

SUPPLEMENTARY MATERIAL TO

An efficient synthesis and spectroscopic characterization of Schiff bases containing the 9,10-anthracenedione moiety

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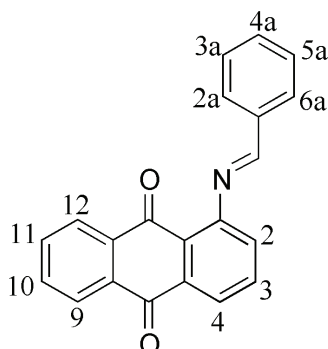


Fig. S-1. Atomic numbering of the prepared Schiff bases.

1-[(3-Hydroxyphenyl)methylidene]amino -9,10-anthraquinone (1). Orange solid; Yield: 82 %; m.p. 312 °C; Anal. Calcd. for C₂₁H₁₃NO₃: C, 77.05; H, 4.00; N, 4.28 %. Found: C, 77.00; H, 3.92 ; N, 4.21 %; IR (KBr, cm⁻¹): 3425, 3331, 1666, 1635, 1600, 1542, 1280; ¹H-NMR (300 MHz, DMSO-*d*₆, δ / ppm): 11.20 (1H, *bs*, OH), 8.64 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.34–6.79 (4H, *m*, Ar-H); ¹³C-NMR (75 MHz, DMSO-*d*₆, δ / ppm): 184.90, 182.80, 159.52 (N=C), 156.01, 147.01, 136.89, 135.90, 134.33, 133.71, 133.25, 133.15, 131.65, 131.10, 130.30, 126.36, 126.30, 125.51, 122.39, 122.09 121.59, 115.89; LC-MS Mass (*m/z*): 327.

1-[(4-Hydroxyphenyl)methylidene]amino -9,10-anthraquinone (2). Orange solid; Yield: 87 %; m.p. 306 °C; Anal. Calcd. for C₂₁H₁₃NO₃: C, 77.05; H, 4.00;

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N, 4.28 %. Found: C, 77.01; H, 3.98; N, 4.29 %; IR (KBr, cm^{-1}): 3427, 3312, 1666, 1635, 1600, 1542, 1282; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 11.26 (1H, *bs*, OH), 8.51 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.39 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 6.75 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 161.01, 159.40 (N=C), 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 132.61, 131.65, 130.30, 127.11, 126.36, 126.30, 125.51, 122.39, 116.29; LC-MS Mass (m/z): 327.

1-[(3-Chlorophenyl)methylidene]amino-9,10-anthraquinone (3). Red solid; Yield: 82 %; m.p. 289 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{12}\text{ClNO}_2$: C, 72.94; H, 3.50; N, 4.05 %. Found: C, 72.96; H, 3.48; N, 4.01 %; IR (KBr, cm^{-1}): 1665, 1636, 1603, 1589, 1542, 1279, 706, 650; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.54 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.52–7.20 (4H, *m*, Ar-H); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.52 (N=C), 147.01, 136.10, 135.90, 134.33, 133.71, 133.41, 133.25, 133.15, 132.10, 131.74, 130.11, 130.01, 129.84, 127.20, 126.36, 126.30, 125.52, 122.39; LC-MS Mass (m/z): M^+ , 345.5; M^{2+} , 347.5.

1-[(2-Furylmethylidene)amino-9,10-anthraquinone (4). Red solid; Yield: 92 %; m.p. 321 °C; Anal. Calcd. for $\text{C}_{19}\text{H}_{11}\text{NO}_3$: C, 75.74; H, 3.68; N, 4.65 %. Found: C, 75.71; H, 3.62; N, 4.66 %; IR (KBr, cm^{-1}): 1666, 1635, 1604, 1590, 1542, 1281; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.68 (1H, *s*, N=CH-Ar), 8.09–8.01 (3H, *m*, H-4/H-9/H-12), 7.87 (1H, *d*, $J_{4a,3a} = 5.6$ Hz, H-4a), 7.75–7.61 (4H, *m*, H-2/H-3/H-10/H-11), 6.75 (1H, *d*, $J_{2a,3a} = 5.6$ Hz, H-2a), 6.55 (1H, *t*, $J_{3a(2a,4a)} = 7.5$ Hz, H-3a); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 148.70, 147.01, 145.35 (N=C), 144.92, 135.90, 134.33, 133.71, 133.25, 133.15, 131.72, 130.30, 126.36, 126.30, 125.50, 122.39, 116.92, 112.84; LC-MS Mass (m/z): 301.

1-[(4-Hydroxy-3-methoxyphenyl)methylidene]amino-9,10-anthraquinone (5). Red solid; Yield: 85 %; m.p. 306 °C; Anal. Calcd. for $\text{C}_{22}\text{H}_{15}\text{NO}_4$: C, 73.94; H, 4.23; N, 3.92 %. Found: C, 73.89; H, 4.20; N, 3.89 %; IR (KBr, cm^{-1}): 3434, 3312, 1667, 1635, 1605, 1590, 1542, 1282; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 11.40 (1H, *bs*, OH), 8.64 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.30 (1H, *s*, H-2a), 7.00 (1H, *d*, $J_{5a,6a} = 8.4$ Hz, H-5a), 6.68 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a), 3.79 (3H, *s*, OCH_3); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.31 (N=C), 150.80, 148.76, 147.01, 135.90, 134.61, 134.33, 133.71, 133.25, 133.15, 131.71, 130.30, 126.36, 126.30, 125.49, 125.30, 122.39, 114.92, 113.26, 56.78; LC-MS Mass (m/z): 357.

1-[(3-Bromo-4-hydroxyphenyl)methylidene]amino-9,10-anthraquinone (6). Orange solid; Yield: 83 %; m.p. 324 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{12}\text{BrNO}_3$: C, 62.09; H, 2.98; N, 3.45 %. Found: C, 73.75; H, 3.11; N, 3.42 %; IR (KBr, cm^{-1}):

1666, 1605, 1542, 1282, 708, 633; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 12.10 (1H, *bs*, OH), 8.54 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.40 (1H, *s*, H-2a), 7.34 (1H, *d*, $J_{5a,6a} = 8.4$ Hz, H-5a), 6.68 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.31 (N=C), 156.40, 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 131.71, 131.56, 130.30, 129.46, 128.10, 126.36, 126.30, 125.49, 122.39, 116.48, 109.40; LC-MS Mass (m/z): M^+ , 406; M^{2+} , 408.

1-[(4-Nitrophenyl)methylidene]amino-9,10-anthraquinone (**7**). Red solid; Yield: 94 %; m.p. 345 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{12}\text{N}_2\text{O}_4$: C, 70.78; H, 3.39; N, 7.86 %. Found: C, 70.93; H, 3.15; N, 7.80 %; IR (KBr, cm^{-1}): 1665, 1636, 1602, 1541, 1279; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.64 (1H, *s*, N=CH-Ar), 8.15 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.4$ Hz, H-2a/H-6a), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.90 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.4$ Hz, H-3a/H-5a), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.51 (N=C), 151.70, 147.01, 139.97, 135.90, 134.33, 133.71, 133.25, 133.15, 131.71, 131.20, 130.30, 126.36, 126.30, 125.51, 124.59, 122.39; LC-MS Mass (m/z): 356.

*1-[(3-Bromophenyl)methylidene]amino*anthra-9,10-quinone (**8**). Red solid; Yield: 74 %; m.p. 340 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{12}\text{BrNO}_2$: C, 64.63; H, 3.10; N, 3.59 %. Found: C, 64.60; H, 3.02; N, 7.89 %; IR (KBr, cm^{-1}): 1671, 1605, 1587, 1542, 1291, 916, 795, 705, 645; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.54 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.52–7.44 (3H, *m*, H-2a/H-4a/H-6a), 7.20 (1H, *t*, $J_{5a(4a,6a)} = 7.2$ Hz, H-5a); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.52 (N=C), 147.01, 136.10, 135.90, 134.33, 133.71, 133.25, 133.15, 132.10, 131.74, 130.11, 130.30, 129.84, 127.20, 126.36, 126.30, 125.52, 122.39; LC-MS Mass (m/z): M^+ , 390; M^{2+} , 392.

1-[(3-Nitrophenyl)methylidene]amino-9,10-anthraquinone (**9**). Red solid; Yield: 87 %; m.p. 290 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{12}\text{N}_2\text{O}_4$: C, 70.78; H, 3.39; N, 7.86 %. Found: C, 70.72; H, 3.34; N, 7.89 %; IR (KBr, cm^{-1}): 1665, 1635, 1603, 1589, 1542, 1279; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.75 (1H, *s*, H-2a), 8.70 (1H, *s*, N=CH-Ar), 8.26 (1H, *d*, $J_{4a,5a} = 8.4$ Hz, H-4a), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.90 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.50 (1H, *t*, $J_{5a(4a,6a)} = 7.2$ Hz, H-5a); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.62 (N=C), 148.72, 147.01, 135.90, 135.30, 134.33, 133.71, 133.25, 133.15, 131.70, 130.80, 130.30, 129.39, 126.36, 126.30, 125.51, 123.65, 122.39, 117.96; LC-MS Mass (m/z): 356.

1-[(2-Nitrophenyl)methylidene]amino-9,10-anthraquinone (**10**). Red solid; Yield: 87 %; m.p. 299 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{12}\text{N}_2\text{O}_4$: C, 70.78; H, 3.39; N, 7.86 %. Found: C, 70.77; H, 3.41; N, 7.84 %; IR (KBr, cm^{-1}): 1665, 1635, 1603, 1589, 1542, 1279; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.82 (1H, *s*,

N=CH-Ar), 8.21 (1H, *d*, $J_{3a,4a} = 8.4$ Hz, H-3a), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.81 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a), 7.70–7.54, (5H, *m*, H-2/H-3/H-10/H-11/H-6a), 7.50 (1H, *t*, $J_{5a(4a,6a)} = 7.2$ Hz, H-5a); ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.90, 182.80, 155.32 (N=C), 149.30, 147.01, 135.90, 134.33, 133.72, 133.71, 133.60, 133.25, 133.15, 131.80, 131.71, 130.30, 128.70, 126.36, 126.30, 125.50, 124.79, 122.39; LC-MS Mass (*m/z*): 356.

1-[(4-Methoxyphenyl)methylidene]amino-9,10-anthraquinone (**11**). Blood red solid; Yield: 91 %; m.p. 289 °C; Anal. Calcd. for $\text{C}_{22}\text{H}_{15}\text{NO}_3$: C, 77.41; H, 4.43; N, 4.10 %. Found: C, 77.39; H, 4.46; N, 4.07 %; IR (KBr, cm^{-1}): 1677, 1597, 1573, 1511, 1259, 1161; ^1H -NMR (300 MHz, DMSO- d_6 , δ / ppm): 8.51 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.50 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 6.85 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a), 3.74 (3H, *s*, OCH₃); ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.90, 182.80, 164.06, 159.82 (N=C), 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 132.30, 131.72, 128.31, 130.30, 126.36, 126.30, 125.42, 122.39, 114.46, 56.04; LC-MS Mass (*m/z*): 341.

1-[(4-Chlorophenyl)methylidene]amino-9,10-anthraquinone (**12**). Red solid; Yield: 90 %; m.p. 305 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{12}\text{ClNO}_2$: C, 72.49; H, 3.50; N, 4.05 %. Found: C, 72.56; H, 4.45; N, 4.01 %; IR (KBr, cm^{-1}): 1668, 1573, 1517, 1280, 1171; ^1H -NMR (300 MHz, DMSO- d_6 , δ / ppm): 8.64 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.50 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.4$ Hz, H-2a/H-6a), 7.28 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.4$ Hz, H-3a/H-5a); ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.95, 182.80, 160.01 (N=C), 147.01, 138.36, 135.90, 134.61, 134.33, 133.71, 133.25, 133.15, 131.71, 131.20, 130.30, 129.21, 126.36, 126.30, 125.51, 122.39; LC-MS Mass (*m/z*): M^+ , 345.5; M^{2+} , 347.5.

1-[(4-Chloro-3-nitrophenyl)methylidene]amino-9,10-anthraquinone (**13**). Red solid; Yield: 74 %; m.p. 312 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{11}\text{ClN}_2\text{O}_4$: C, 64.54; H, 2.84; N, 4.05 %. Found: C, 64.58; H, 2.79; N, 7.11 %; IR (KBr, cm^{-1}): 1665, 1632, 1602, 1589, 1542, 1279, 707; ^1H -NMR (300 MHz, DMSO- d_6 , δ / ppm): 8.69 (1H, *s*, N=CH-Ar), 8.66 (1H, *s*, H-2a), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.88 (1H, *d*, $J_{6a,5a} = 8.6$ Hz, H-6a), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.50 (1H, *d*, $J_{5a,6a} = 8.6$ Hz, H-5a); ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.95, 182.80, 159.62 (N=C), 147.92, 147.01, 137.85, 136.58, 135.90, 134.33, 133.71, 133.25, 133.15, 131.72, 130.30, 129.65, 128.70, 126.36, 126.30, 122.55, 124.36, 122.39; LC-MS Mass (*m/z*): M^+ , 390.5; M^{2+} , 392.5.

1-[(2,4-Dihydroxyphenyl)methylidene]amino-9,10-anthraquinone (**14**). Red solid; Yield: 72 %; m.p. 330 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{13}\text{NO}_4$: C, 73.46; H, 3.82; N, 4.08 %. Found: C, 73.50; H, 3.79; N, 7.05 %; IR (KBr, cm^{-1}): 3412, 3311, 1666, 1605, 1542, 1281; ^1H -NMR (300 MHz, DMSO- d_6 , δ / ppm): 12.10 (1H, *bs*, OH), 10.23 (1H, *bs*, OH), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56

(4H, *m*, H-2/H-3/H-10/H-11), 7.20 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a), 7.10 (1H, *s*, N=CH-Ar), 6.55 (1H, *d*, $J_{5a,6a} = 8.4$ Hz, H-5a), 6.44 (1H, *s*, H-3a); ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.90, 181.98, 164.90, 162.40, 159.52 (N=C), 147.01, 135.90, 134.33, 133.71, 133.31, 133.25, 133.15, 131.70, 130.30, 126.36, 126.30, 125.50, 122.39, 113.70, 108.95, 103.55; LC-MS Mass (m/z): 343.

1-[(4-(Diethylamino)phenyl)methylidene]amino-9,10-anthraquinone (**15**). Brownish red solid; Yield: 83 %; m.p. 346 °C; Anal. Calcd. for $\text{C}_{25}\text{H}_{22}\text{N}_2\text{O}_2$: C, 78.51; H, 5.80; N, 7.29 %. Found: C, 78.49; H, 5.85; N, 7.29 %; IR (KBr, cm^{-1}): 1665, 1602, 1573, 1535; ^1H -NMR (300 MHz, DMSO- d_6 , δ / ppm): 8.81 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.48 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 6.65 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a), 3.50 (4H, *q*, $J = 6.5$ Hz, $\text{N}(\text{CH}_2\text{CH}_3)_2$), 1.18 (6H, *t*, $J = 6.5$ Hz, $\text{N}(\text{CH}_2\text{CH}_3)_2$), ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.90, 182.80, 159.46 (N=C), 151.82, 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 132.92, 131.74, 130.30, 126.36, 126.30, 123.81, 122.39, 125.50, 109.48, 46.30, 13.02; LC-MS Mass (m/z): 382.

1-[(2-Bromo-3-phenyl-2-propenylidene)amino]-9,10-anthraquinone (**16**). Orangish red solid; Yield: 87 %; m.p. 315 °C; Anal. Calcd. for $\text{C}_{23}\text{H}_{14}\text{BrNO}_2$: C, 66.36; H, 3.39; N, 3.36 %. Found: C, 66.37; H, 3.35; N, 3.33 %; IR (KBr, cm^{-1}): 1665, 1602, 1573, 1535, 916, 784, 707; ^1H -NMR (300 MHz, DMSO- d_6 , δ / ppm): 9.40 (1H, *s*, N=CH), 8.42 (1H, *s*, CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.56–7.19 (5H, *m*, Ar-H); ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.90, 182.80, 149.82 (N=C), 147.01, 140.71, 135.90, 134.33, 133.76, 133.71, 133.25, 133.15, 131.70, 130.30, 129.81, 128.70, 128.01, 126.36, 126.30, 125.49, 122.42, 122.35; LC-MS Mass (m/z): M^+ , 416; M^{2+} , 418.

1-[(3,5-Dibromo-4-hydroxyphenyl)methylidene]amino-9,10-anthraquinone (**17**). Orangish red solid; Yield: 86 %; m.p. 346 °C; Anal. Calcd. for $\text{C}_{21}\text{H}_{11}\text{Br}_2\text{NO}_3$: C, 51.99; H, 2.29; N, 2.89 %. Found: C, 51.89; H, 2.35; N, 2.85 %; IR (KBr, cm^{-1}): 3433, 3311, 1670, 1636, 1604, 1589, 1543, 1280, 879, 707; ^1H -NMR (300 MHz, DMSO- d_6 , δ / ppm): 12.10 (1H, *bs*, OH), 8.67 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.73–7.56 (6H, *m*, H-2/H-3/H-10/H-11/H-2a/H-6a); ^{13}C -NMR (75 MHz, DMSO- d_6 , δ / ppm): 184.90, 182.80, 159.26 (N=C), 153.61, 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 131.74, 131.45, 130.30, 128.72, 126.36, 126.30, 125.48, 122.39, 109.92; LC-MS Mass (m/z): 485.

1-[[3-(4-(Dimethylamino)phenyl)-2-propenylidene]amino]-9,10-anthraquinone (**18**). Black solid; Yield: 94 %; m.p. 296 °C; Anal. Calcd. for $\text{C}_{25}\text{H}_{20}\text{N}_2\text{O}_2$: C, 78.93; H, 5.30; N, 7.36 %. Found: C, 78.90; H, 5.35; N, 7.33 %; IR (KBr, cm^{-1}): 1672, 1602, 1529, 1156; ^1H -NMR (300MHz, DMSO- d_6 , δ / ppm): 8.47 (*d*, 1H, N=CH, $J = 7.8$ Hz), 8.01–7.99 (*m*, 3H, H-4/H-9/H-12), 7.70–7.56 (*m*, 4H, H-2/H-

-3/H-10/H-11), 7.01 (*d*, 2H, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 6.95 (*dd*, 1H, $J = 7.8$ Hz and $J = 14.5$ Hz, CH=CH-CH), 6.79 (*d*, 1H, $J = 14.5$ Hz, CH=CH), 6.52 (*d*, 2H, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a), 2.88 (*s*, 6H, N(CH₃)₂); ¹³C-NMR (75 MHz, DMSO-*d*₆, δ / ppm): 184.90, 182.80, 155.12 (N=C), 150.72, 146.88, 146.46, 134.98, 134.33, 133.71, 133.25, 133.15, 131.11, 131.06, 129.54, 127.99, 126.36, 126.30, 124.96, 124.04, 121.88, 112.52, 41.81; LC-MS Mass (*m/z*): 380.

1-[(2-Ethoxyphenyl)methylidene]amino-9,10-anthraquinone (**19**). Orange solid; Yield: 79 %; m.p. 300 °C; Anal. Calcd. for C₂₃H₁₇NO₃: C, 77.73; H, 4.82; N, 3.94 %. Found: C, 77.70; H, 4.85; N, 3.93 %; IR (KBr, cm⁻¹): 1683, 1621, 1604, 1562, 1286; ¹H-NMR (300 MHz, DMSO-*d*₆, δ / ppm): 8.54 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.54 (4H, *m*, H-2/H-3/H-10/H-11), 7.52 (1H, *d*, $J_{3a,4a} = 8.4$ Hz, H-3a), 7.51 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a), 6.90 (1H, *t*, $J_{4a(3a,5a)} = 7.2$ Hz, H-4a), 6.70 (1H, *t*, $J_{5a(4a,6a)} = 7.2$ Hz, H-5a), 3.99 (2H, *q*, $J = 6.5$ Hz, OCH₂CH₃), 1.32 (3H, *t*, $J = 6.5$ Hz, CH₃CH₂O); ¹³C-NMR (75 MHz, DMSO-*d*₆, δ / ppm): 184.90, 182.80, 160.62, 160.22 (N=C), 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 133.12, 131.71, 131.68, 130.30, 126.36, 126.30, 125.49, 121.47, 121.75, 121.39, 114.35, 64.42, 13.84; LC-MS Mass (*m/z*): 355.

1-[[4-(Dimethylamino)phenyl]methylidene]amino-9,10-anthraquinone (**20**). Brownish red solid; Yield: 71 %; m.p. 310 °C; Anal. Calcd. for C₂₃H₁₈N₂O₂: C, 77.95; H, 5.12; N, 7.90 %. Found: C, 77.90; H, 5.16; N, 7.88 %; IR (KBr, cm⁻¹): 1665, 1602, 1542, 1282; ¹H-NMR (300 MHz, DMSO-*d*₆, δ / ppm): 8.51 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.50 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 6.85 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a), 3.74 (6H, *s*, N(CH₃)₂); ¹³C-NMR (75 MHz, DMSO-*d*₆, δ / ppm): 184.90, 182.80, 159.46 (N=C), 154.82, 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 131.74, 130.30, 126.36, 126.30, 125.50, 123.81, 122.95, 122.39, 111.51, 41.85; LC-MS Mass (*m/z*): 354.

1-[[1-(2-Hydroxyphenyl)ethylidene]amino-9,10-anthraquinone (**21**). Orange-red solid; Yield: 82 %; m.p. 330 °C; Anal. Calcd. for C₂₂H₁₅NO₃: C, 77.41; H, 4.43; N, 4.10 %. Found: C, 77.39; H, 4.46; N, 4.07 %; IR (KBr, cm⁻¹): 3442, 3310, 1664, 1635, 1602, 1589, 1542, 1280; ¹H-NMR (300 MHz, DMSO-*d*₆, δ / ppm): 11.59 (1H, *bs*, OH), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.54 (4H, *m*, H-2/H-3/H-10/H-11), 7.52 (1H, *d*, $J_{3a,4a} = 8.4$ Hz, H-3a), 7.51 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a), 6.90 (1H, *t*, $J_{4a(3a,5a)} = 7.2$ Hz, H-4a), 6.70 (1H, *t*, $J_{5a(4a,6a)} = 7.2$ Hz, H-5a), 2.79 (3H, *s*, CH₃); ¹³C-NMR (75 MHz, DMSO-*d*₆, δ / ppm): 184.90, 182.80, 166.22 (N=C), 159.55, 145.01, 134.33, 133.72, 133.71, 133.25, 133.15, 132.80, 132.54, 132.36, 129.02, 126.36, 126.30, 125.10, 121.47, 120.94, 120.15, 117.24, 21.36; LC-MS Mass (*m/z*): 341.

1-[[3,4-Dimethoxyphenyl]methylidene]amino-9,10-anthraquinone (**22**). Red solid; Yield: 89 %; m.p. 303 °C; Anal. Calcd. for C₂₃H₁₇NO₄: C, 74.38; H,

4.61; N, 3.77 %. Found: C, 74.35; H, 4.66; N, 3.72 %; IR (KBr, cm^{-1}): 1665, 1636, 1603, 1590, 1542, 1280; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.64 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.46 (1H, *s*, H-2a), 7.18 (1H, *d*, $J_{6a,5a} = 8.4$ Hz, H-6a), 6.80 (1H, *d*, $J_{5a,6a} = 8.4$ Hz, H-5a), 3.79 (6H, *s*, OCH_3); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.72 (N=C), 154.86, 149.62, 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 131.71, 130.46, 130.30, 126.36, 126.30, 125.51, 125.36, 122.39, 112.88, 112.01, 56.76; LC-MS Mass (*m/z*): 371.

1-[[3-(4-Methoxyphenyl)-2-propenylidene]amino]-9,10-anthraquinone (23). Red solid; Yield: 88 %; m.p. 305 °C; Anal. Calcd. for $\text{C}_{24}\text{H}_{17}\text{NO}_3$: C, 78.46; H, 4.66; N, 3.81. Found: C, 78.40; H, 4.62; N, 3.85; IR (KBr, cm^{-1}): 1665, 1599, 1545, 1270, 1160; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.60 (*d*, 1H, N=CH, $J = 7.6$ Hz), 8.01–7.99 (*m*, 3H, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.16 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 6.92 (*dd*, 1H, $J = 7.6$ Hz and $J = 14.5$ Hz, CH=CH-CH), 6.83 (1H, *d*, $J = 14.5$ Hz, CH=CH), 6.68 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a), 3.81 (3H, *s*, OCH_3); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.94, 154.12 (N=C), 146.88, 146.46, 134.98, 134.33, 133.71, 133.25, 133.15, 131.11, 131.06, 129.44, 128.72, 127.99, 126.36, 126.30, 124.92, 121.54, 114.52, 56.01; LC-MS Mass (*m/z*): 367.

1-[[4-Ethoxyphenyl)methylidene]amino]-9,10-anthraquinone (24). Red solid; Yield: 88 %; m.p. 297 °C; Anal. Calcd. for $\text{C}_{23}\text{H}_{17}\text{NO}_3$: C, 73.73; H, 4.82; N, 3.94 %. Found: C, 73.69; H, 4.78; N, 3.97 %; IR (KBr, cm^{-1}): 1666, 1605, 1543, 1282; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.53 (1H, *s*, N=CH-Ar), 8.06–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.54 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 6.95 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a), 3.99 (2H, *q*, OCH_2CH_3), 1.32 (3H, *t*, $\text{CH}_3\text{CH}_2\text{O}$); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 162.06, 159.82 (N=C), 147.01, 135.90, 134.33, 133.71, 133.25, 133.15, 132.30, 131.70, 130.36, 130.30, 126.36, 126.30, 125.42, 122.39, 114.36, 63.98, 13.82; LC-MS Mass (*m/z*): 355.

1-[[4-Methylphenyl)methylidene]amino]-9,10-anthraquinone (25). Orange solid; Yield: 81 %; m.p. 290 °C; Anal. Calcd. for $\text{C}_{22}\text{H}_{15}\text{NO}_2$: C, 81.21; H, 4.65; N, 4.30 %. Found: C, 81.19; H, 4.68; N, 4.27 %; IR (KBr, cm^{-1}): 1672, 1628, 1600, 1571, 1516, 1174; $^1\text{H-NMR}$ (300 MHz, $\text{DMSO-}d_6$, δ / ppm): 8.61 (1H, *s*, N=CH-Ar), 8.01–7.99 (3H, *m*, H-4/H-9/H-12), 7.70–7.56 (4H, *m*, H-2/H-3/H-10/H-11), 7.50 (2H, *d*, $J_{2a,3a} = J_{6a,5a} = 8.7$ Hz, H-2a/H-6a), 7.11 (2H, *d*, $J_{3a,2a} = J_{5a,6a} = 8.7$ Hz, H-3a/H-5a), 2.31 (3H, *s*, CH_3); $^{13}\text{C-NMR}$ (75 MHz, $\text{DMSO-}d_6$, δ / ppm): 184.90, 182.80, 159.40 (N=C), 147.01, 143.61, 135.90, 134.33, 133.71, 133.25, 133.15, 133.85, 131.61, 130.30, 130.16, 129.48, 126.36, 126.30, 125.51, 122.39, 21.19; LC-MS Mass (*m/z*): 325.