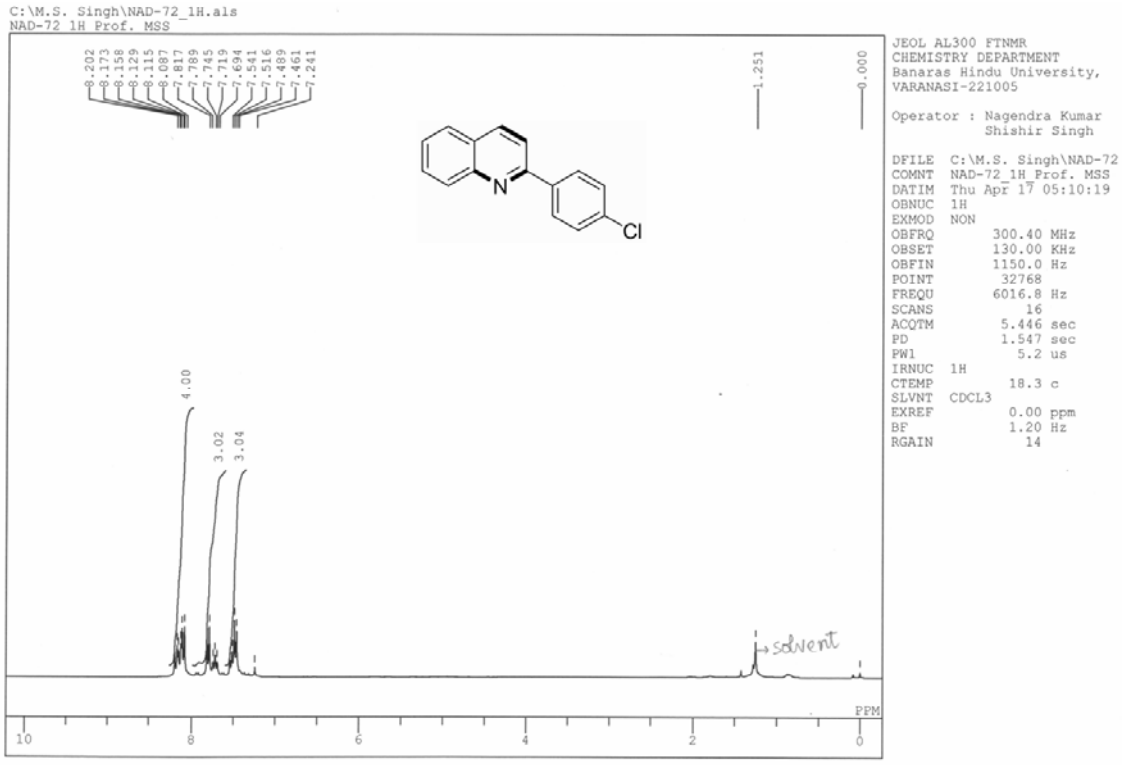
^{1}H NMR of **3aj**



^{13}C NMR of **3aj**



^{1}H NMR of **3ak**



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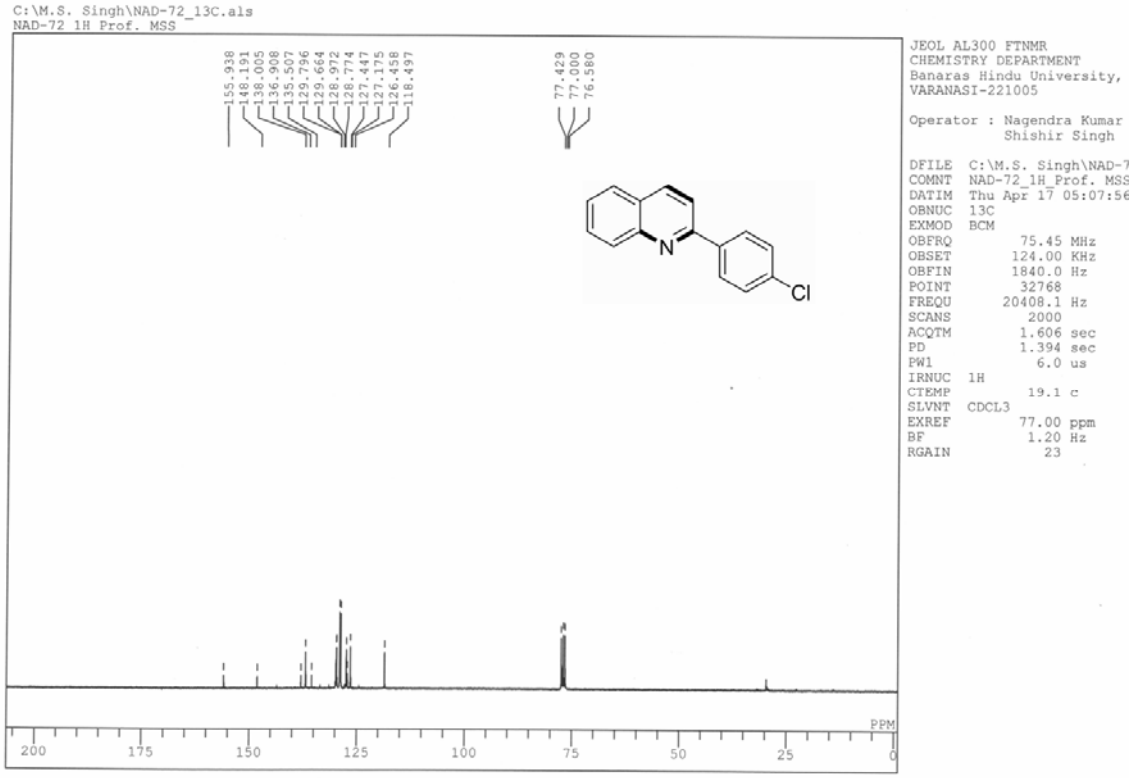
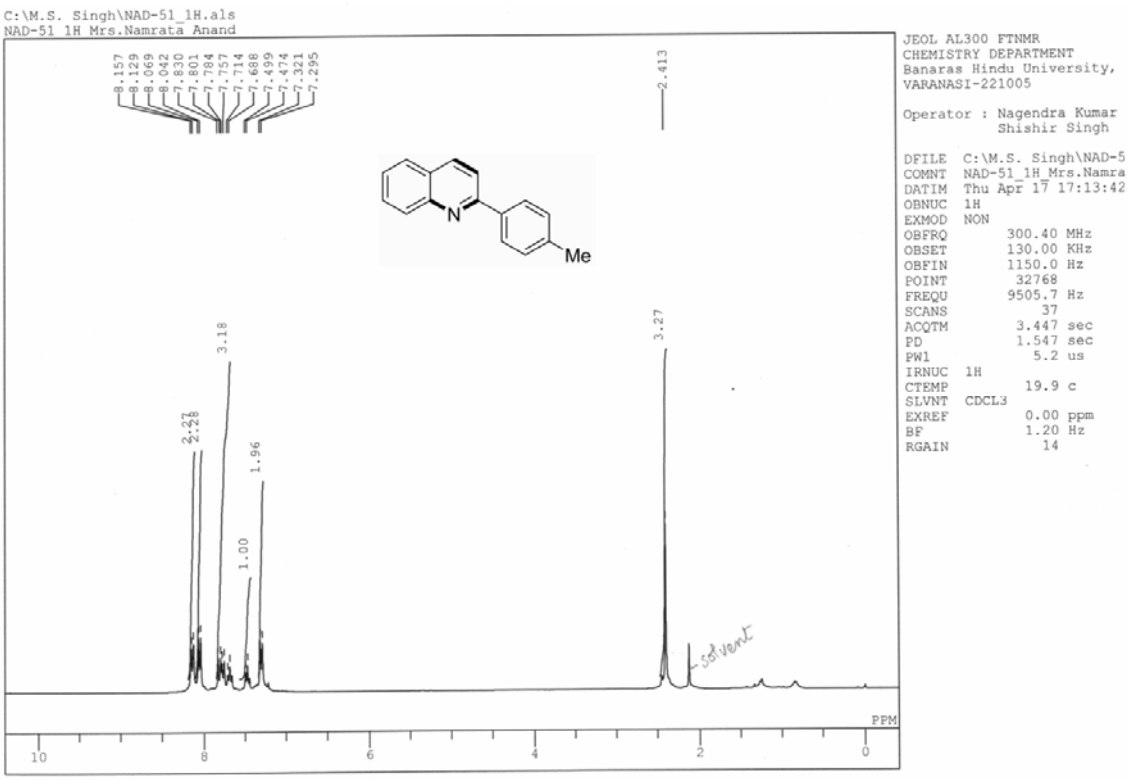
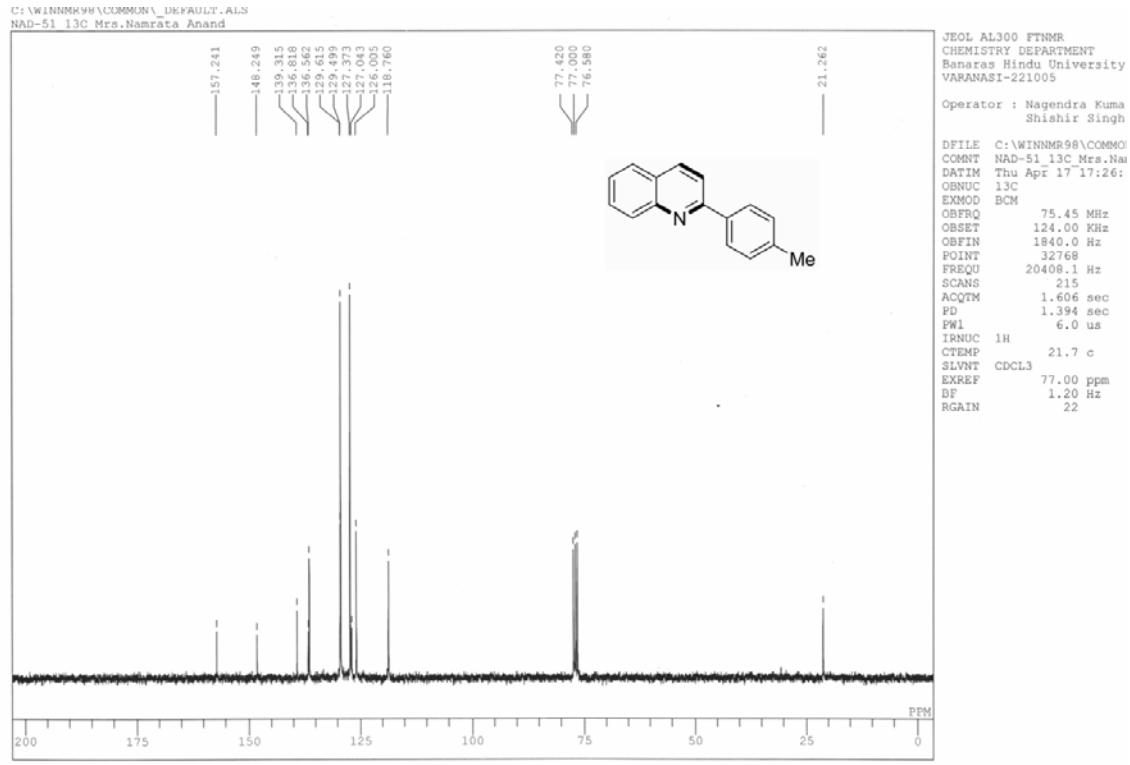


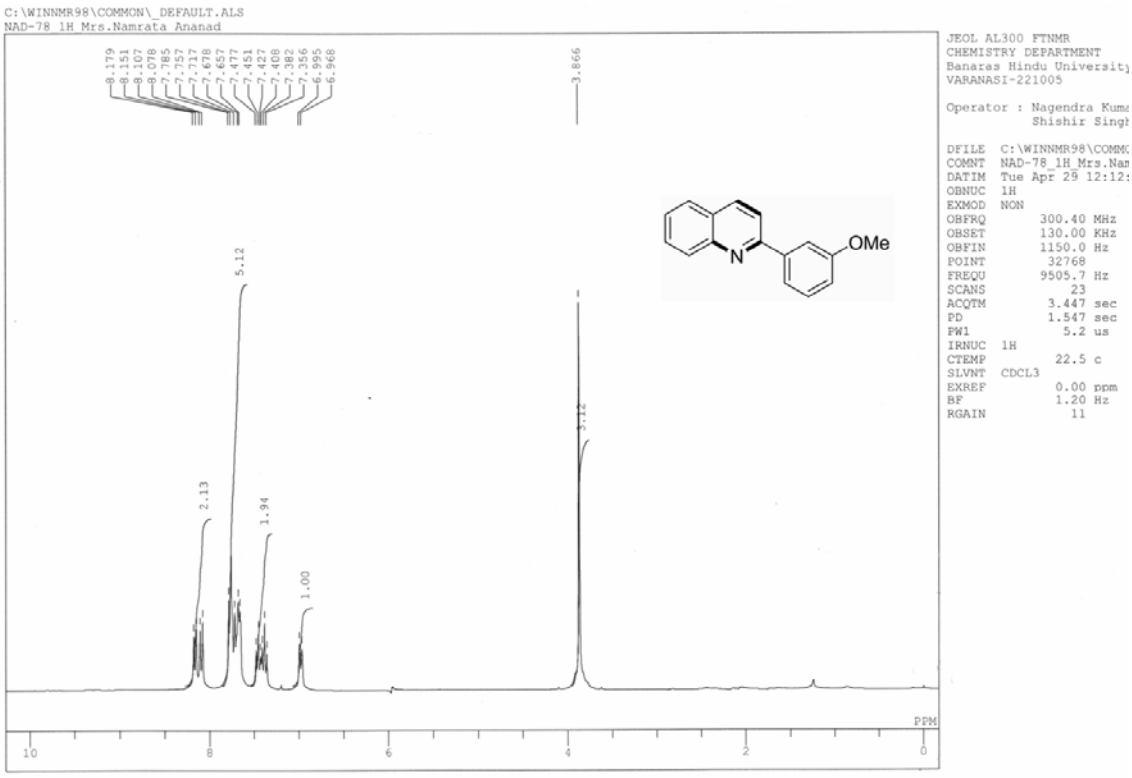
^{1}H NMR of **3al**



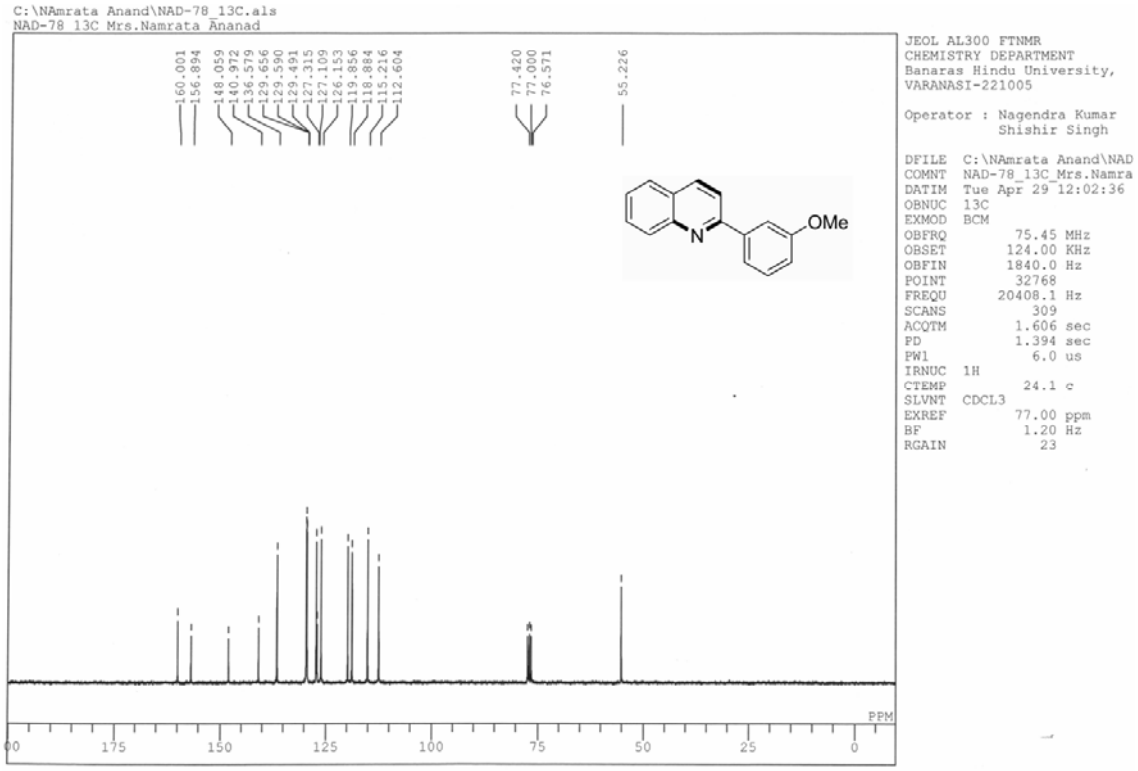
^{13}C NMR of **3al**



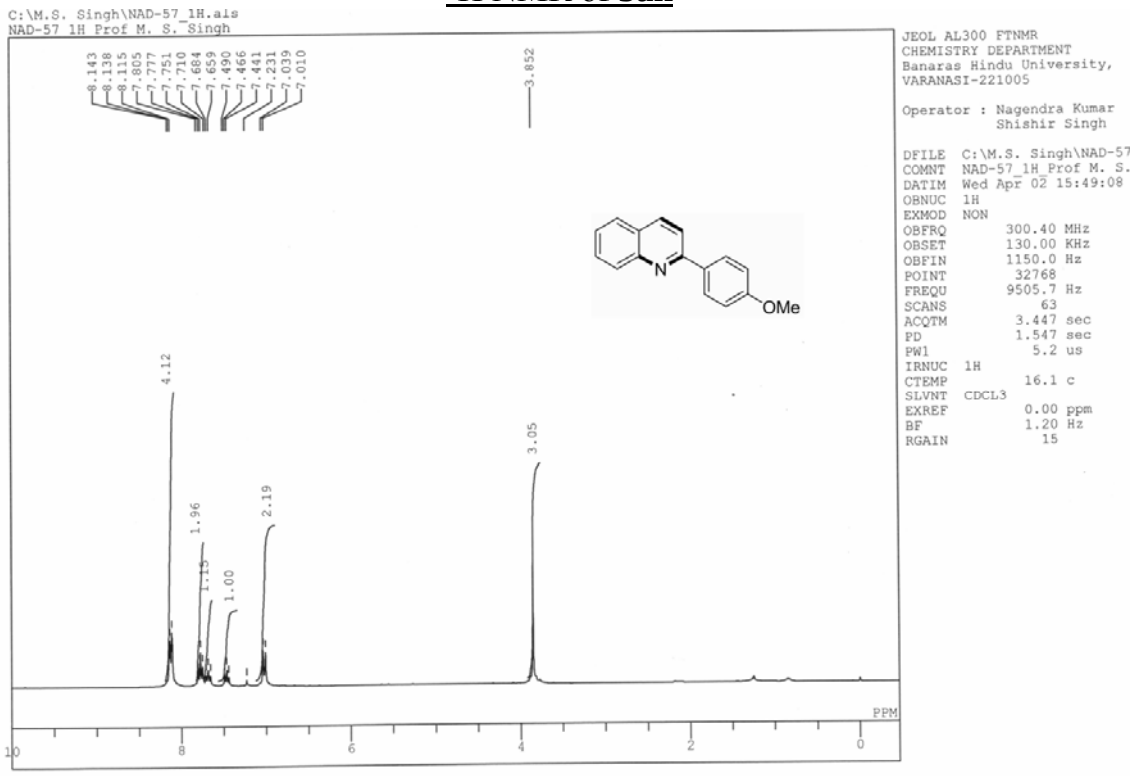
^{1}H NMR of **3am**



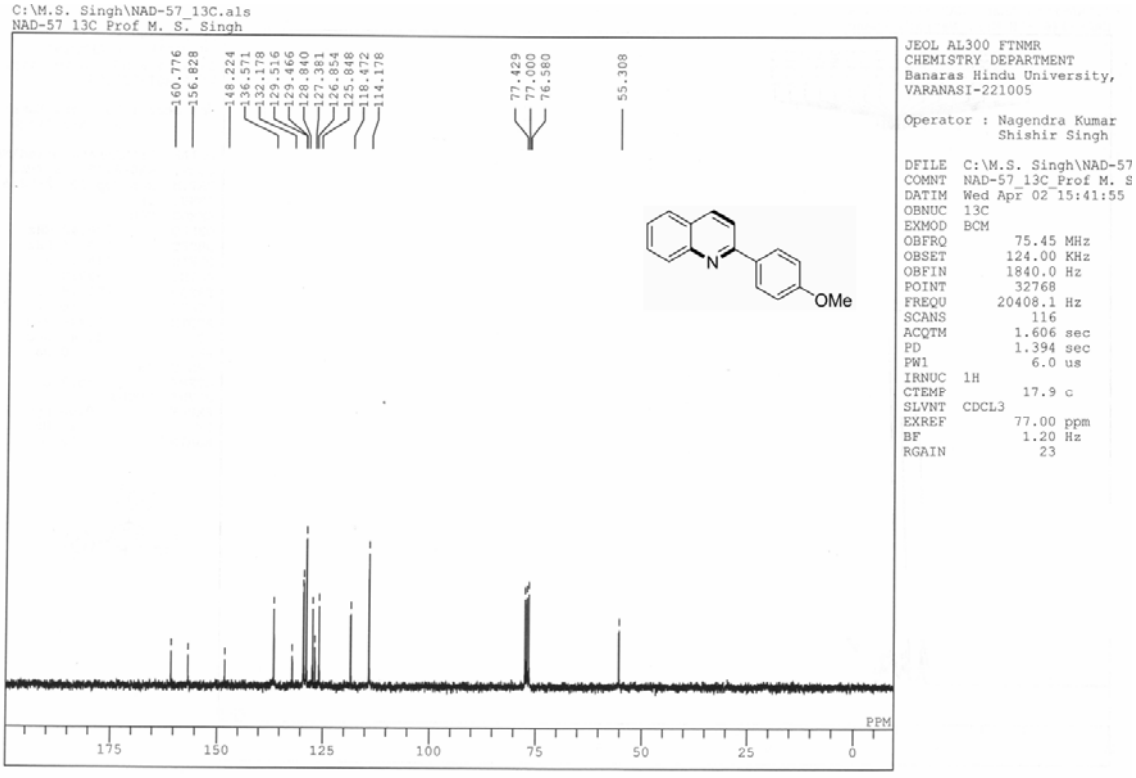
^{13}C NMR of **3am**



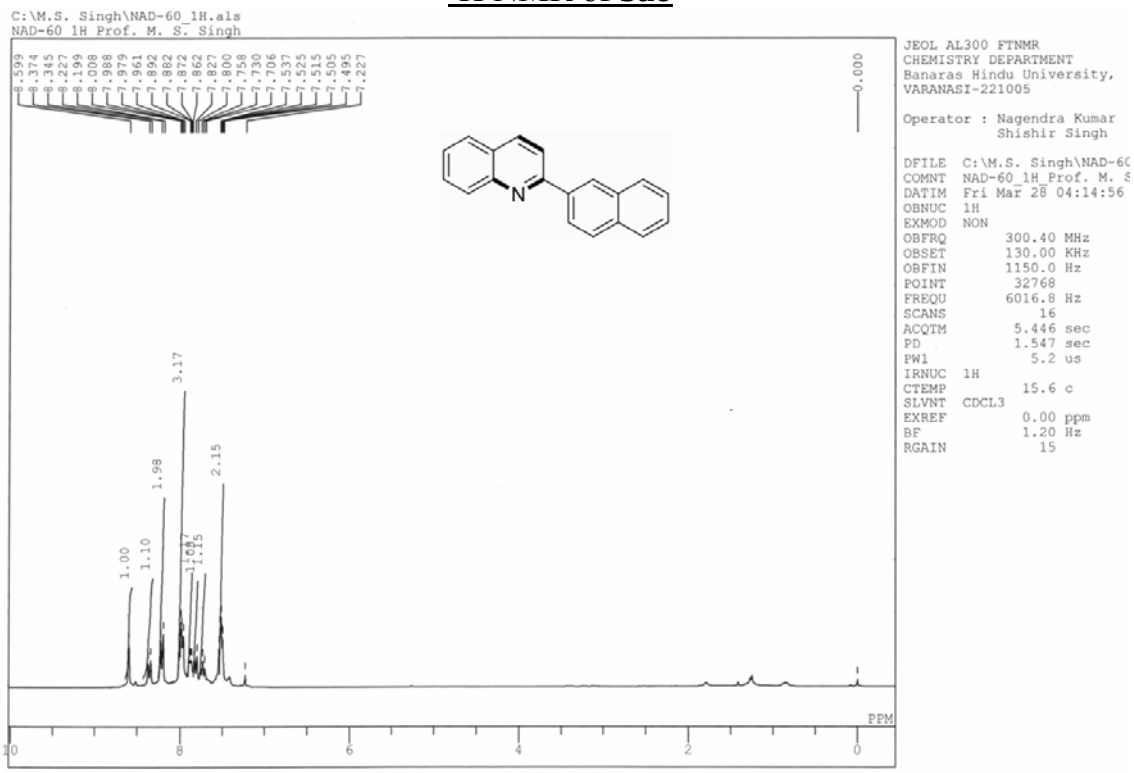
^{1}H NMR of **3an**



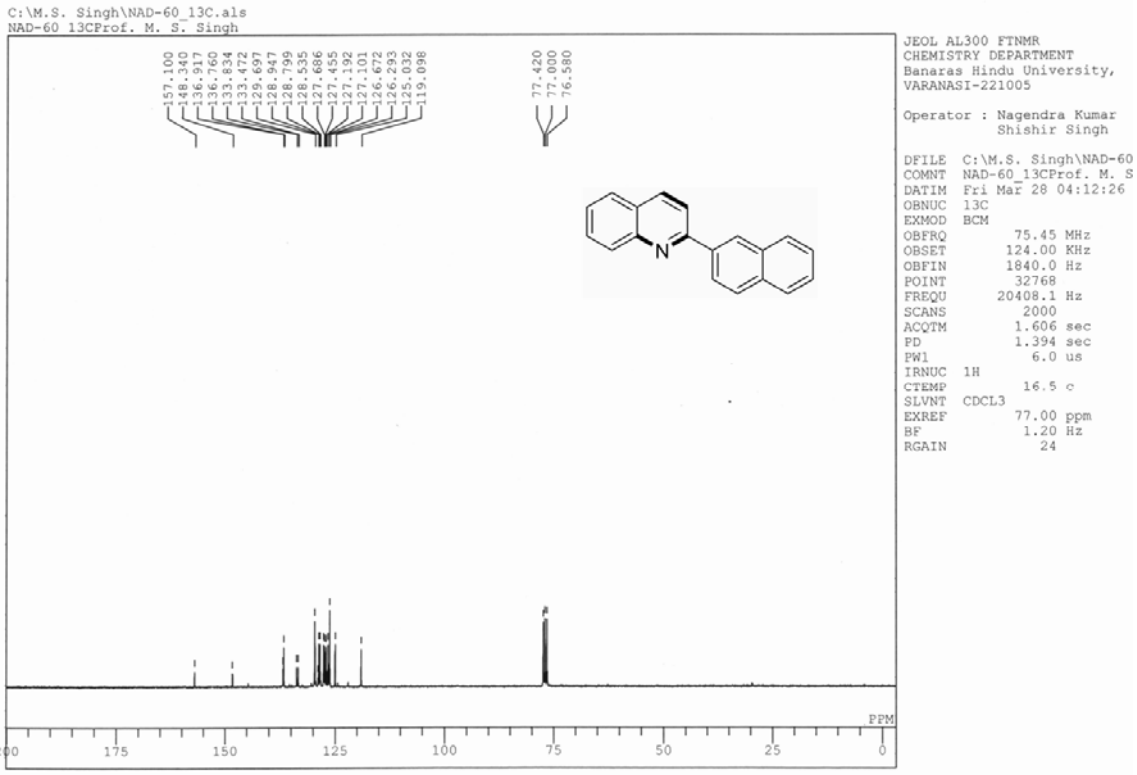
^{13}C NMR of **3an**



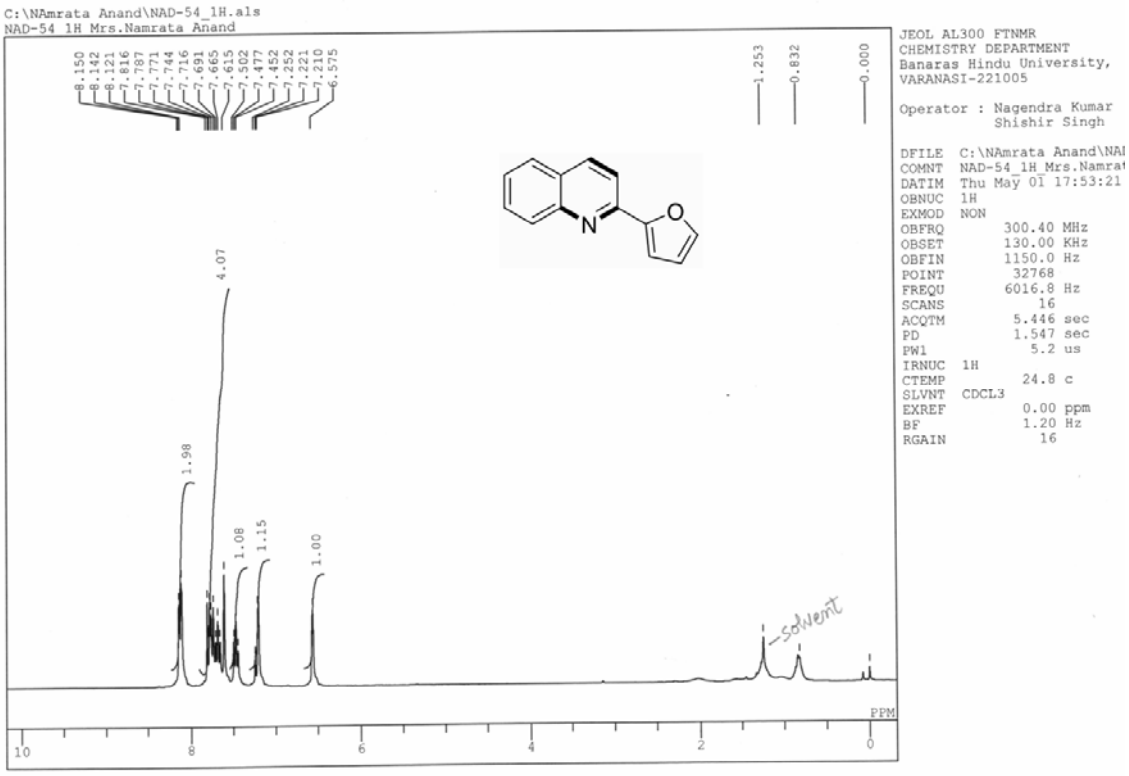
^{1}H NMR of **3ao**



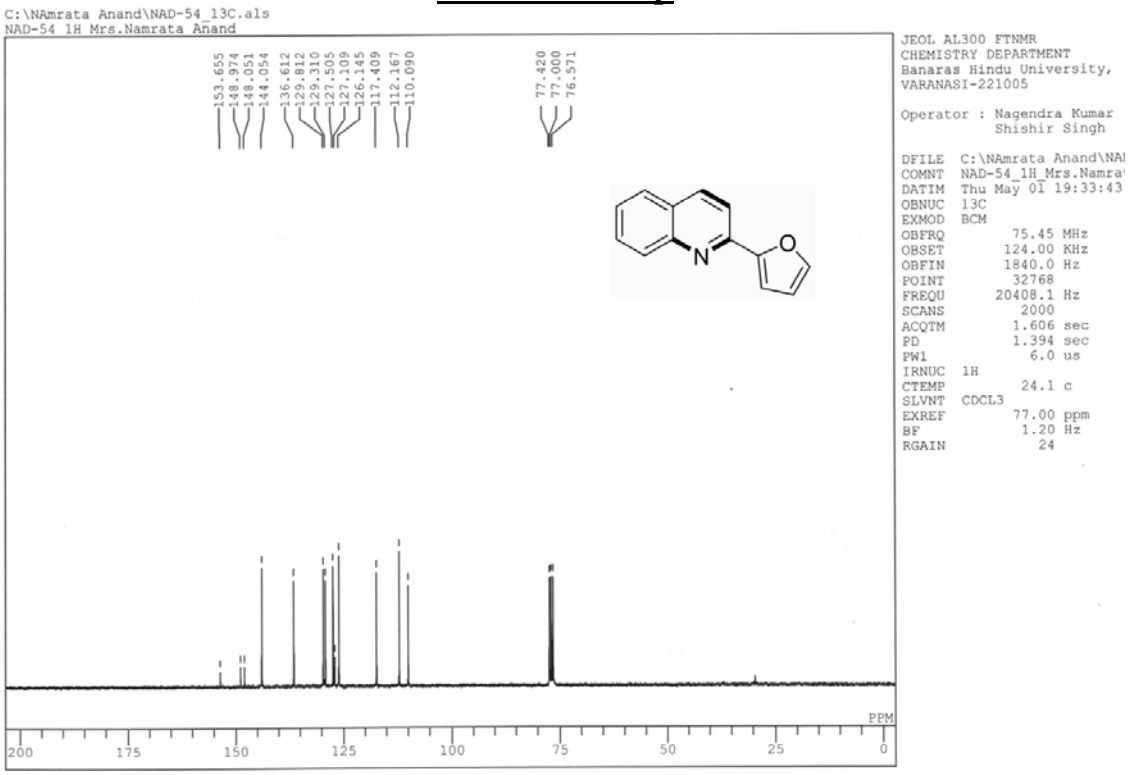
^{13}C NMR of **3ao**



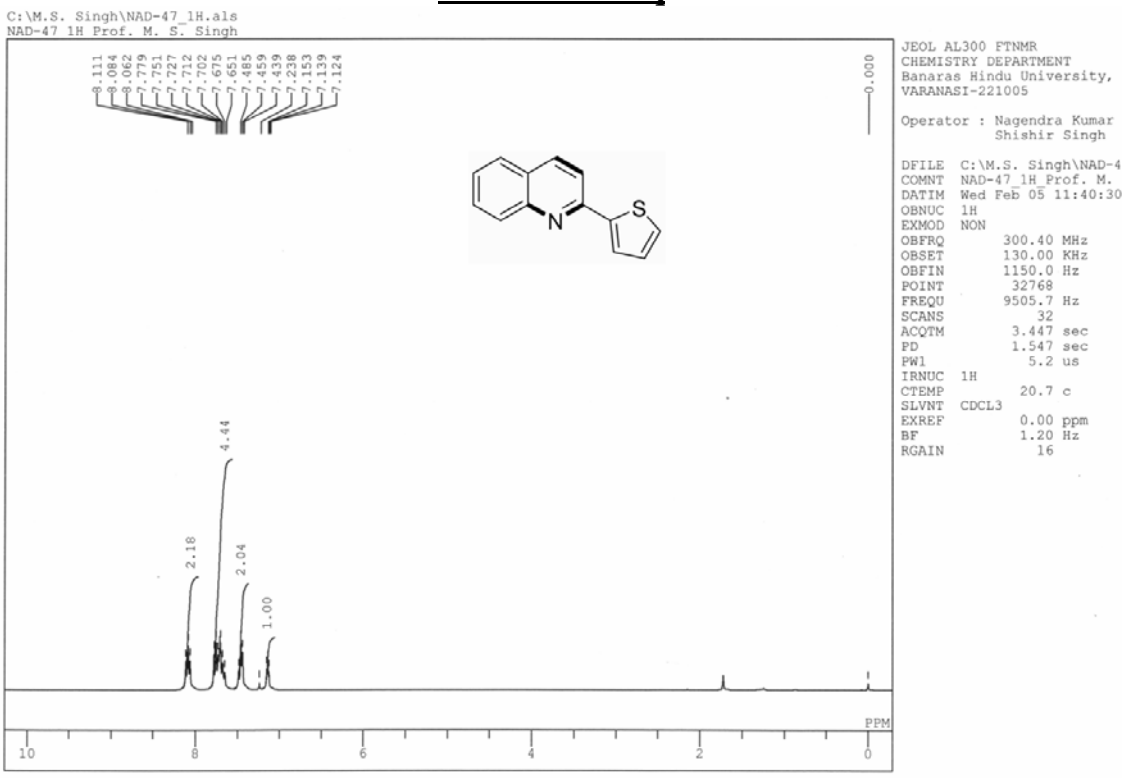
^{1}H NMR of **3ap**



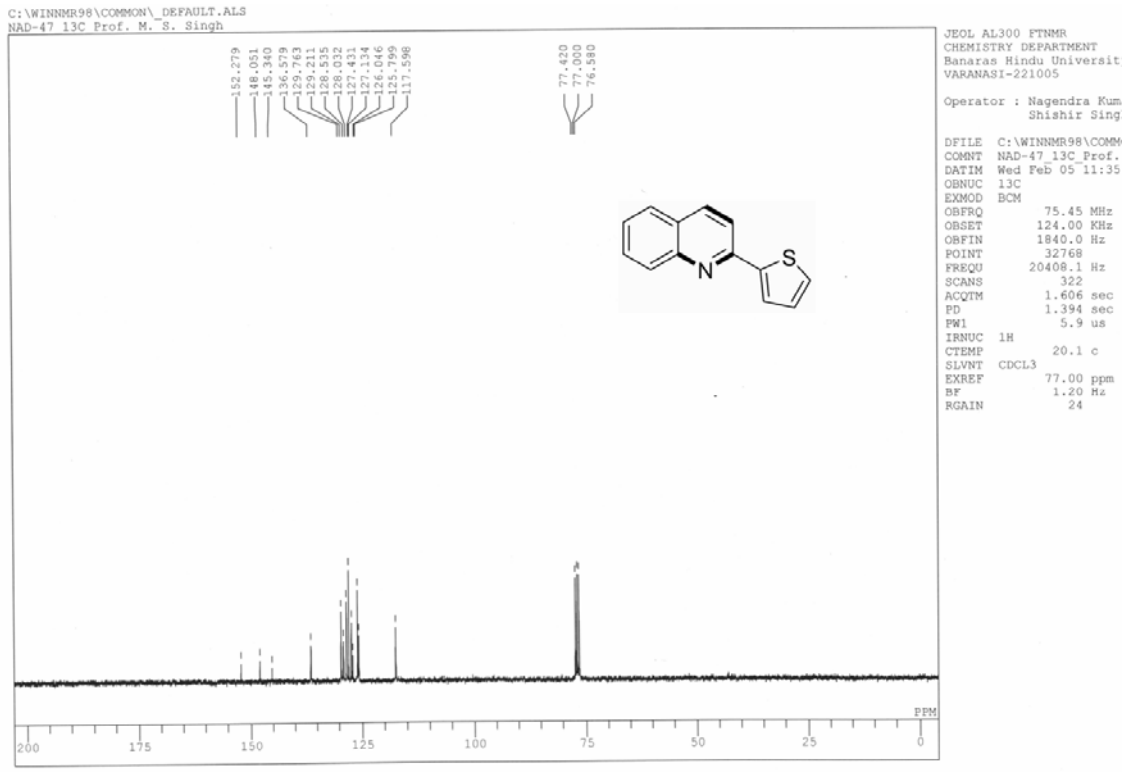
^{13}C NMR of **3ap**



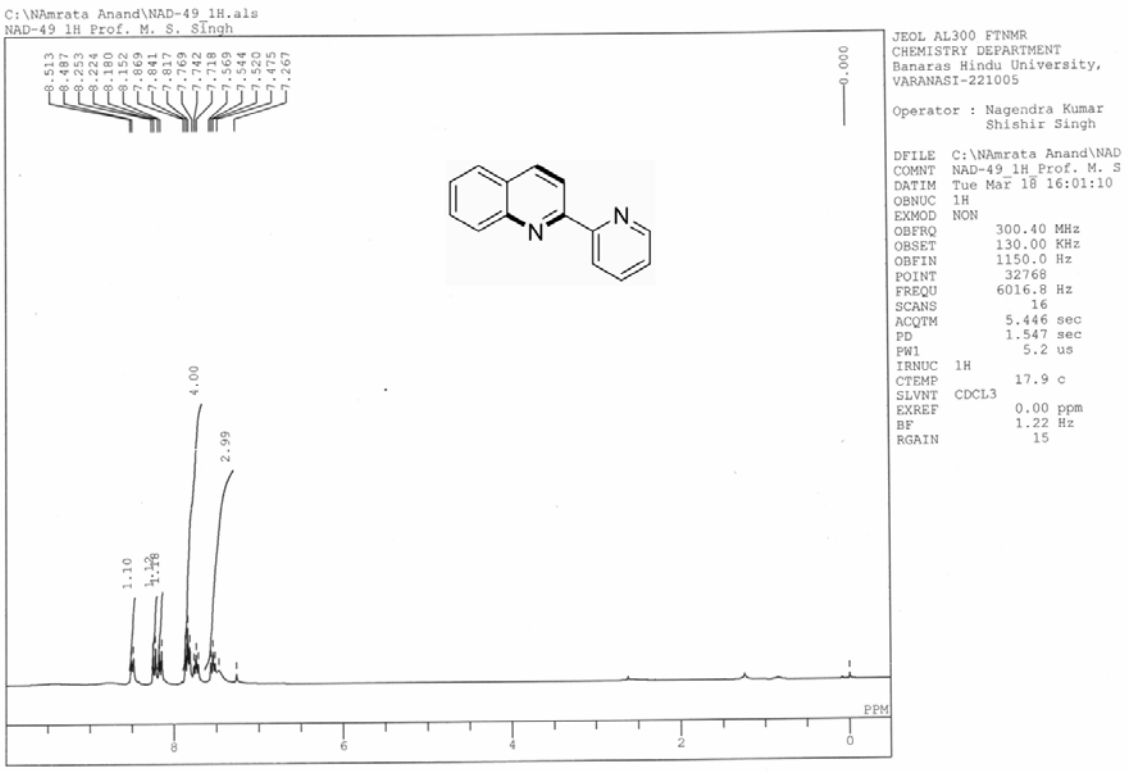
^{1}H NMR of **3aq**



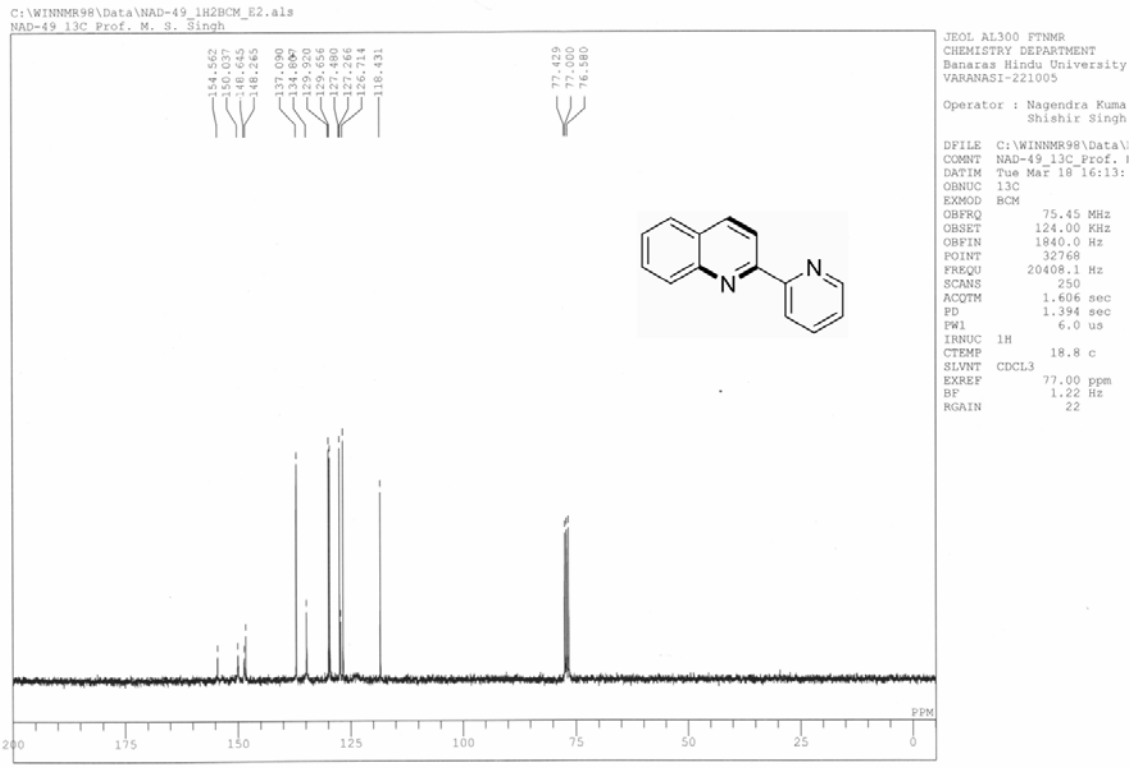
^{13}C NMR of **3aq**



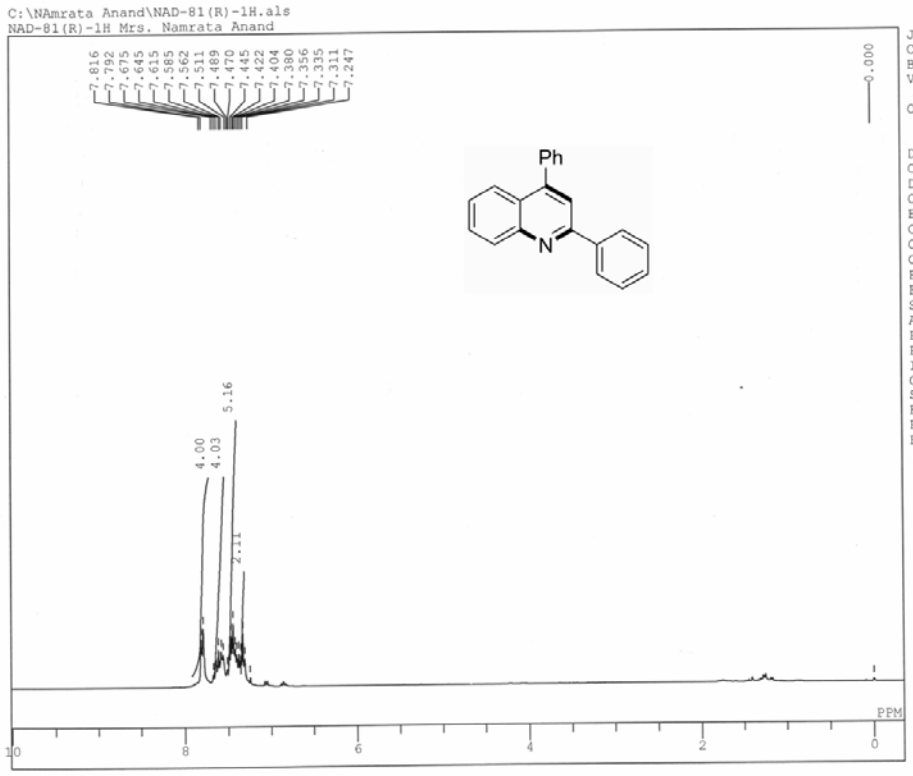
^{1}H NMR of **3ar**



^{13}C NMR of **3ar**



^{1}H NMR of **3ch**

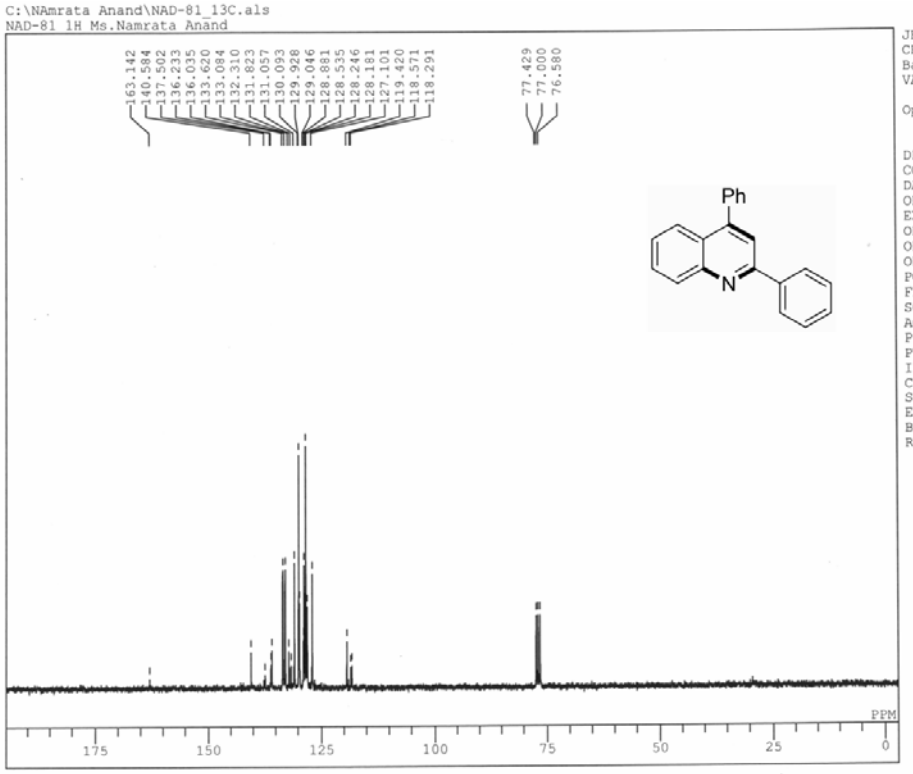


JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

Operator : Nagendra Kumar
Shishir Singh

DFILE	C:\NAmrata Anand\NA
COMNT	NAD-81(R)-1H_Mrs. N
DATIM	Mon Sep 29 12:58:57
OBNUC	1H
EXMOD	NON
OBFRQ	300.40 MHz
OBSET	130.00 KHz
OBFIN	1150.0 Hz
POINT	32768
FREQU	6016.8 Hz
SCANS	16
ACQTM	5.446 sec
PD	1.547 sec
PW1	5.0 us
IRNUC	1H
CTEMP	19.7 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	1.20 Hz
RGAIN	12

^{13}C NMR of **3ch**

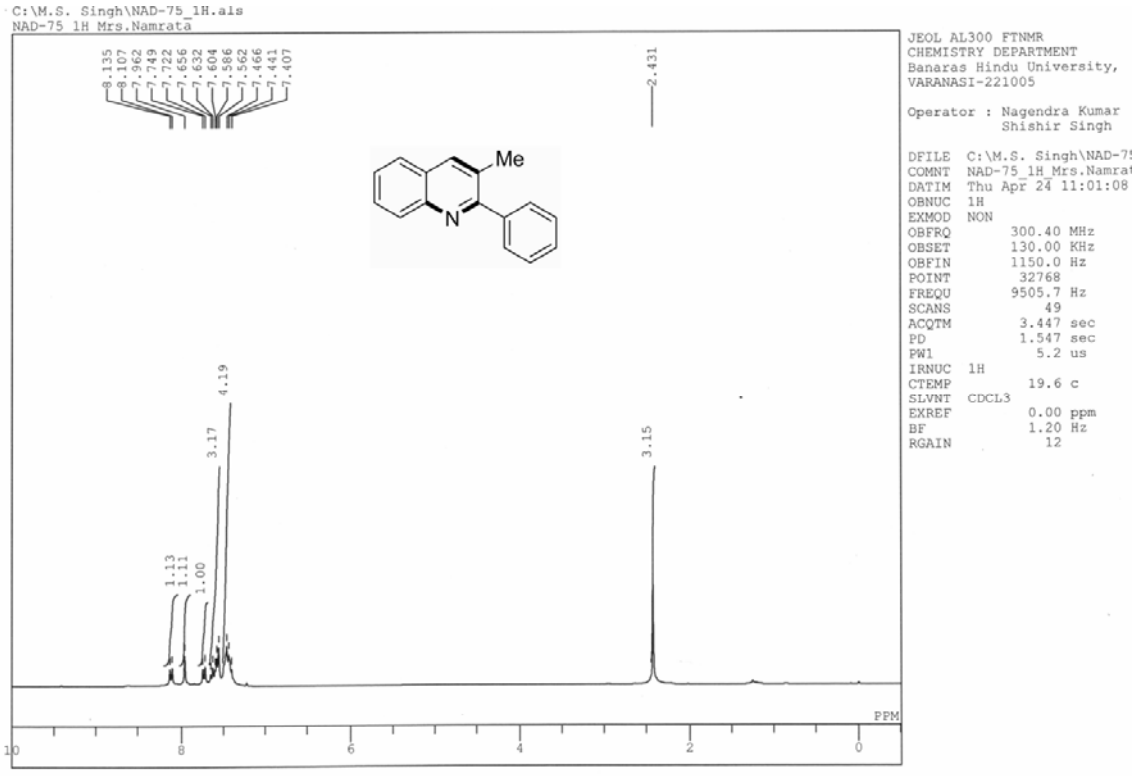


JEOL AL300 FTNMR
CHEMISTRY DEPARTMENT
Banaras Hindu University,
VARANASI-221005

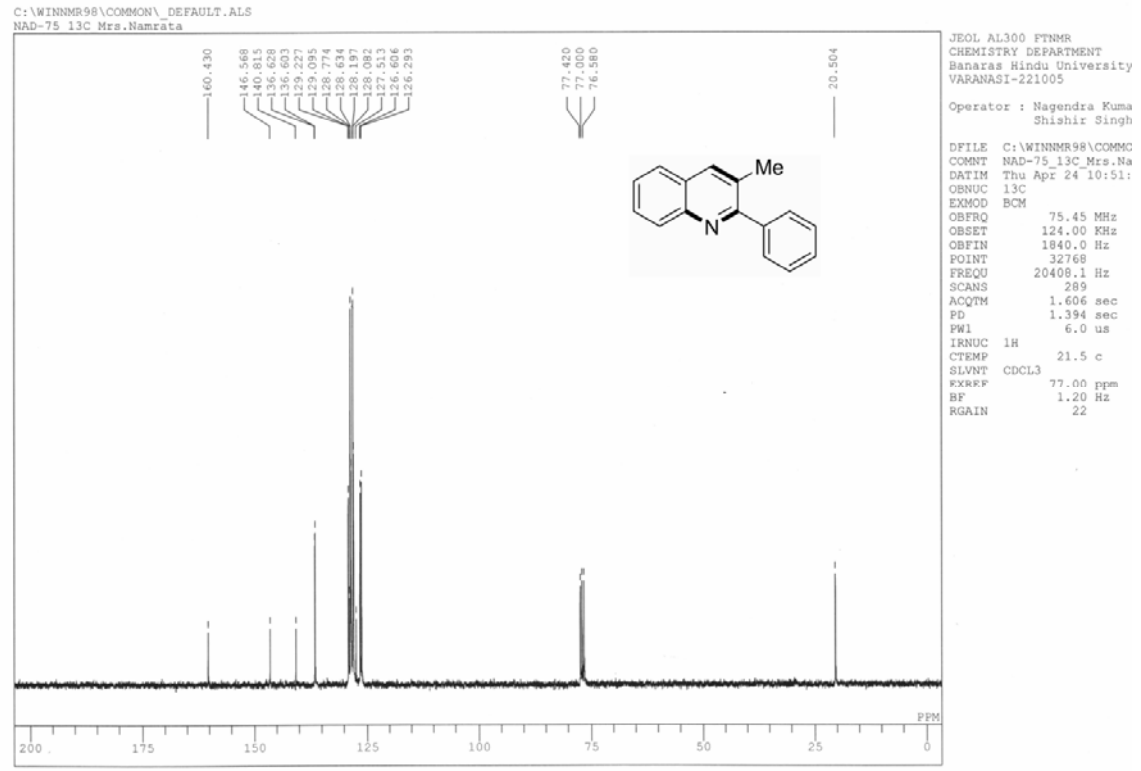
Operator : Nagendra Kumar
Shishir Singh

DFILE	C:\NAmrata Anand\NAI
COMNT	NAD-81_1H_Ms.Namrat
DATIM	Thu May 22 03:19:04
OBNUC	13C
EXMOD	BCM
OBFRQ	75.45 MHz
OBSET	124.00 KHz
OBFIN	1840.0 Hz
POINT	32768
FREQU	20408.1 Hz
SCANS	200
ACQTM	1.606 sec
PD	1.394 sec
PW1	6.0 us
IRNUC	1H
CTEMP	26.2 c
SLVNT	CDCL3
EXREF	77.00 ppm
BF	1.20 Hz
RGAIN	24

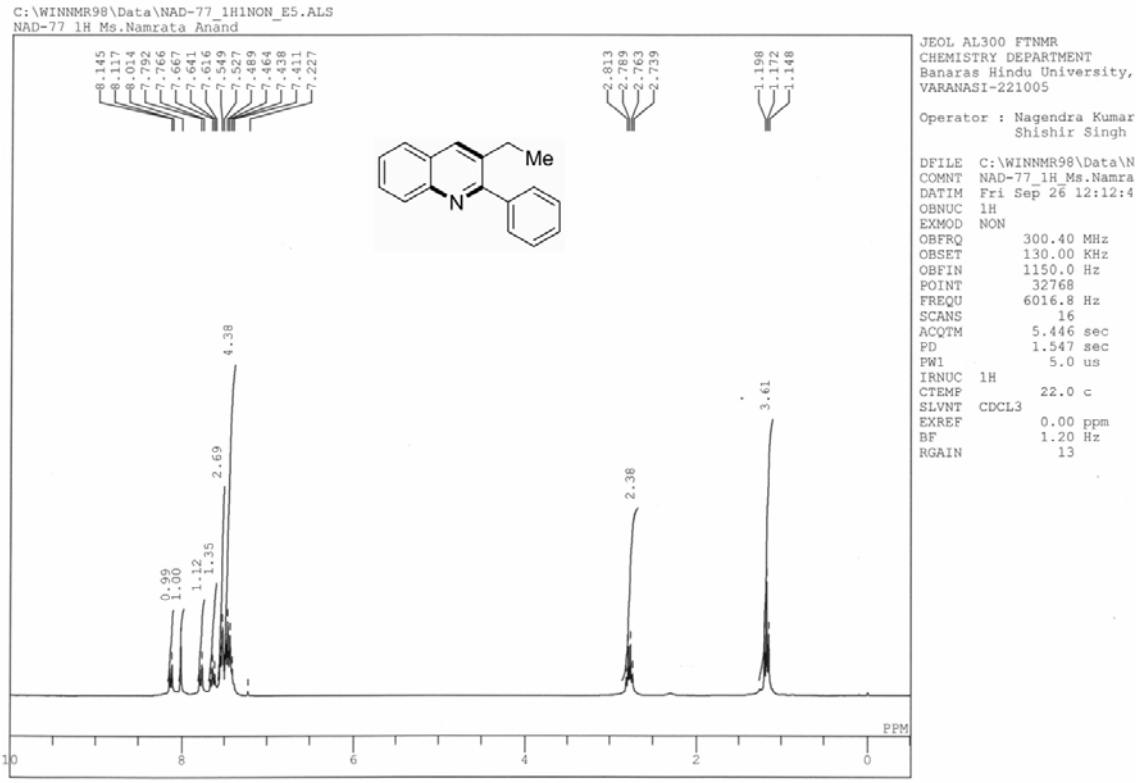
^{1}H NMR of **3as**



^{13}C NMR of **3as**



^{1}H NMR of **3at**



^{13}C NMR of **3at**