Supporting Information 1

Multicomponent, one-pot and expeditous synthesis of highly substituted new spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´-triones under micellar catalytic effect of CTAB in water

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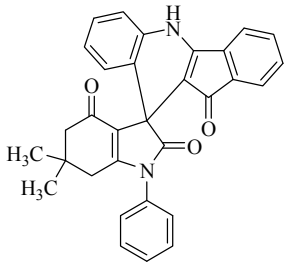
Experimental section

General Methods:

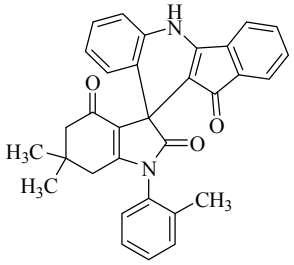
Typically highly substituted spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´-triones derivatives were developed in ecofriendly water medium in presence of CTAB (15 mol%) under the reflux condition and the progress of the reaction was checked by TLC using silica gel. All reagents were purchased from commercial sources and used without further purification. Melting points were determined in open capillary tubes. 1H NMR and 13C NMR spectra were recorded on Bruker 300 MHz instrument using CDCl3 and DMSO-d6. Chemical shifts are given in δ values referenced to the solvent. IR spectra were recorded on a Perkin Elmer Spectrophotometer RX / FT- IR system and X-Ray crystallographic analysis was performed with a Bruker SMART diffractometer.

General Procedure for the Synthesis of spiro[indole-3,10´-indeno[1,2-b]quinolin]-2,4,11´-trione derivatives:

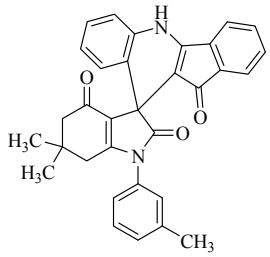
A 25 mL flask was charged with the indane-1,3-dione (**1**, 1 mmol), isatin (**2**,1 mmol), enamenones (**3**, 1 mmol) and surfactant CTAB (0.15 mmol) in water (10 mL). The mixture was refluxed for 5 h. After the completion of the reaction (monitored by TLC), a red solid compound precipitated out. After cooling the reaction mixture, the precipitate was filtered and washed with water to remove adhering surfactant CTAB. This filtrate (water containing CTAB) was reused for another cycle of the reaction. Furthermore, the solid product was washed with ethanol followed by 40 % [EtOAc / petroleum ether (60-80°C)] (10 mL x 4) to remove other organic residues which are insoluble in water. In few cases, the products were purified by column chromatography using silica gel (60-120 mesh) with 50% ethyl acetate in petroleum ether (60-80 °C) as eluant. The structures of the products (**4bb** and **4al**) were assigned on the basis of spectral and analytical crystallographic data.



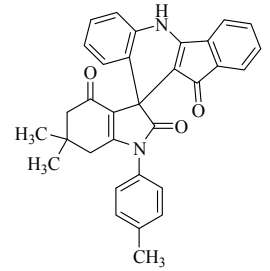
6,6-dimethyl-1-phenyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4aa**): Yield 90 % (425 mg); red solid; Mp: 338-344 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1750, 1675, 1605, 1547, 1487, 1396, 1233, 1050, 749, 705; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.98 (s, 1H, NH), 7.65-7.19 (m, 12H, ArH), 7.03 (s, 1H, ArH), 2.65 (d, *J*=17.7 Hz, 1H, CH_2), 2.23-2.15 (m, 2H, CH_2), 2.00 (d, *J*=16.2 Hz, 1H, CH_2), 1.00 (d, *J*=8.7 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.1, 188.4, 180.0, 159.6, 155.9, 136.6, 136.0, 134.7, 133.8, 131.3, 130.5, 129.5, 128.7, 128.5, 127.7, 127.2, 124.5, 123.0, 121.0, 120.1, 119.2, 117.8, 100.8, 50.9, 49.1, 35.9, 34.1, 28.8, 27.1; Anal. calcd. for $C_{31}H_{24}N_2O_3$; C: 78.79; H: 5.12; N: 5.93. Found: C: 78.99; H: 5.19; N: 5.81%.



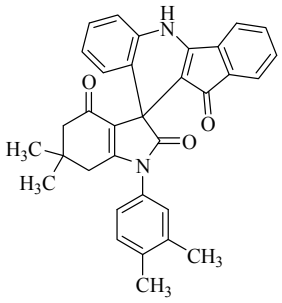
6,6-Dimethyl-1-*o*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ab**): Yield 90 % (438 mg); red solid; Mp: 336-340 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1751, 1611, 1545, 1487, 1390, 1234, 750, 703; ^{1}H NMR (300 MHz, $CDCl_3$) δ_H: 10.34 (d, *J*=5.4 Hz, 1H, NH), 7.62-7.59 (m, .5H, ArH), 7.46-7.37 (m, 3H, ArH), 7.28-7.22 (m, .5H, ArH), 7.07-7.02 (m, 2H, ArH), 6.93-6.85 (m, 2H, ArH), 6.74-6.39 (m, 4H, ArH), 2.55-2.21 (m, 7H, CH_2, CH_3), 1.30-1.22 (m, 6H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ_C: 191.6, 190.0, 180.9, 162.4, 161.9, 156.9, 138.3, 136.4, 136.2, 135.8, 134.9, 133.0, 132.6, 131.8, 131.0, 130.4, 129.8, 129.6, 129.3, 128.5, 128.2, 127.7, 126.9, 126.1, 125.6, 124.2, 121.8, 121.4, 120.0, 118.9, 118.5, 118.4, 100.1, 51.5, 50.3, 49.8, 36.9, 34.4, 29.3, 28.6, 28.0, 18.0; Anal. calcd. for $C_{32}H_{26}N_2O_3$; C: 78.99; H: 5.39; N: 5.76; Found: C: 78.74; H: 5.35; N: 5.64%.



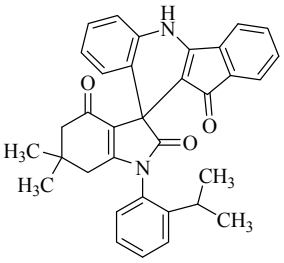
6,6-Dimethyl-1-*m*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ac**): Yield 92 % (448 mg); red solid; Mp: 332-336 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1750, 1680, 1618, 1546, 1486, 1390, 1234, 1050, 861, 761, 708, 574; ^{1}H NMR (300 MHz, $CDCl_3$) δ_H: 10.32 (s, 1H, NH), 7.45-7.28 (m, 4H, ArH), 7.06-6.90 (m, 3H, ArH), 6.84 (d, *J*=7.2 Hz, 1H, ArH), 6.74 (t, *J*=7.4 Hz, 1H, ArH), 6.64 (d, *J*=7.2 Hz, 1H, ArH), 6.55 (t, *J*=7.5 Hz, 1H, ArH), 6.45 (d, *J*=7.8 Hz, 1H, ArH), 2.52-2.35 (m, 7H, Ar-CH_3, CH_2), 1.24 (d, *J*=10.8 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ_C: 191.9, 190.0, 181.2, 162.1, 156.9, 139.9, 136.4, 135.9, 134.8, 133.7, 130.5, 130.0, 129.7, 129.5, 128.5, 126.2, 124.9, 124.2, 121.7, 121.4, 119.9, 118.8, 118.5, 100.1, 51.6, 50.0, 37.0, 34.4, 29.0, 28.3, 21.4; Anal. calcd. for $C_{32}H_{26}N_2O_3$; C: 78.99; H: 5.39; N: 5.76; Found: C: 78.82; H: 5.35; N: 5.64%.



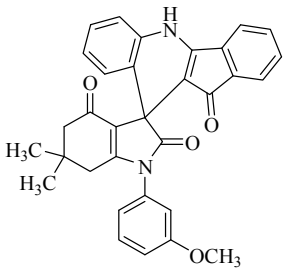
6,6-Dimethyl-1-*p*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ad**): Yield 93 % (453 mg); red solid; Mp: 335-342 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1745, 1626, 1600, 1486, 1396, 1232, 1048, 768; ^{1}H NMR (300 MHz, $CDCl_3$) δ_H: 10.32 (s, 1H, NH), 7.42-7.28 (m, 4H, ArH), 7.05-6.89 (m, 3H, ArH), 6.83 (d, *J*=7.5 Hz, 1H, ArH), 6.73 (t, *J*=7.5 Hz, 1H, ArH), 6.63 (d, *J*=7.2 Hz, 1H, ArH), 6.53 (t, *J*=7.1 Hz, 1H, ArH), 6.44 (d, *J*=7.5 Hz, 1H, ArH), 2.51-2.40 (m, 7H, Ar-CH_3, CH_2), 1.23 (d, *J*=10.5 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ_C: 191.8, 190.0, 181.4, 162.1, 156.9, 139.3, 136.4, 135.9, 134.8, 131.2, 130.5, 130.4, 129.7, 128.4, 127.7, 126.2, 124.2, 121.7, 121.4, 119.9, 118.8, 118.5, 100.1, 51.5, 50.0, 49.5, 36.9, 34.4, 29.0, 28.2, 21.3; Anal. calcd. for $C_{32}H_{26}N_2O_3$; C: 78.99; H: 5.39; N: 5.76; Found: C: 78.77; H: 5.41; N: 5.65%.



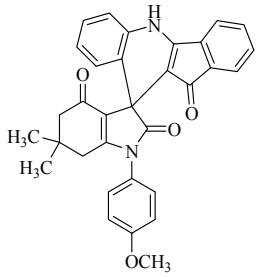
1-(3,4-Dimethyl-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ae**): Yield 92 % (461 mg); red solid; Mp: 340-346 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1752, 1603, 1546, 1235, 1051, 768, 705; ^1H NMR (300 MHz, DMSO-d_6) δ_H: 10.89 (s, 1H, NH), 7.56 (d, *J*=6.9 Hz, 1H, ArH), 7.42-7.09 (m, 7H, ArH), 6.98-6.92 (m, 2H, ArH), 5.66 (s, 1H, ArH), 2.56-2.42 (m, 2H, CH_2), 2.16-2.06 (m, 6H, Ar-CH_3), 2.00-1.90 (m, 2H, CH_2), 0.93 (d, *J*=7.5 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.5, 188.9, 180.6, 160.5, 156.4, 138.1, 137.6, 137.0, 136.5, 135.1, 131.8, 131.7, 131.0, 130.8, 128.9, 127.6, 125.5, 125.0, 123.6, 121.3, 120.6, 119.6, 118.3, 101.2, 55.3, 51.3, 49.4, 36.3, 34.5, 31.1, 29.3, 27.6, 19.8, 19.6; Anal. calcd. for $C_{33}H_{28}N_2O_3$; C: 79.18; H: 5.64; N: 5.60; Found: C: 79.41; H: 5.69; N: 5.72%.



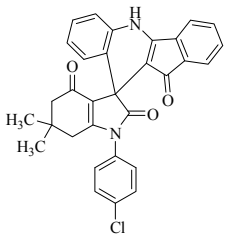
1-(2-Isopropyl-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4af**): Yield 92 % (473 mg); red solid; Mp: □350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1747, 1604, 1542, 1394, 1231, 1051, 750, 701; ^1H NMR (300 MHz, DMSO-d_6) δ_H: 10.93 (s, 1H, NH), 7.66 (d, *J*=6.9 Hz, 1H, ArH), 7.58-7.04 (m, 11H, ArH), 2.62 (d, *J*=17.7 Hz, 1H, CH_2), 2.26 (d, *J*=15.6 Hz, 1H, CH_2), 2.17-1.92 (m, 2H, CH_2), 1.33-1.05 (m, 13H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C:190.0, 188.3, 180.3, 160.4, 156.0, 148.0, 136.3, 136.0, 134.7, 131.3, 131.2, 130.5, 130.0, 128.8, 128.6, 126.9, 124.6, 123.2, 121.0, 120.3, 119.1, 117.9, 100.2, 51.0, 48.8, 35.9, 34.2, 30.7, 29.4, 27.2, 26.7, 24.1, 23.7; Anal. calcd. for $C_{34}H_{30}N_2O_3$; C: 79.35; H: 5.88; N: 5.44; Found: C: 79.58; H: 5.82; N: 5.57%.



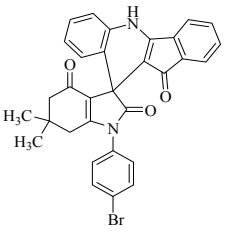
1-(3-Methoxy-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ag**): Yield 88 % (442 mg); red solid; Mp: 336-344 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.55; IR (ν_{max}, KBr, cm^{-1}): 1750, 1630, 1542, 1512, 1482, 13851248, 1181, 1049, 768, 690; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.98 (s, 1H, NH), 7.72-7.07 (m, 12H, ArH), 3.85 (s, 3H, OCH_3), 2.70 (d, *J*=17.4 Hz, 1H, CH_2), 2.28-2.12 (m, 2H, CH_2), 2.03 (d, *J*=16.2 Hz, 1H, CH_2), 1.04 (d, *J*=11.1 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.7, 188.9, 180.4, 160.4, 160.2, 156.4, 137.0, 136.5, 135.4, 135.1, 131.9, 131.0, 130.8, 129.0, 127.8, 125.0, 123.5, 121.4, 120.6, 120.4, 119.7, 118.3, 114.7, 101.2, 56.0, 51.4, 49.5, 37.9, 36.3, 34.6, 29.4, 27.5; Anal. calcd. for $C_{32}H_{26}N_2O_4$; C: 76.48; H: 5.21; N: 5.57; Found: C: 76.66; H: 5.17; N: 5.45%.



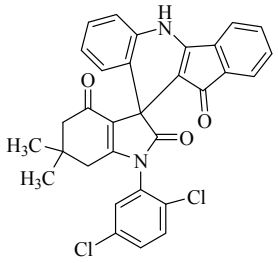
1-(4-Methoxy-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ah**): Yield 94 % (472 mg); red solid; Mp: □350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1749, 1625, 1601, 1544, 1513, 1485, 1388, 1252, 1051, 770; ^{1}H NMR (300 MHz, $CDCl_3$) δ_H: 10.27 (s, 1H, NH), 7.33 (d, *J*=8.7 Hz, 2H, ArH), 6.99-6.80 (m, 5H, ArH), 6.74 (d, *J*=7.2 Hz, 1H, ArH), 6.65 (t, *J*=7.1 Hz, 1H, ArH), 6.54 (d, *J*=6.9 Hz, 1H, ArH), 6.46 (t, *J*=7.1 Hz, 1H, ArH), 6.37 (d, *J*=7.1 Hz, 1H, ArH), 3.79 (s, 3H, OCH_3), 2.41-2.31 (m, 4H, $CH_{2)}$, 1.14 (d, *J*=10.2 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, $CDCl_3$) δ_C: 191.8, 190.0, 181.5, 162.4, 160.0, 157.0, 136.4, 135.9, 134.8, 130.5, 129.7, 129.2, 128.4, 126.3, 126.2, 124.2, 121.7, 121.3, 119.9, 118.8, 118.5, 115.0, 100.1, 55.6, 51.5, 49.9, 36.9, 34.4, 29.0, 28.3; Anal. calcd. For $C_{32}H_{26}N_2O_4$; C: 76.48; H: 5.21; N: 5.57; Found: C: 76.69; H: 5.26; N: 5.69%.



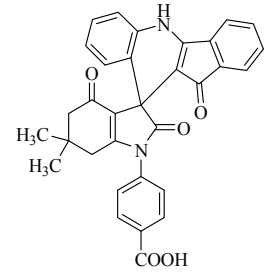
1-(4-Chloro-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ai**): Yield 85 % (431 mg); red solid; Mp: 332-338 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1749, 1675, 1632, 1544, 1487, 1386, 1230, 1047, 752, 703; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.01 (s, 1H, NH), 7.70-7.66 (m, 3H, ArH), 7.58-7.48 (m, 3H, ArH), 7.44 (t, *J*=7.2 Hz, 1H, ArH), 7.36-7.23 (m, 3H, ArH), 7.09-6.96 (m, 2H, ArH), 2.70 (d, *J*=18.0 Hz, 1H, CH_2), 2.29-2.19 (m, 2H, CH_2), 2.03 (d, *J*=15.9 Hz, 1H, CH_2), 1.10-0.95 (m, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.7, 188.9, 180.4, 159.7, 156.4, 137.0, 136.4, 135.1, 133.8, 133.2, 131.8, 131.1, 130.1, 129.1, 127.9, 125.1, 123.3, 121.5, 120.6, 119.8, 118.3, 101.1, 51.4, 49.6, 36.2, 34.6, 29.4, 27.5; Anal. calcd. for $C_{31}H_{23}ClN_2O_3$; C: 73.44; H: 4.57; N: 5.53; Found: C: 73.59; H: 4.54; N: 5.45%.



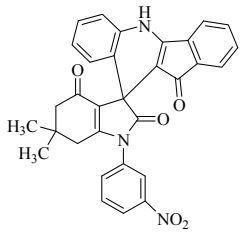
1-(4-Bromo-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4aj**): Yield 87 % (480 mg); red solid; Mp: 336-340 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.55; IR (ν_{max}, KBr, cm^{-1}): 1746, 1674, 1607, 1542, 1487, 1231, 1046, 750; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.01 (s, 1H, NH), 7.80 (d, *J*=8.4 Hz, 2H, ArH), 7.65 (d, *J*=6.9 Hz, 1H, ArH), 7.54-7.21 (m, 7H, ArH), 7.12-7.04 (m, 2H, ArH), 2.68 (d, *J*=17.7 Hz, 1H, CH_2), 2.22 (t, *J*=15.6 Hz, 2H, CH_2), 2.01 (d, *J*=17.2 Hz, 1H, CH_2), 1.02 (d, *J*=13.5 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.7, 188.9, 180.3, 159.6, 156.4, 137.0, 136.4, 135.1, 133.6, 133.0, 131.8, 131.1, 130.3, 129.1, 127.8, 125.0, 123.3, 122.2, 121.5, 120.6, 119.7, 118.3, 101.1, 72.4, 51.3, 49.6, 36.2, 34.6, 29.3, 27.5; Anal. calcd. for $C_{31}H_{23}BrN_2O_3$; C: 67.52; H: 4.20; N: 5.08; Found: C: 67.74; H: 4.26; N: 5.19%.



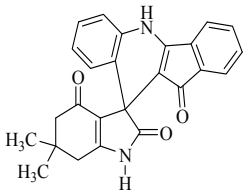
1-(2,5-Dichloro-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ak**): Yield 78 % (442 mg); red solid; Mp: 325-330 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1757, 1645, 1575, 1548, 1492, 1387, 1232, 1036, 848, 755, 702; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.10 (s, 1H, NH), 7.89-7.04 (m, 11H, ArH), 2.57-2.38 (m, 2H, CH_2), 2.22-2.07 (m, 2H, CH_2), 1.05 (d, *J*=6.9 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.8, 189.1, 179.7, 158.8, 156.6, 137.1, 136.3, 135.1, 133.1, 132.3, 132.0, 131.9, 131.2, 130.8, 129.3, 127.6, 125.3, 122.9, 121.8, 120.8, 119.9, 118.6, 100.9, 51.3, 49.7, 35.3, 34.7, 28.4, 28.1; Anal. calcd. for $C_{31}H_{22}Cl_2N_2O_3$; C: 68.77; H: 4.10; N: 5.17; Found: C: 68.91; H: 4.04; N: 5.28%.



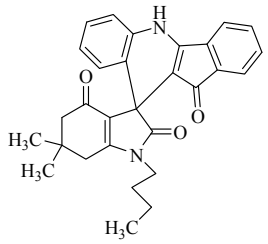
1-*p*-Benzoicacid-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4al**): Yield 88 % (455 mg); red solid; Mp: 340-344 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.45; IR (ν_{max}, KBr, cm^{-1}): 1746, 1601, 1542, 1394, 1233, 1053, 753, 707; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 13.16 (s, 1H, COOH), 10.98 (s, 1H, NH), 8.10 (d, *J*=8.4 Hz, 2H, ArH), 7.63-7.56 (m, 3H, ArH), 7.45 (t, *J*=7.4 Hz, 1H, ArH), 7.36 (t, *J*=7.5 Hz, 1H, ArH), 7.26-7.17 (m, 3H, ArH), 7.01 (d, J=3.9 Hz, 2H, ArH), 2.69 (d, *J*=18.0 Hz, 1H, CH_2), 2.27-2.14 (m, 2H, CH_2), 1.98 (d, *J*=15.9 Hz, 1H, CH_2), 0.98 (d, J=12 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.4, 188.5, 179.8, 166.6, 159.0, 137.6, 136.6, 136.0, 134.7, 131.4, 130.8, 130.6, 130.5, 128.7, 127.7, 127.3, 124.6, 122.9, 121.3, 120.2, 119.3, 117.9, 100.7, 50.9, 49.2, 35.9, 34.2, 30.7, 28.9, 27.1; Anal. calcd. for $C_{32}H_{24}N_2O_5$; C: 74.41; H: 4.68; N: 5.42; Found: C: 74.64; H: 4.65; N: 5.25%.



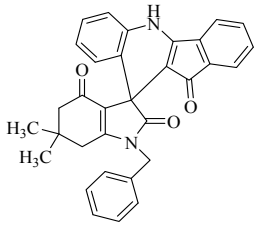
6,6-Dimethyl-1-(3-nitro-phenyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4am**): Yield 84 % (435 mg); red solid; Mp: 336-345 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1743, 1609, 1529, 1486, 1385, 1349, 1228, 1047, 703; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.97 (s, 1H, NH), 8.34-8.27 (m, 2H, ArH), 7.91 (d, *J*=7.8 Hz, 1H, ArH), 7.82 (t, *J*=8.1 Hz, 1H, ArH), 7.58 (d, *J*=6.9 Hz, 1H, ArH), 7.41 (t, *J*=7.2 Hz, 1H, ArH), 7.32 (t, *J*=7.4 Hz, 1H, ArH), 7.24-7.09 (m, 4H, ArH), 6.97 (t, *J*=7.2 Hz, 1H, ArH), 2.68 (d, *J*=17.7 Hz, 1H, CH_2), 2.24-2.10 (m, 2H, CH_2), 1.95 (d, *J*=15.9 Hz, 1H, CH_2), 0.94 (d, *J*=15.3 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.9, 189.0, 180.3, 159.1, 156.5, 148.8, 137.0, 136.4, 135.3, 135.1, 134.8, 131.8, 131.5, 131.1, 129.1, 128.2, 125.1, 124.0, 123.2, 121.7, 120.7, 119.8, 118.3, 101.0, 51.4, 49.7, 36.2, 34.7, 29.4, 27.4; Anal. calcd. for $C_{31}H_{23}N_3O_5$; C: 71.94; H: 4.48; N: 8.12; Found: C: 71.88; H: 4.45; N: 8.27%.



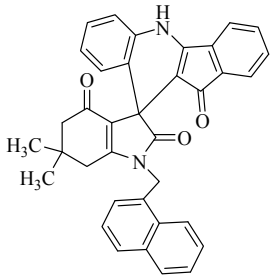
6,6-Dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4an**): Yield 75 % (297 mg); red solid; Mp: 340-346 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1677, 1642, 1508, 1310, 1195, 1085, 902, 747; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.63 (s, 1H, NH), 10.28 (s, 1H, NH), 7.61 (d, *J*=6.9 Hz, 1H, ArH), 7.47 (t, *J*=7.1 Hz, 1H, ArH), 7.34 (t, *J*=7.2 Hz, 1H, ArH), 7.20 (d, *J*=6.6 Hz, 1H, ArH), 7.06 (t, *J*=7.2 Hz, 1H, ArH), 6.90 (d, *J*=6.9 Hz, 1H, ArH), 6.79-6.73 (m, 2H, ArH), 2.59, 2.69 (ABq, *J*=17.1 Hz, 2H, CH_2), 2.10 (ABq, *J*=16.2 Hz, 2H, CH_2), 1.04 (d, *J*=16.2 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 193.9, 189.5, 178.9, 153.6, 151.4, 142.6, 136.0, 135.7, 132.7, 132.1, 130.5, 127.5, 122.8, 121.0, 120.7, 119.5, 112.7, 108.5, 108.2, 50.5, 47.4, 32.2, 28.2, 26.8; Anal. calcd. for $C_{25}H_{20}N_2O_3$; C: 75.74; H: 5.08; N: 7.07; Found: C: 75.92; H: 5.02; N: 7.18%.



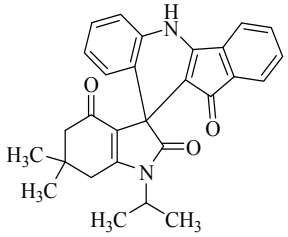
1-Butyl-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ao**): Yield 86 % (389 mg); red solid; Mp: 335-342 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1713, 1678, 1613, 1545, 1489, 1231, 1032, 756, 703; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.90 (s, 1H, NH), 7.62 (d, *J*=6.9 Hz, 1H, ArH), 7.47 (t, *J*=7.2 Hz, 1H, ArH), 7.37 (t, *J*=7.1 Hz, 1H, ArH), 7.25-7.17 (m, 3H, ArH), 6.97 (t, *J*=6.9 Hz, 1H, ArH), 6.72 (d, *J*=7.5 Hz, 1H, ArH), 3.61-3.45 (m, 2H, CH_2), 2.79, 2.66 (ABq, *J*=17.7 Hz, 2H, CH_2), 2.12, 2.00 (ABq, *J*=15.8 Hz, 2H, CH_2), 1.58 (t, *J*=6.6 Hz, 2H, CH_2), 1.39 (t, *J*=6.5 Hz, 2H, CH_2), 1.09-0.90 (m, 9H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 189.5, 188.2, 180.8, 160.9, 155.9, 136.5, 136.1, 134.7, 131.2, 130.4, 128.3, 126.6, 124.3, 123.3, 120.7, 120.0, 119.0, 117.8, 100.7, 56.1, 50.7, 48.7, 34.9, 34.0, 30.9, 28.7, 27.5, 19.4; Anal. calcd. for $C_{29}H_{28}N_2O_3$; C: 76.97; H: 6.24; N: 6.19; Found: C: 77.23; H: 6.29; N: 6.37%.



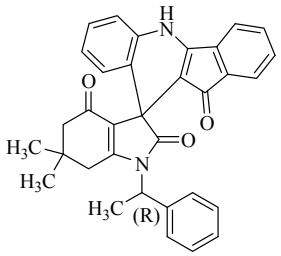
1-Benzyl-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ap**): Yield 95 % (462 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1698, 1648, 1603, 1542, 1483, 1389, 1231, 1071, 977, 859, 743, 705; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.93 (s, 1H, NH), 7.65 (d, *J*=7.2 Hz, 1H, ArH), 7.51-7.20 (m, 10H, ArH), 6.99-6.96 (m, 1H, ArH), 6.79 (d, *J*=7.5 Hz, 1H, ArH), 4.96, 4.81 (ABq, *J*=16.4 Hz, 2H, Ar-CH_2), 2.72 (d, *J*=17.7 Hz, 1H, CH_2), 2.41 (d, *J*=17.7 Hz, 1H, CH_2), 2.14, 1.98 (ABq, *J*=15.9 Hz, 2H, CH_2), 1.02 (s, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 189.6, 188.3, 180.8, 160.6, 156.1, 136.8, 136.4, 136.0, 134.7, 131.2, 130.5, 128.7, 128.5, 127.4, 126.7, 126.6, 124.3, 123.2, 120.9, 120.1, 119.1, 117.9, 100.4, 50.7, 48.7, 43.3, 35.1, 34.0, 28.8, 27.4; Anal. calcd. for $C_{32}H_{26}N_2O_3$; C: 78.99; H: 5.39; N: 5.76; Found: C: 79.15; H: 5.32; N: 5.88%.



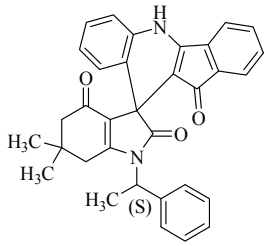
6,6-Dimethyl-1-naphthalen-1-ylmethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4aq**): Yield 96 % (515 mg); red solid; Mp: □350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1740, 1600, 1543, 1487, 1399, 1232, 1062, 775, 699; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.49 (s, 1H, NH), 7.96-7.75 (m, 4H, ArH), 7.57-7.45 (m, 3H, ArH), 7.16-7.07 (m, 4H, ArH), 6.84-6.73 (m, 4H, ArH), 5.32 (s, 2H, Ar-CH_2), 2.44 (s, 2H, CH_2), 2.18 (s, 2H, CH_2), 1.05 (d, *J*=26.1 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.3, 189.0, 181.0, 160.7, 156.5, 136.1, 135.8, 134.7, 133.2, 130.7, 130.3, 129.9, 129.6, 128.5, 128.0, 127.9, 126.2, 126.0, 125.6, 125.3, 123.9, 122.1, 121.2, 119.7, 118.4, 118.0, 99.7, 50.7, 49.1, 41.9, 35.6, 33.8, 28.7, 27.4; Anal. calcd. for $C_{36}H_{28}N_2O_3$; C: 80.58; H: 5.26; N: 5.22; Found: C: 80.78; H: 5.29; N: 5.35%.



1-Isopropyl-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ar**): Yield 82 % (360 mg); red solid; Mp: 316-322 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1717, 1618, 1396, 1232, 1031, 754, 700, 572; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.85 (s, 1H, NH), 7.61 (d, *J*=7.2 Hz, 1H, ArH), 7.47 (t, *J*=7.4 Hz, 1H, ArH), 7.37 (t, *J*=7.4 Hz, 1H, ArH), 7.24-7.16 (m, 3H, ArH), 6.98 (t, *J*=7.2 Hz, 1H, ArH), 6.72 (d, *J*=7.5 Hz, 1H, ArH), 4.28-4.23 (m, 1H, CH), 2.74 (ABq, *J*=17.7 Hz, 2H, CH_2), 2.10, 1.97 (ABq, *J*=16.1 Hz, 2H, CH_2), 1.44-1.42 (m, 6H, CH_3), 1.08 (d, *J*=3.9 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 189.6, 188.2, 180.9, 160.8, 136.6, 136.1, 134.7, 131.2, 130.4, 128.3, 126.5, 124.4, 123.6, 121.0, 120.0, 119.0, 117.7, 101.0, 54.7, 50.4, 48.9, 45.1, 35.7, 34.0, 28.8, 27.5, 20.1; Anal. calcd. for $C_{28}H_{26}N_2O_3$; C: 76.69; H: 5.98; N: 6.39; Found: C: 76.47; H: 5.92; N: 6.28%.

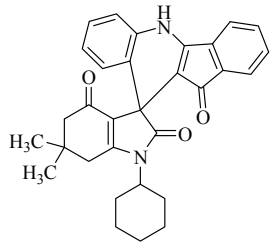


6,6-Dimethyl-1-(α-1-phenyl-ethyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4as**): Yield 94 % (471 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1718, 1601, 1545, 1399, 1230, 1027, 756, 697, 571; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.93 (d, *J*=6.6 Hz, 1H, NH), 7.63 (d, *J*=5.4 Hz 1H, ArH), 7.46-7.21 (m, 9H, ArH), 7.06-7.00 (m, IH, ArH), 6.85 (d, *J*=7.8 Hz, .5H, ArH), 6.75 (d, *J*=7.5 Hz, .5H, ArH), 5.57 (q, *J*=7.2 Hz, .5H, CH), 5.49 (q, *J*=6.9 Hz, .5H, CH), 2.70 (d, *J*=17.4 Hz, .5H, CH_2), 2.51-2.35 (m, 1H, CH_2), 2.09-1.80 (m, 5.5H, CH_2), 1.00-0.87 (m, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 189.7, 188.3, 180.7, 180.6, 160.5, 160.2, 156.1, 155.9, 140.2, 140.1, 136.5, 136.4, 136.0, 134.7, 131.2, 130.5, 128.6, 128.5, 128.4, 127.3, 126.5, 126.4, 126.2, 124.5, 123.4, 123.3, 121.5, 121.3, 120.2, 120.1, 119.0, 117.8, 50.5, 50.4, 50.3, 49.5, 48.8, 48.5, 36.2, 36.1, 34.2, 34.1, 28.9, 28.4, 27.5, 26.9, 18.3, 17.8; Anal. calcd. for $C_{33}H_{28}N_2O_3$; C: 79.18; H: 5.64; N: 5.60; Found: C: 79.29; H: 5.67; N: 5.72%.

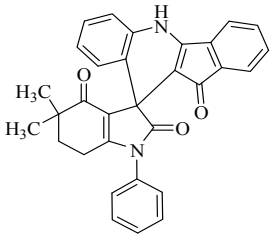


6,6-Dimethyl-1-(β-1-phenyl-ethyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4at**): Yield 94 % (471 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1719, 1600, 1545, 1487, 1400, 1229, 1026, 756, 696, 571; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.92 (d, *J*=6.6 Hz, 1H, NH), 7.68-7.22 (m, 11H, ArH), 7.10-6.99 (m, IH, ArH), 6.87 (d, *J*=7.5 Hz, .5H, ArH), 6.77 (d, *J*=7.5 Hz, .5H, ArH), 5.62-5.48 (m, 1H, CH), 2.71 (d, *J*=17.7 Hz, .5H, CH_2), 2.49 (d, *J*=15.3 Hz, .5H, CH_2), 2.34 (d, *J*=17.7 Hz, .5H, CH_2), 2.16-1.82 (m, 5.5H, CH_2, Ar-CH_3), 1.08-0.91 (m, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.2, 188.9, 188.8, 181.2, 161.0, 160.7, 156.6, 156.4, 140.7, 140.6, 137.0, 136.9, 136.5, 135.2,

131.7, 131.0, 129.1, 129.0, 128.9, 127.8, 127.0, 126.9, 126.7, 125.0, 123.8, 122.0, 121.8, 120.7, 120.6, 119.5, 118.3, 101.2, 101.1, 50.9, 50.7, 49.9, 49.3, 48.9, 36.7, 36.6, 34.7, 34.6, 29.4, 28.9, 27.9, 27.4, 18.8, 18.3; Anal. calcd. for $C_{33}H_{28}N_2O_3$; C: 79.18; H: 5.64; N: 5.60; Found: C: 79.27; H: 5.66; N: 5.52%.

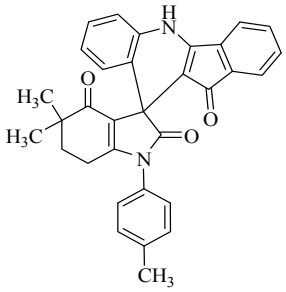


1-Cyclohexyl-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4au**): Yield 87 % (416 mg); red solid; Mp: 326-330 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1683, 1652, 1601, 1542, 1485, 1396, 1223, 1044, 750; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.84 (s, 1H, NH), 7.61 (d, *J*=6.9 Hz, 1H, ArH), 7.46 (t, *J*=7.2 Hz, 1H, ArH), 7.37 (t, *J*=7.2 Hz, 1H, ArH), 7.24-7.16 (m, 3H, ArH), 6.97 (t, *J*=7.2 Hz, 1H, ArH), 6.71 (d, *J*=7.5 Hz, 1H, ArH), 3.89-3.75 (m, 1H, CH), 2.83, 2.69 (ABq, *J*=17.9 Hz, 2H, CH_2), 2.12-1.61 (m, 9H, CH_2), 1.45-1.08 (m, 8H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 189.6, 188.1, 181.0, 160.8, 155.8, 136.6, 136.1, 134.7, 131.1, 130.4, 128.2, 126.5, 124.3, 123.6, 121.0, 119.9, 118.9, 117.7, 101.0, 53.3, 50.4, 48.9, 35.8, 34.0, 29.7, 28.7, 27.5, 25.5, 24.8; Anal. calcd. for $C_{31}H_{30}N_2O_3$; C: 77.80; H: 6.32; N: 5.85; Found: C: 77.87; H: 6.39; N: 5.71%.

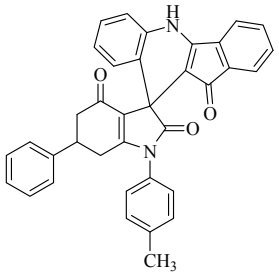


4,4-Dimethyl-1-phenyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ba**): Yield 88 % (416 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1750, 1665, 1600, 1552, 1465, 1387, 1252, 1035, 752, 702; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.95 (s, 1H, NH), 7.65-7.19 (m, 11H, ArH), 7.07-6.99 (m, 2H, ArH), 2.71-2.64 (m, 1H, CH_2), 2.43-2.37 (m, 1H, CH_2), 1.88-1.37 (m, 2H, CH_2), 0.91 (d, *J*=5.1 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 195.4, 188.3, 179.9, 159.1, 155.9, 136.6, 136.0, 134.7, 133.8, 131.2, 130.5, 129.4, 128.7, 128.5, 127.8, 127.2, 124.5, 123.2, 120.2, 120.0, 119.2, 117.7,

100.9, 49.5, 34.8, 24.0, 23.7, 20.1; Anal. calcd. for $C_{31}H_{24}N_2O_3$; C: 78.79; H: 5.12; N: 5.93; Found: C: 78.93; H: 5.18; N: 5.81%.

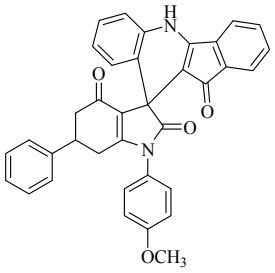


4,4-Dimethyl-1-*p*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4bb**): Yield 90 % (438 mg); red solid; Mp: 342-348 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.55; IR (ν_{max}, KBr, cm^{-1}): 1741, 1611, 1543, 1487, 1393, 1234, 1040, 1004, 756, 707; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.92 (s, 1H, NH), 7.60 (d, *J*=6.9 Hz, 1H, ArH), 7.44 (t, *J*=7.2 Hz, 1H, ArH), 7.35-7.15 (m, 8H, ArH), 6.97 (t, *J*=7.3 Hz, 2H, ArH), 2.69-2.53 (m, 1H, CH_2), 2.46 (s, 1H, CH_2), 2.33 (s, 3H, Ar-CH_3) 1.89-1.69 (m, 2H, CH_2), 0.87 (d, *J*=4.5 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 195.4, 188.4, 180.1, 159.4, 156.0, 138.3, 136.6, 136.1, 134.7, 131.2, 130.5, 129.9, 128.5, 127.6, 127.2, 124.5, 123.3, 120.2, 120.1, 119.2, 117.7, 100.9, 49.5, 34.8, 24.0, 23.8, 20.8, 20.1; Anal. calcd. for $C_{32}H_{26}N_2O_3$; C: 78.99; H: 5.39; N: 5.76; Found: C: 78.92; H: 5.32; N: 5.84%.

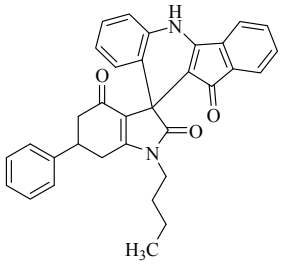


6-phenyl-1-*p*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ca**): Yield 92 % (492 mg); red solid; Mp: 336-340 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.55; IR (ν_{max}, KBr, cm^{-1}): 1747, 1600, 1541, 1485, 1389, 1231, 772, 750, 699; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.00 (d, *J*=5.4, 1H, NH), 7.67-7.00 (m, 17H, ArH), 3.42-3.58 (m, 1H, CH), 3.05-3.20 (m, 1H, CH_2), 2.79-2.23 (m, 6H, CH_2, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C:189.5, 188.4, 180.0, 160.4, 156.1, 156.0, 143.1, 143.0, 138.4, 136.6, 135.9, 134.7, 131.3, 131.1, 130.6, 130.0, 129.9, 129.7, 128.5, 127.6, 127.4, 127.0, 126.8, 124.5, 122.9, 121.9, 121.5, 120.0, 119.3, 117.8, 59.7, 49.1,

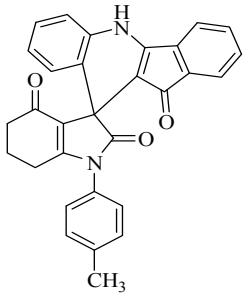
44.1, 43.7, 29.9, 20.8; Anal. calcd. for $C_{36}H_{26}N_2O_3$; C: 80.88; H: 4.90; N: 5.24; Found: C: 80.67; H: 4.95; N: 5.37%.



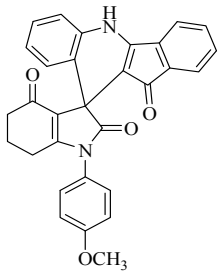
1-(4-Methoxy-phenyl)-6-phenyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4cb**): Yield 92 % (507 mg); red solid; Mp: □350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1719, 1640, 1623, 1543, 1512, 1385, 1247, 1059, 1028, 830, 774, 753, 698; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 110.94 (s, 1H, NH), 7.58 (d, J=6.3 Hz, 1H, ArH), 7.41-6.97 (m, 16H, ArH), 3.72 (s, 3H, OCH_3), 3.55-3.36 (m, 1H, CH); 2.76-2.36 (m, 3H, CH_2), 2.21 (d, *J*=16.2 Hz, 1H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 189.4, 188.3, 180.2, 160.9, 159.3, 156.1, 143.1, 136.6, 136.0, 134.7, 131.3, 130.6, 129.1, 128.9, 128.5, 127.6, 127.1, 126.7, 126.2, 124.6, 123.2, 121.9, 120.0, 119.2, 117.8, 114.7, 100.8, 55.5, 49.1, 44.0, 29.8; Anal. calcd. for $C_{36}H_{26}N_2O_4$; C: 78.53; H: 4.76; N: 5.09; Found: C: 78.74; H: 4.79; N: 5.24%.



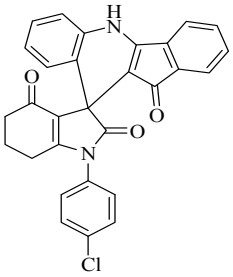
1-Butyl-6-phenyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4cc**): Yield 88 % (440 mg); red solid; Mp: 320-326 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1726, 1601, 1541, 1486, 1388, 1231, 1032, 755, 699; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.88 (s, 1H, NH), 7.74-6.69 (m, 13H, ArH), 3.59-2.89 (m, 5H, CH_2), 2.59-2.48 (m, 1H, CH_2), 2.28-2.19 (m, 1H, CH_2), 1.57-1.23 (m, 4H, CH_2), 0.89 (s, 3H, CH3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 188.9, 188.5, 180.7, 161.7, 161.5, 156.0, 155.9, 143.3, 143.2, 136.6, 136.5, 136.1, 134.7, 131.2, 130.5, 128.5, 128.4, 127.2, 126.9, 126.8, 126.7, 124.4, 124.3, 123.2, 121.4, 120.0, 119.1, 117.7, 100.6, 48.9, 48.8, 44.0, 30.8, 28.9, 28.7, 19.4, 13.7; Anal. calcd. for $C_{33}H_{28}N_2O_3$; C: 79.18; H: 5.64; N: 5.60; Found: C: 79.39; H: 5.60; N: 5.43%.



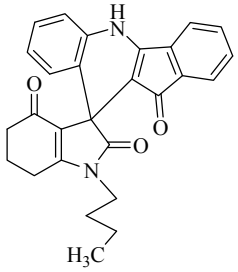
1-*p*-Tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4da**): Yield 92 % (422 mg); red solid; Mp: 338-342 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1736, 1609, 1546, 1485, 1387, 1250, 1188, 1022, 832, 757; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.97 (s, 1H, NH), 7.66 (d, *J*=7.8 Hz, 1H, ArH), 7.53-7.40 (m, 6H, ArH), 7.33-7.22 (m, 3H, ArH), 7.09-7.05 (m, 2H, ArH), 2.67-2.59 (m, 1H, CH_2), 2.46-2.36 (m, 4H, CH_3, CH_2), 2.23-2.14 (m, 2H, CH_2), 2.08-0.91 (m, 2H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 191.0, 188.8, 180.4, 161.8, 156.4, 138.9, 137.1, 136.4, 135.2, 131.8, 131.7, 131.0, 130.4, 128.9, 128.0, 127.8, 125.0, 123.6, 122.4, 120.5, 119.7, 118.2, 101.3, 49.6, 37.3, 22.9, 22.1, 21.3; Anal. calcd. for $C_{30}H_{22}N_2O_3$; C: 78.59; H: 4.84; N: 6.11; Found: C: 78.38; H: 4.89; N: 6.22%.



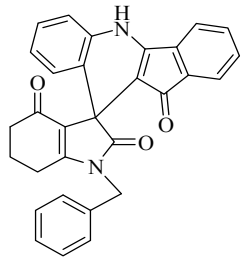
1-(4-Methoxy-phenyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4db**): Yield 94 % (446 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1735, 1611, 1545, 1389, 1251, 1188, 1023, 833, 756; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.96 (s, 1H, NH), 7.76-6.98 (m, 12H, ArH), 3.84(s, 3H, -OCH_3), 2.59-1.82 (m, 6H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.9, 188.8, 180.6, 162.1, 159.8, 156.5, 137.1, 136.4, 135.2, 131.7, 131.0, 129.5, 128.9, 127.9, 126.8, 125.0, 123.7, 122.3, 120.5, 119.7, 118.2, 115.1, 101.3, 56.5, 56.0, 49.6, 37.3, 22.9, 22.1; Anal. calcd. for $C_{30}H_{22}N_2O_4$; C: 75.94; H: 4.67; N: 5.90; Found: C: 75.77; H: 4.69; N: 5.81%.



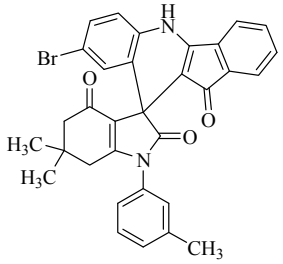
1-(4-Chloro-phenyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4dc**): Yield 86 % (412 mg); red solid; Mp: 332-336 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1744, 1637, 1609, 1547, 1490, 1384, 1231, 742; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.92 (s, 1H, NH), 7.59-7.12 (m, 10H, ArH), 7.01-6.95 (m, 2H, ArH), 2.68-2.50 (m, 1H, CH_2), 2.36-2.29 (m, 1H, CH_2), 2.14-2.05 (m, 2H, CH_2), 1.92-1.85 (m, 2H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.6, 188.4, 179.7, 160.7, 156.0, 136.6, 135.9, 134.7, 133.3, 132.8, 131.3, 130.6, 129.6, 129.5, 128.5, 127.5, 124.6, 123.0, 122.2, 120.1, 119.3, 117.8, 100.7, 49.3, 36.8, 224, 21.6; Anal. calcd. for $C_{29}ClH_{19}N_2O_3$; C: 72.73; H: 4.00; N: 5.84; Found: C: 72.51; H: 4.06; N: 5.71%.



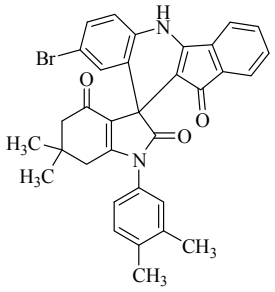
1-Butyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4dd**): Yield 85 % (361 mg); red solid; Mp: 324-330 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1724, 1611, 1545, 1489, 1420, 1230, 1191, 755, 708; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.86 (s, 1H, NH), 7.61 (d, *J*=6.9 Hz, 1H, ArH), 7.46 (t, *J*=7.4 Hz, 1H, ArH), 7.37 (t, *J*=7.4 Hz, 1H, ArH), 7.26-7.19 (m, 3H, ArH), 6.97(t, *J*=7.4 Hz, 1H, ArH), 6.75 (d, *J*=7.5 Hz, 1H, ArH), 3.61-3.38 (m, 2H, CH_2), 2.84-2.79 (m, 2H, CH_2), 2.15-2.02 (m, 4H, CH_2), 1.62-1.57 (m, 2H, CH_2), 1.41-1.36 (m, 2H, CH_2), 1.08-1.06 (m, 3H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 189.9, 188.1, 180.5, 162.2, 155.9, 136.5, 136.0, 134.7, 131.2, 130.4, 128.3, 126.7, 124.3, 123.4, 121.8, 119.9, 119.0, 117.7, 100.7, 48.8, 36.6, 30.7, 21.6, 19.4, 13.7; Anal. calcd. for $C_{27}H_{24}N_2O_3$; C: 76.39; H: 5.70; N: 6.60; Found: C: 76.16; H: 5.76; N: 6.73%.



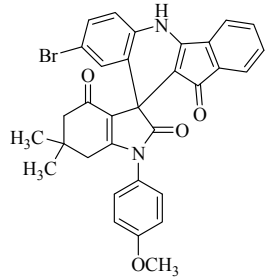
1-Benzyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4de**): Yield 89 % (408 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1735, 1671, 1637, 1613, 1537, 1475, 1405, 1231, 1005, 955, 757, 702, 565; ^1H NMR (300 MHz, DMSO-d_6) δ_H: 10.93 (s, 1H, NH), 7.72-6.83 (m, 13H, ArH), 4.99, 4.83 (ABq, *J*=16.2 Hz, 2H, Ar-CH_2), 3.52-3.38 (m, 1H, CH_2), 2.86-2.69 (m, 1H, CH_2), 2.21-1.88 (m, 4H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.6, 188.7, 181.1, 162.4, 156.6, 137.3, 136.9, 136.4, 135.2, 131.7, 131.0, 129.2, 128.9, 127.9, 127.4, 127.2, 124.9, 123.7, 122.4, 120.5, 119.6, 118.3, 100.9, 56.5, 49.3, 43.8, 37.1, 22.3, 22.0, 19.1; Anal. calcd. for $C_{30}H_{22}N_2O_3$; C: 78.59; H: 4.84; N: 6.11; Found: C: 78.40; H: 4.81; N: 6.18%.



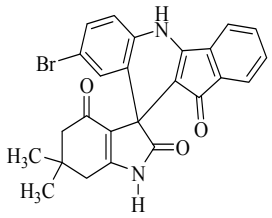
8´-Bromo-6,6-dimethyl-1-*m*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ea**): Yield 90 % (509 mg); red solid; Mp: 330-335 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1755, 1619, 1545, 1483, 1395, 1236, 1052, 865, 757, 699, ; ^1H NMR (300 MHz, DMSO-d_6) δ_H: 11.09 (s, 1H, NH), 7.72-7.15 (m, 11H, ArH), 2.79-1.93 (m, 7H, Ar-CH_3, CH_2), 1.04 (d, *J*=15.3 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.8, 188.9, 180.1, 160.9, 156.2, 139.6, 136.6, 136.2, 134.9, 134.1, 132.1, 132.0, 131.2, 130.1, 130.0, 129.8, 128.5, 125.7, 125.2, 121.0, 120.8, 120.2, 119.8, 116.6, 101.2, 51.3, 49.5, 36.3, 34.6, 29.5, 27.4, 21.4; Anal. calcd. for $C_{32}H_{25}BrN_2O_3$; C: 67.97; H: 4.46; N: 4.95; Found: C: 67.76; H: 4.51; N: 4.88%.



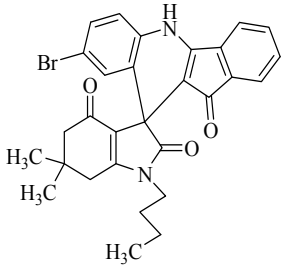
8´-Bromo-1-(3,4-dimethyl-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4eb**): Yield 94 % (545 mg); red solid; Mp: 330-336 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.55; IR (ν_{max}, KBr, cm^{-1}): 1749, 1676, 1608, 1535, 1480, 1389, 1232, 1052, 979, 939, 813, 766, 705; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.10 (s, 1H, NH), 7.64-7.13 (m, 10H, ArH), 2.73 (d, *J*=16.5 Hz, 1H, CH_2), 2.42-2.16 (m, 6H, Ar-CH_3), 2.00 (d, *J*=13.8 Hz, 3H, CH_2), 1.02 (d, *J*=14.4 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.7, 188.8, 180.1, 161.1, 156.2, 138.1, 137.7, 136.6, 136.2, 134.8, 132.0, 131.7, 131.1, 130.8, 130.0, 128.8, 125.7, 125.4, 120.8, 120.2, 119.7, 116.5, 101.2, 51.2, 49.4, 36.3, 34.5, 29.4, 27.5, 19.8, 19.6; Anal. calcd. for $C_{33}H_{27}BrN_2O_3$; C: 68.40; H: 4.70; N: 4.83; Found: C: 68.52; H: 4.75; N: 4.71%.



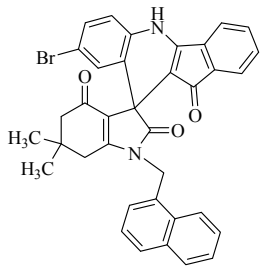
8´-Bromo-1-(4-methoxy-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ec**): Yield 95 % (552 mg); red solid; Mp: 338-342 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1750, 1629, 1608, 1536, 1509, 1391, 1249, 1170, 1048, 768; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.09 (s, 1H, NH), 7.64-7.12 (m, 11H, ArH), 3.83 (s, 3H, OCH_3), 2.72 (d, *J*=17.7 Hz, 1H, CH_2), 2.28-2.12 (m, 2H, CH_2), 1.99 (d, *J*=15.9 Hz, 1H, CH_2), 1.01 (d, *J*=17.7 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C:190.2, 188.4, 179.9, 160.8, 159.4, 155.7, 136.2, 135.8, 134.4, 131.5, 130.7, 129.6, 129.0, 126.2, 125.3, 120.3, 119.7, 119.3, 116.1, 114.7, 100.8, 55.5, 50.8, 49.0, 35.8, 34.0, 29.0, 27.0; Anal. calcd. for $C_{32}H_{25}BrN_2O_4$; C: 66.10; H: 4.33; N: 4.82; Found: C: 66.37; H: 4.38; N: 4.70%.



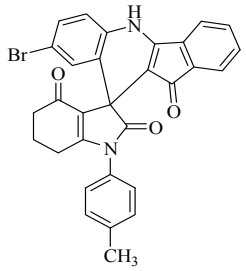
8´-Bromo-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ed**): Yield 77 % (366 mg); red solid; Mp: 340-346 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1694, 1632, 1508, 1474, 1321, 1085, 721; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.71(s, 1H, NH), 10.44 (s, 1H, NH), 7.66-7.08 (m, 6H, ArH), 6.74 (d, *J*=8.1 Hz, 1H, ArH), 2.67 (s, 2H, CH_2), 2.15 (d, *J*=7.2 Hz, 2H, CH_2), 1.07 (d, *J*=8.1 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C:194.6, 190.0, 179.0, 154.4, 152.5, 142.5, 138.7, 136.1, 133.0, 132.7, 131.1, 130.7, 126.1, 121.3, 120.2, 113.1, 112.7, 110.9, 107.9, 50.9, 48.2, 32.7, 28.3, 27.7; Anal. calcd. for $C_{25}H_{19}BrN_2O_3$; C: 63.17; H: 4.03; N: 5.89. Found: C: 63.34; H: 4.06; N: 5.78%.



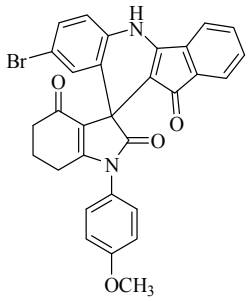
8´-Bromo-1-butyl-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ee**): Yield 82 % (436 mg); red solid; Mp: 326-332 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1742, 1676, 1598, 1541, 1481, 1406, 1234, 1032, 943, 766, 706, 633, 571; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.98 (s, 1H, NH), 7.63-6.85 (m, 6H, ArH), 6.85 (s, 1H, ArH), 3.70-3.53 (m, 2H, N-CH_2), 2.87, 2.67 (ABq, J=17.8 Hz, 2H, CH_2), 1.66-1.56 (m, 2H, CH_2), 1.46-1.33 (m, 2H, CH_2), 1.11(d, *J*=5.4 Hz, 6H, CH_3), 0.96 (t, J=7.2 Hz, 3H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.1, 188.6, 180.9, 162.0, 156.2, 136.5, 136.3, 134.8, 131.9, 131.8, 131.0, 129.5, 126.0, 120.9, 120.7, 120.2, 119.6, 116.2, 101.0, 51.1, 49.0, 35.3, 34.6, 31.2, 29.2, 27.9, 19.9, 14.2; Anal. calcd. for $C_{29}H_{27}$BrN2O3; C: 65.54; H: 5.12; N: 5.27; Found: C: 65.69; H: 5.16; N: 5.38%.



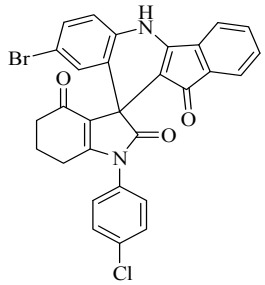
8´-Bromo-6,6-dimethyl-1-naphthalen-1-ylmethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ef**): Yield 92 % (566 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1742, 1672, 1629, 1602, 1542, 1402, 1234, 954, 776, 668, 572; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.09 (s, 1H, NH), 8.16-7.84 (m, 4H, ArH), 7.64-7.38 (m, 8H, ArH), 7.21 (d, *J*=8.1 Hz, 1H, ArH), 7.02 (s, 1H, ArH), 5.41 (s, 2H, Ar-CH_2), 2.78 (d, *J*=18.0 Hz, 1H, CH_2), 2.43 (d, *J*=18.0 Hz, 1H, CH_2), 2.26 (d, *J*=17.7 Hz, 1H, CH_2), 2.02 (d, *J*=15.6 Hz, 1H, CH_2), 1.04 (d, *J*=11.7 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.4, 188.9, 181.0, 162.0, 156.5, 136.4, 136.3, 134.9, 133.7, 132.3, 132.1, 132.0, 131.2, 130.5, 129.6, 129.2, 128.4, 127.1, 126.6, 126.0, 125.8, 124.1, 123.4, 121.2, 120.9, 120.3, 119.7, 116.5, 100.7, 51.07, 49.3, 42.3, 35.5, 34.6, 29.3, 27.6; Anal. calcd. for $C_{36}H_{27}BrN_2O_3$; C: 70.25; H: 4.42; N: 4.55; Found: C: 70.38; H: 4.47; N: 4.63%.



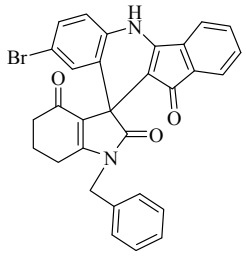
8´-Bromo-1-*p*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4fa**): Yield 86 % (462 mg); red solid; Mp: 340-346 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.55; IR (ν_{max}, KBr, cm^{-1}): 1745, 1631, 1586, 1540, 1508, 1477, 1248, 1172, 830, 705, 530; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.96 (s, 1H, NH), 7.75-7.62 (m, 1H, ArH), 7.54-7.38 (m, 8H, ArH), 7.30 (d, *J*=6.9 Hz, 1H, ArH), 7.24-7.17 (m, 2H, ArH), 2.73-2.64 (m, 1H, CH_2), 2.52-2.28 (m, 4H, Ar-CH_3, CH_2), 2.26-2.13 (m, 2H, CH_2), 2.11-1.89 (m, 2H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 191.1, 188.8, 180.0, 162.6, 156.2, 138.9, 136.7, 136.2, 134.9, 132.0, 131.6, 131.1, 130.4, 130.2, 128.1, 125.8, 121.9, 120.7, 120.1, 119.8, 116.6, 101.2, 49.6, 22.9, 22.0, 21.3; Anal. calcd. for $C_{30}H_{21}BrN_2O_3$; C: 67.05; H: 3.94; N: 5.21; Found: C: 67.23; H: 3.97; N: 5.34%.



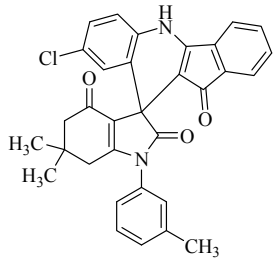
8´-Bromo-1-(4-methoxy-phenyl) -5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4fb**): Yield 88 % (487 mg); red solid; Mp: 350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1742, 1630, 1599, 1539, 1512, 1478, 1389, 1250, 1171, 831, 704, 528; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.01 (s, 1H, NH), 7.56 (d, *J*=7.2 Hz, 1H, ArH), 7.46-7.32 (m, 6H, ArH), 7.22 (d, *J*=6.6 Hz, 1H, ArH), 7.14-7.00 (m, 3H, ArH), 3.77 (s, 3H, OMe), 2.69-2.53 (m, 1H, CH_2), 2.34-2.23 (m, 1H, CH_2), 2.14 (s, 2H, CH_2), 1.97-1.82 (m, 2H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 191.1, 188.6, 179.9, 163.1, 159.2, 155.9, 136.2, 135.7, 134.4, 131.5, 130.6, 129.7, 129.1, 126.3, 125.4, 121.4, 120.2, 119.6, 119.3, 116.1, 114.6, 100.8, 55.5, 49.1, 36.7, 22.4, 21.5; Anal. calcd. for $C_{30}H_{21}BrN_2O_4$; C: 65.11; H: 3.82; N: 5.06; Found: C: 65.36; H: 3.86; N: 5.18%.



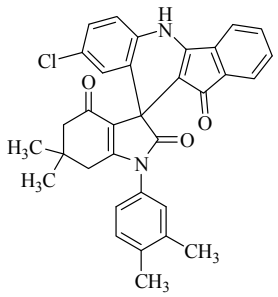
8´-Bromo-1-(4-chloro-phenyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4fc**): Yield 81 % (452 mg); red solid; Mp: 310-315 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1739, 1639, 1608, 1539, 1487, 1389, 1232, 1085, 997, 828, 705, 625; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.08 (s, 1H, NH), 7.67-7.37 (m, 8H, ArH), 7.32-7.10 (m, 3H, ArH), 2.68 (d, *J*=17.4 Hz, 1H, CH_2), 2.46-2.24 (m, 1H, CH_2), 2.23-2.12 (m, 2H, CH_2), 2.11-1.87 (m, 2H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 191.2, 188.7, 179.7, 161.9, 156.2, 136.6, 136.1, 134.8, 133.8, 133.1, 132.0, 131.9, 131.1, 130.3, 130.1, 129.9, 125.5, 122.1, 120.7, 120.1, 119.8, 116.7, 101.1, 49.6, 37.2, 22.8, 22.0; Anal. calcd. for $C_{29}H_{18}BrClN_2O_3$; C: 62.44; H: 3.25; N: 5.02; Found: C: 62.62; H: 3.29; N: 5.13%.



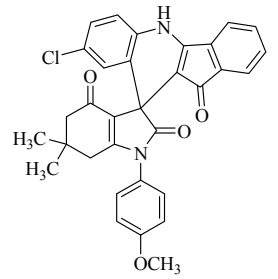
1-Benzyl-8´-bromo-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4fd**): Yield 90 % (484 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1739, 1675, 1640, 1615, 1542, 1478, 1399, 1237, 1068, 965, 812, 705; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.04 (s, 1H, NH), 7.63 (d, *J*=7.2 Hz 1H, ArH), 7.53-7.29 (m, 9H, ArH), 7.18 (d, *J*=8.4 Hz 1H, ArH), 6.95 (d, *J*=1.8 Hz 1H, ArH), 4.92 (q, *J*=16.2 Hz, 2H, Ar-CH_2), 2.84-2.78 (m, 1H, CH_2), 2.57-2.42 (m, 1H, CH_2), 2.17-1.97 (m, 4H, CH_2);^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.7, 188.7, 180.7,163.0, 156.5, 137.2, 136.4, 136.2, 134.9, 131.9, 131.1, 129.6, 129.2, 128.0, 127.4, 126.0, 122.1, 120.7, 120.1, 119.6, 116.5, 100.7, 49.2, 44.0, 37.0, 22.4, 21.9; Anal. calcd. for $C_{30}H_{21}BrN_2O_3$; C: 67.05; H: 3.94; N: 5.21; Found: C: 67.24; H: 3.89; N: 5.12%.



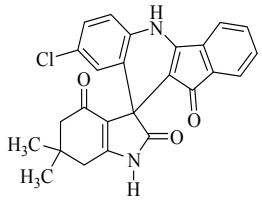
8´-Chloro-6,6-dimethyl-1-*m*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ga**): Yield 90 % (461 mg); red solid; Mp: 340-345 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1753, 1683, 1618, 1544, 1484, 1393, 1235, 1053, 759, 697, 572; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.10 (s, 1H, NH), 7.65 (d, *J*=6.9 Hz, 1H, ArH), 7.54-7.24 (m, 9H, ArH), 7.06 (d, *J*=2.1 Hz, 1H, ArH), 2.76 (d, *J*=18.0 Hz, 1H, CH_2), 2.53-2.38 (m, 3H, CH_3), 2.32-2.18 (m, 2H, CH_2), 2.05-1.98 (m, 1H, CH_2), 1.04 (d, *J*=15.3 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.7, 188.9, 180.1, 160.9, 156.3, 139.6, 136.2, 134.9, 134.1, 132.0, 131.2, 130.0, 129.8, 129.2, 128.6, 128.5, 127.3, 125.3, 125.2, 120.9, 120.8, 119.9, 101.0, 51.3, 49.6, 36.4, 34.6, 29.6, 27.4, 21.3; Anal. calcd. for $C_{32}H_{25}ClN_2O_3$; C: 73.77; H: 4.84; N: 5.38; Found: C: 73.60; H: 4.88; N: 5.27%.



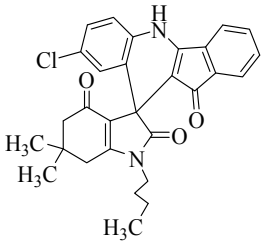
8´-Chloro-1-(3,4-dimethyl-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4gb**): Yield 95 % (508 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1750, 1676, 1629, 1542, 1481, 13890, 1235, 1052, 939, 875, 766, 671; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.09 (s, 1H, NH), 7.66-7.04 (m, 10H, ArH), 2.76-1.99 (m, 10H, Ar-CH_3, CH_2), 1.04 (d, *J*=14.4 Hz, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.7, 188.9, 180.2, 161.2, 156.3, 138.1, 137.7, 136.3, 134.9, 131.9, 131.7, 131.2, 130.8, 129.2, 128.8, 128.6, 127.3, 125.5, 125.4, 120.8, 119.9, 119.7, 101.1, 51.3, 49.5, 36.4, 34.5, 29.6, 27.4, 19.9, 19.6; Anal. calcd. for $C_{33}H_{27}ClN_2O_3$; C: 74.08; H: 5.09; N: 5.24; Found: C: 74.26; H: 5.12; N: 5.15%.



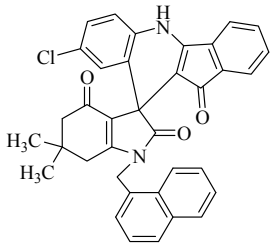
8´-Chloro-1-(4-methoxy-phenyl)-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4gc**): Yield 92 % (494 mg); red solid; Mp: 326-335 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.55; IR (ν_{max}, KBr, cm^{-1}): 1751, 1631, 1608, 1540, 1512, 1485, 1392, 1250, 1170, 1049, 769; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.08 (s, 1H, NH), 7.61 (d, *J*=7.2 Hz 1H, ArH), 7.51-7.28 (m, 6H, ArH), 7.22 (d, *J*=8.4 Hz 1H, ArH), 7.11 (d, *J*=8.7 Hz 2H, ArH), 7.04 (s, 1H, ArH), 3.81 (s, 3H, OCH_3), 2.70 (d, *J*=17.7 Hz, 1H, CH_2), 2.27-2.11 (m, 2H, CH_2), 1.97 (d, *J*=16.2 Hz, 1H, CH_2), 1.00 (d, *J*=17.7 Hz, 6H, CH_3) ; ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.2, 188.4, 179.9, 160.9, 159.4, 155.8, 135.8, 134.4, 131.5, 130.7, 129.1, 128.7, 128.2, 126.9, 126.2, 124.9, 120.3, 119.4, 119.3, 114.7, 100.7, 55.5, 50.8, 49.0, 35.9, 34.0, 29.1, 26.9; Anal. calcd. for $C_{32}H_{25}ClN_2O_4$; C: 71.57; H: 4.69; N: 5.22; Found: C: 71.69; H: 4.62; N: 5.34%.



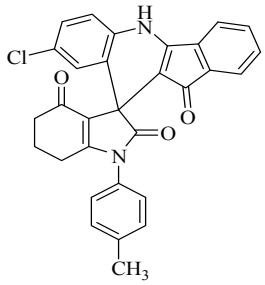
8´-Chloro-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4gd**): Yield 76 % (327 mg); red solid; Mp: 324-330 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.50; IR (ν_{max}, KBr, cm^{-1}): 1697, 1648, 1508, 1475, 1356, 1325, 1229, 1084, 915, 768, 723; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.70 (s, 1H, NH), 10.43 (s, 1H, NH), 7.71-7.58 (m, 1H, ArH), 7.56-7.47 (m, 1H, ArH), 7.43-7.19 (m, 2H, ArH), 7.15-7.12 (m, 1H, ArH), 6.97 (d, *J*=2.1 Hz, 1H, ArH), 6.81-6.76 (m, 1H, ArH), 2.67 (s, 2H, CH_2), 2.15 (d, *J*=8.7 Hz, 2H, CH_2), 1.10-1.06 (m, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 194.6, 190.2, 179.2, 154.4, 152.5, 142.1, 138.3, 136.3, 133.0, 132.6, 131.1, 127.8, 125.4, 123.4, 121.3, 120.1, 112.7, 110.3, 107.9, 56.5, 50.9, 48.2, 32.7, 28.3, 27.8, 19.1; Anal. calcd. for $C_{25}H_{19}ClN_2O_3$; C: 69.69; H: 4.44; N: 6.50; Found: C: 69.93; H: 4.51; N: 6.34%.



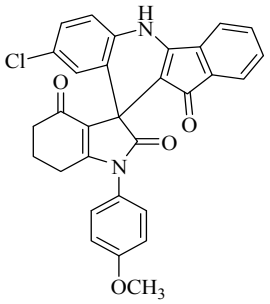
8´-Chloro-1-butyl-6,6-dimethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ge**): Yield 85 % (414 mg); red solid; Mp: 314-320 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1741, 1677, 1600, 1540, 1481, 1405, 1231, 1030, 944, 765, 703, 575; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 10.98 (s, 1H, NH), 7.62 (d, *J*=6.9 Hz, 1H, ArH), 7.53-7.50 (m, 1H, ArH), 7.48-7.21 (m, 4H, ArH), 6.74 (d, *J*=2.4 Hz, 1H, ArH), 3.73-3.54 (m, 2H, N-CH_2), 2.88, 2.66 (ABq, *J*=17.7 Hz, 2H, CH_2), 2.22, 2.02 (ABq, *J*=15.9 Hz, 2H, CH_2), 1.65-1.56 (m, 2H, CH_2), 1.44-1.32 (m, 2H, CH_2), 1.12 (d, *J*=6.0 Hz, 6H, CH_3), 0.95 (t, *J*=7.4 Hz, 3H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.1, 188.6, 180.9, 162.0, 156.2, 136.3, 136.1, 134.8, 131.9, 131.0, 128.9, 128.3, 126.7, 125.7, 120.8, 120.7, 119.8, 119.6, 100.9, 51.1, 49.1, 35.3, 34.5, 31.2, 29.3, 27.8, 19.9, 14.2; Anal. calcd. for $C_{29}H_{27}ClN_2O_3$; C: 71.52; H: 5.59; N: 5.75; Found: C: 71.34; H: 5.62; N: 5.89%.



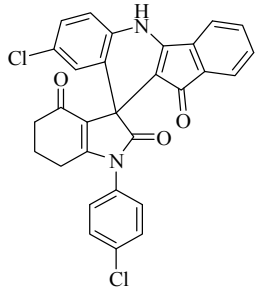
8´-Chloro-6,6-dimethyl-1-naphthalen-1-ylmethyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4gf**): Yield 93 % (531 mg); red solid; Mp: >350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.70; IR (ν_{max}, KBr, cm^{-1}): 1443, 1671, 1601, 1543, 1486, 1235, 1060, 953, 803, 757, 667, 571; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.09 (s, 1H, NH), 8.16-7.85 (m, 4H, ArH), 7.68-7.25 (m, 9H, ArH), 6.90 (s, 1H, ArH), 5.41 (s, 2H, Ar-CH_2), 2.79 (d, *J*=17.7 Hz, 1H, CH_2), 2.42 (d, *J*=18.0 Hz, 2H, CH_2), 2.27 (d, *J*=16.2 Hz, 1H, CH_2), 2.01 (d, *J*=15.9 Hz, 1H, CH_2), 1.11-0.95 (m, 6H, CH_3); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.4, 188.9, 180.9, 162.0, 156.6, 136.3, 136.0, 134.9, 133.7, 132.3, 132.0, 131.2, 130.5, 129.2, 128.6, 128.4, 127.1, 126.9, 126.6, 126.0, 125.5, 124.1, 123.4, 121.1, 120.9, 120.0, 119.7, 100.6, 51.1, 49.3, 42.3, 35.5, 34.6, 29.4, 27.6; Anal. calcd. for $C_{36}H_{27}ClN_2O_3$; C: 75.72; H: 4.77; N: 4.91; Found: C: 75.56; H: 4.84; N: 4.79%.



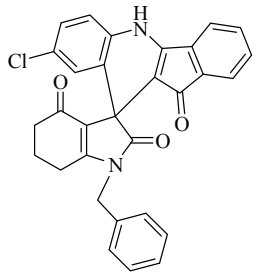
8´-Chloro-1-*p*-tolyl-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4ha**): Yield 88 % (434 mg); red solid; Mp: 328-335°C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1742, 1669, 1633, 1552, 1513, 1481, 1387, 1250, 1065, 833, 702, 525; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.08 (s, 1H, NH), 7.65-7.23 (m, 10H, ArH), 7.11 (d, *J*=2.4 Hz, 1H, ArH), 2.71-2.59 (m, 1H, CH_2), 2.55-2.32 (m, 4H, CH_2, CH_3), 2.21 (d, *J*=5.1 Hz, 2H, CH_2), 2.08-1.97 (m, 2H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 191.1, 188.8, 179.9, 162.6, 156.3, 138.9, 136.3, 136.2, 134.9, 131.9, 131.6, 131.1, 130.3, 129.1, 128.7, 128.1, 127.5, 125.5, 121.9, 120.7, 119.7, 101.1, 49.7, 37.2, 22.9, 22.0, 21.3; Anal. calcd. for $C_{30}H_{21}ClN_2O_3$; C: 73.09; H: 4.29; N: 5.68; Found: C: 73.25; H: 4.34; N: 5.76%.



8´-Chloro-1-(4-methoxy-phenyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4hb**): Yield 87 % (443 mg); red solid; Mp: □350 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1741, 1671, 1630, 1512, 1389, 1251, 1172, 831, 705, 529; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.06 (s, 1H, NH), 7.60 (d, *J*=6.9 Hz 1H, ArH), 7.51-7.20 (m, 7H, ArH), 7.11 (d, *J*=6.6 Hz 3H, ArH), 3.81 (s, 3H, OCH_3), 2.74-2.61 (m, 1H, CH_2), 2.42-2.28 (m, 1H, CH_2), 2.18 (s, 2H, CH_2), 2.07-1.94 (m, 2H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.5, 188.6, 179.6, 162.4, 159.3, 155.8, 135.8, 135.7, 134.6, 131.4, 130.6, 129.1, 128.6, 128.2, 127.0, 126.3, 125.0, 121.3, 120.2, 119.2, 114.6, 101.1, 55.5, 49.1, 36.7, 30.7, 22.4, 21.5; Anal. calcd. for $C_{30}H_{21}ClN_2O_4$; C: 70.80; H: 4.16; N: 5.50; Found: C: 70.98; H: 4.19; N: 5.39%.



8´-Chloro-1-(4-chloro-phenyl)-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4hc**): Yield 86 % (441 mg); red solid; Mp: 320-328 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.65; IR (ν_{max}, KBr, cm^{-1}): 1741, 1637, 1610, 1542, 1492, 1387, 1235, 1088, 828, 706; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.11 (s, 1H, NH), 7.68-7.58 (m, 5H, ArH), 7.48 (t, *J*=7.4 Hz, 1H, ArH), 7.42-7.17 (m, 5H, ArH), 2.71-2.65 (m, 1H, CH_2), 2.47-2.34 (m, 1H, CH_2), 2.24-1.92 (m, 4H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 191.1, 188.7, 179.6, 161.8, 156.2, 136.2, 136.1, 134.8, 133.7, 133.0, 131.8, 131.1, 130.0, 129.8, 129.1, 128.6, 127.5, 125.1, 122.0, 120.6, 119.7, 100.9, 49.6, 37.1, 22.8, 21.9; Anal. calcd. for $C_{29}H_{18}Cl_2N_2O_3$; C: 67.85; H: 3.53; N: 5.46; Found: C: 68.11; H: 3.57; N: 5.32%.



1-Benzyl-8´-chloro-5,6,7,5´-tetrahydro-1H-spiro[indolo-3,10´-indeno[1,2-b]quinolin]-2,4,11´triones: (**4hd**): Yield 90 % (444 mg); red solid; Mp: 320-326 °C (EtOH); R_f [80 % EtOAc / petroleum ether (60-80°C)]: 0.60; IR (ν_{max}, KBr, cm^{-1}): 1737, 1677, 1638, 1612, 1539, 1481, 1404, 1355, 1234, 1069, 959, 708; ^{1}H NMR (300 MHz, DMSO-d_6) δ_H: 11.04 (s, 1H, NH), 7.63-7.20 (m, 10H, ArH), 6.85 (s, 1H, ArH), 5.00, 4.82 (ABq, J=16.2 Hz, 2H, Ar-CH_2), 2.83-2.77 (m, 1H, CH_2), 2.51-2.46 (m, 1H, CH_2), 2.16-1.96 (m, 4H, CH_2); ^{13}C NMR (75 MHz, DMSO-d_6) δ_C: 190.2, 188.2, 180.2, 162.5, 156.0, 136.7, 135.8, 135.6, 134.4, 131.4, 130.6, 128.7, 128.5, 128.0, 127.5, 126.9, 126.3, 125.2, 121.6, 120.2, 119.3, 119.1, 100.2, 48.8, 43.5, 36.5, 21.9, 21.4; Anal. calcd. for $C_{30}H_{21}ClN_2O_3$; C: 73.09; H: 4.29; N: 5.68; Found: C: 73.32; H: 4.32; N: 5.53%.