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SYNTHESIS OF 2,3,8-TRISUBSTITUTED 7*H*-ISOINDOLO[5,6-*g*]QUINOXALINE-5,7,9,11(8*H*)-TETRAONES

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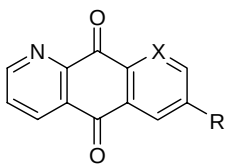
Abstract – Oxidation of 3-methyl- or 7,8-dimethylbenzo[*g*]quinoxalinedione produced the unusual product, dihydroxybenezo[*g*]quinoxaline-5,10-dione-carboxylic acid or dicarboxylic acid. This process was used for the synthesis of a series of 2,3,8-trisubstituted isoindolo[5,6-*g*]quinoxalinetetraone derivatives.

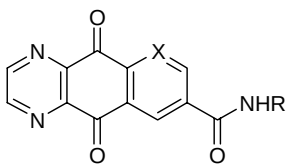
INTRODUCTION

The azaanthraquinones are a new class of antitumor agents that exhibit promising *in vitro* and *in vivo* activity against a wide spectrum of tumor cell lines.[1-3] These are the chromophore-modified analogues of mitoxantrone, a synthetic analogue of doxorubicin. In an effort to develop novel antitumor agents that could overcome the shortcomings of anthracyclines, we recently reported the synthesis and biological evaluation of a series of azaanthraquinone derivatives (**1**).[4-7] In continuation of developing novel azaanthraquinone derivatives, benzo- or pyridoquinoxalinedione carboxamides (**2**) were designed as potential intercalating agents. The target compounds (**2**) required benzo- or pyridoquinoxalinedione-carboxylic acid as penultimate precursors.



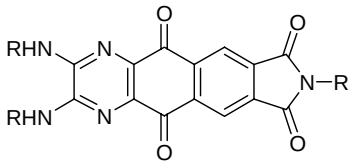
X =CH or N
R = $CH_2OCONHR$, CH_2NR_2
CONHR,

1



X =CH or N
R = alkyl or aryl

2



R = alkyl or aryl

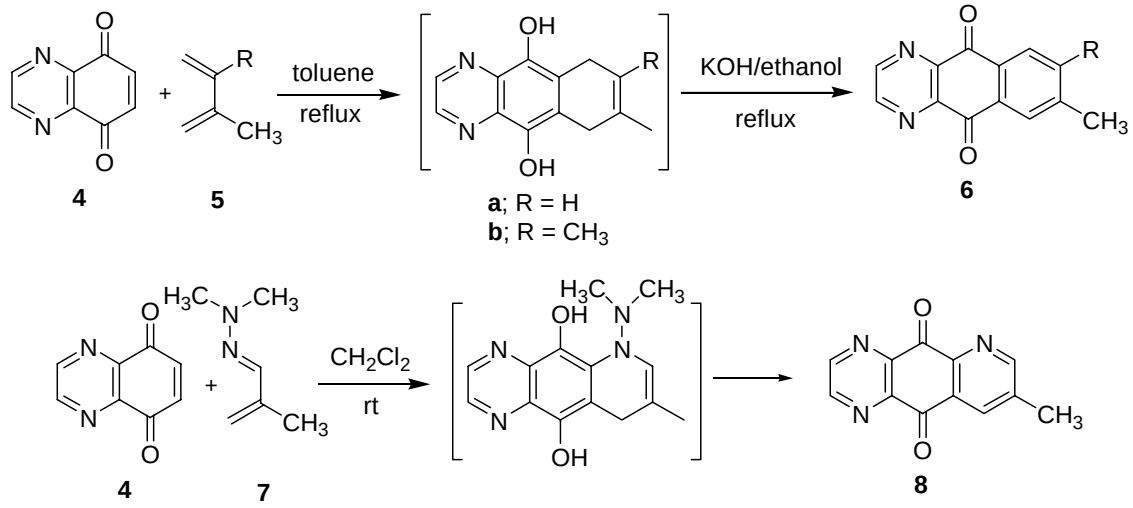
3

It was envisioned that the carboxylic acid intermediates could be obtained by an oxidation of methyl substituted benzo- or pyridoquinoxalinediones. Oxidation of benzylic methyl group with 18% HNO_3 is

known to give the corresponding arylcarboxylic acid.[8] We also observed the formation of the azaanthraquinonecarboxylic acid from methyl substituted azaanthraquinones.[9,10] However, the oxidation of the methyl substituted benzo- or pyridoquinoxalinediones did not give the desired product. In the present study, we described the formation of the unexpected direct ring oxidation product from the methyl substituted benzo- or pyridoquinoxalinediones and its application to the synthesis of a series of 2,3,8-trisubstituted isoindolo[5,6-*g*]quinoxalinetetraone derivatives (**3**) which would act as a potential intercalating agent.

RESULTS AND DISCUSSION

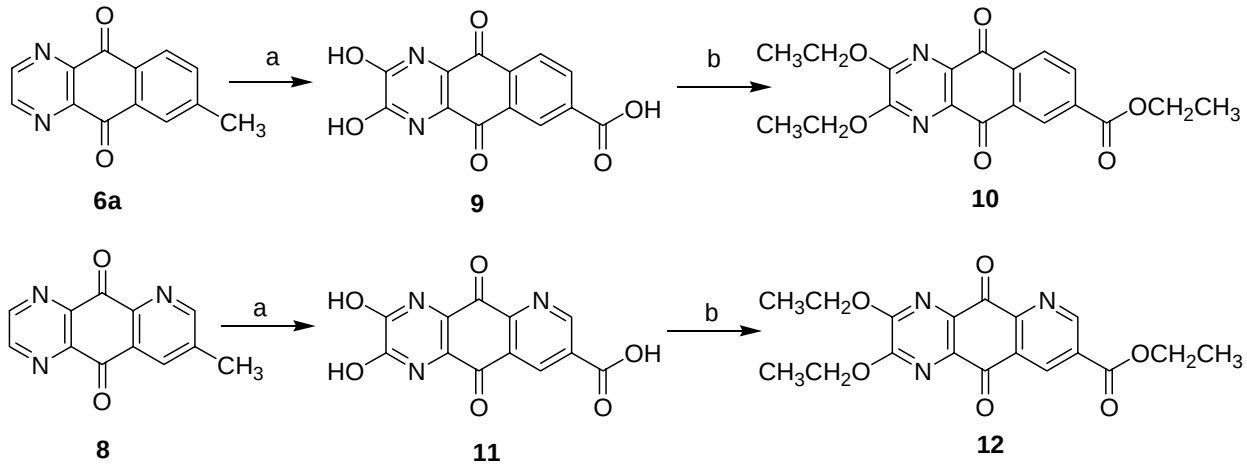
The starting compounds (**5a**, **5b** and **7**) were prepared as outlined in **Scheme 1**. Diels-Alder cycloaddition of quinoxaline-5,8-dione (**4**)[11] with isoprene (**5a**) or 2,3-dimethyl-1,3-butadiene (**5b**) followed by an aerial oxidation in ethanolic KOH solution afforded 7-methyl-5,10-dihydrobenzo[*g*]quinoxaline-5,10-dione (**6a**) or 7,8-dimethyl-5,10-dihydrobenzo[*g*]quinoxaline-5,10-dione (**6b**). Hetero Diels-Alder cycloaddition of quinoxaline-5,8-dione (**4**) with 1-dimethylamino-3-methyl-1-aza-1,3-butadiene (**7**) in dichloromethane provided 7-methyl-5,10-pyrido[2,3-*g*]quinoxaline-5,10-dione (**8**) in 67 % yield.



Scheme 1.

The treatment of the compounds (**6a**) and (**8**) with 18% HNO_3 in Parr type A-30397 titanium pressure reactor for 2 h at 185 - 190^{o}C afforded the unexpected products (**9**) and (**11**) (**Scheme2**). The oxidation of the benzylic methyl group of the compounds (**6a**) and (**8**) accompanied with the ring oxidation of benzo- or pyridoquinoxalinediones. The ring oxidation might proceed through a formation of 2,3-dihydroxy-*N*,*N*-dinitro intermediate followed by a liberation of nitrous acid. In our previous study, the same reaction condition with 3-methyl- and 6,7-dimethyl-1-azaanthraquinone afforded 1-azaanthraquinone-3-carboxylic acid and 6,7-dicarboxylic acid.[9,10] It is rare that the direct ring oxidation of the quinoxaline to 2,3-dihydroxyquinoxaline proceeds without forming *N*-oxide intermediate.[12] The

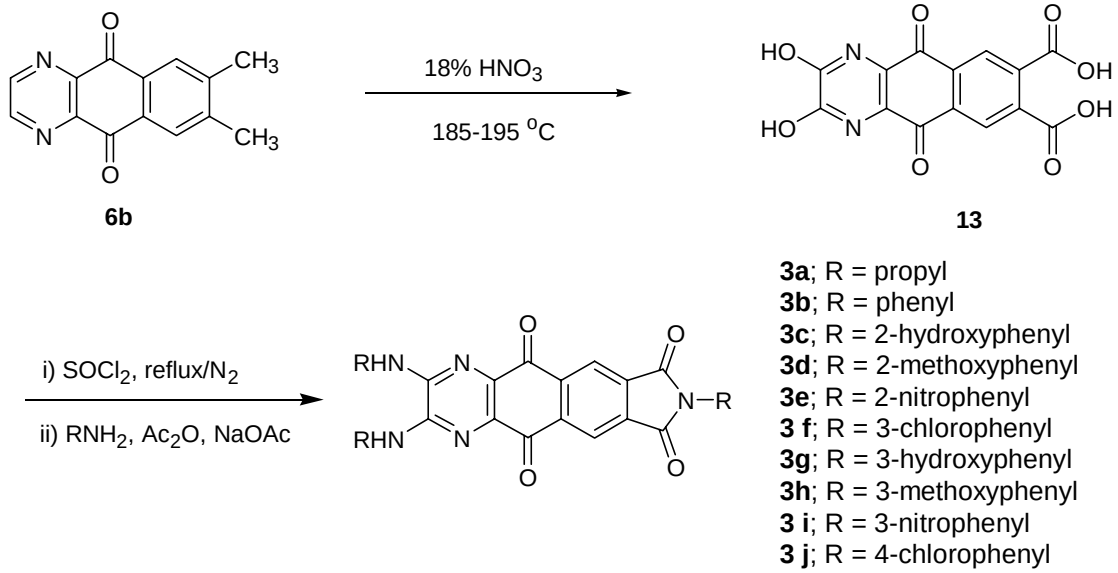
structures of the oxidation products were further elucidated by converting them to the ester products (**10**) and (**12**) (**Scheme 2**). The treatment of the carboxylic acid compounds with ethanol and a catalytic amount of H_2SO_4 afforded the ester products (**10**) and (**12**). Spectroscopic data of the ester products were consistent with the structure as shown in **Scheme 2**. ^{1}H-NMR spectrum which appeared at 1.25-1.45 ppm for the compound (**10**) and at 1.35-1.50 ppm for the compound (**12**) indicated the presence of the three methyl groups.



a: 18% HNO_3, 185 – 190^{o}C, b: CH_3CH_2OH, H_2SO_4, toluene, reflux

Scheme 2. Oxidation of benzo- or pyridoquinoxalinediones.

Based on the above results, we attempted to prepare the 2,3,8-trisubstituted isoindolo[5,6-*g*]quinoxalinetetraone derivatives that would show a promising cytotoxic activity. Thus, the 7,8-dimethylbenzo[*g*]quinoxalinedione (**6b**) was treated with 18% HNO_3 in Parr type A-30397 titanium pressure reactor for 2 h at 190^{o}C to give the dicarboxylic acid (**13**). The crude product (**13**) was heated to reflux in $SOCl_2$ for 5 h. The subsequent treatment of the crude product with a number of alkyl- or aryl-amines afforded the target compounds (**3a - 3j**) in 20 – 35% yield.



3a; R = propyl
3b; R = phenyl
3c; R = 2-hydroxyphenyl
3d; R = 2-methoxyphenyl
3e; R = 2-nitrophenyl
3 f; R = 3-chlorophenyl
3g; R = 3-hydroxyphenyl
3h; R = 3-methoxyphenyl
3 i; R = 3-nitrophenyl
3 j; R = 4-chlorophenyl

Scheme 3.

EXPERIMENTAL

Melting points were determined in an open capillary with Electrothermal IA9100 digital melting point apparatus and are uncorrected. IR spectra were recorded on a JASCO FT-IR300E spectrophotometer. NMR spectra were recorded on a Bruker DPS300 spectrometer 300 MHz for ^{1}H-NMR and 125 MHz for ^{13}C-NMR (tetramethylsilane as internal standard). Mass spectra were recorded on a LCQ (Finnigan) spectrometer. Elemental analyses were performed with an EA 1110 Automatic Elemental Analyzer, CE Instruments. Commercially available reagents and solvents were used without additional purification unless otherwise stated.

7-Methylbenzo[*g*]quinoxaline-5,10-dione (6a)

To a solution of 5,8-quinoxalinedione (**4**) (1.0 g, 6.3 mmol) in anhydrous toluene (50 mL) was added isoprene (**5a**) (10 mL) dropwise. The reaction mixture was heated to reflux for 48 h under nitrogen atmosphere. The mixture was then cooled to ambient temperature and concentrated *in vacuo*. The residue was treated with 5*N*-KOH solution in ethanol (30 mL) and stirred at reflux for 5 h. The mixture was diluted with water (300 mL) and extracted with ethyl acetate (150 mL x 3). The combined organic layers were washed with water (50mL x 3) and brine (50 mL x 2), dried over anhydrous sodium sulfate, and concentrated *in vacuo*. Flash column chromatography (silica gel, 3% MeOH / CH_2Cl_2) of the residue afforded the compound (**6a**) (1.2 g, 86%) as a pale yellow solid (needles from EtOAc): mp 282-284 °C (decomp); IR (KBr) 3044, 1683, 1595 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 9.11 (s, 2H), 8.34 (d, J = 8.0 Hz, 1H), 8.24 (s, 1H), 7.72 (d, J = 8.0 Hz, 1H), 2.59 (s, 3H); Anal. Calcd for $C_{13}H_8N_2O_2$: C, 69.64; H, 3.60; N, 12.49. Found: C, 69.40; H, 3.75; N, 12.60.

7,8-Dimethylbenzo[*g*]quinoxaline-5,10-dione (6b)

Following the above procedure for the preparation of the compound (**6a**), from 5,8-quinoxalinedione (**4**) (1.0 g, 6.3 mmol) and 2,3-dimethyl-1,3-butadiene (**5b**) (1.4 mL, 13 mmol) was obtained **6b** (1.3 g, 86%) as a brown solid (needles from EtOAc): mp 247-256 °C (decomp); IR (KBr) 3047, 2925, 1683, 1590 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 9.09 (s, 2H), 8.14 (s, 2H), 2.56 (s, 6H); Anal. Calcd for $C_{14}H_{10}N_2O_2$: C, 70.58; H, 4.23; N, 11.76. Found: C, 70.34; H, 4.39; N, 11.62.

8-Methylpyrido[2,3-*g*]quinoxaline-5,10-dione (8)

To a solution of 5,8-quinoxalinedione (**4**) (0.10 g, 0.62 mmol) in anhydrous dichloromethane (5 mL) was added 1-(*N*,*N*-dimethylamino)-1-aza-1,3-butadiene (**7**) (83 mg, 0.74 mmol) dropwise. The mixture was stirred at rt for 24 h under nitrogen atmosphere. The reaction mixture was then diluted with dichloromethane (100 mL) and washed with saturated sodium bicarbonate solution (50 mL x 3). The organic layer was dried over anhydrous sodium sulfate and filtered. The filtrate was concentrated *in vacuo*. The residue was purified by flash column chromatography (silica gel, 3% MeOH / CH_2Cl_2) to give

the compound (**8**) (95 mg, 67 %) as a red solid (needles from EtOAC): mp 242-244 °C; IR (KBr) 2924, 1698, 1588 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 9.16 (s, 2H), 9.05 (s, 1H), 8.56 (s, 1H), 2.47 (s, 3H); Anal. Calcd for $C_{12}H_7N_3O_2$: C, 64.00; H, 3.13; N, 18.66. Found: C, 64.24; H, 3.05; N, 18.46.

2,3-Dihydroxy-5,10-dioxobenzo[*g*]quinoxaline-7-carboxylic acid (9)

7-Methylbenzo[*g*]quinoxaline-5,10-dione (**6a**) (1.0 g, 4.5 mmol) was dissolved in 18 % HNO_3 (20 mL). The solution was placed in Parr type A-303971 titanium pressure reactor and stirred at 185-195 °C for 2 h. The mixture was cooled to ambient temperature and filtered to give the product (**9**) (1.0 g, 90%) as cream-colored needles after crystallization from EtOH: mp 205-207 °C; IR (KBr) 3500-2900, 1703, 1500 cm^{-1}; ^{1}H-NMR (DMSO-d_6, 300 MHz) δ 8.23 (s, 1H), 8.12 (d, J = 8.0 Hz, 1H), 7.92 (d, J = 8.0 Hz, 1H); Anal. Calcd for $C_{13}H_6N_2O_6$: C, 54.56; H, 2.11; N, 9.79. Found: C, 54.30; H, 2.25; N, 9.90.

2,3-Diethoxy-5,10-dioxobenzo[*g*]quinoxaline-7-carboxylic acid ethyl ester (10)

2,3-Dihydroxy-5,10-dioxobenzo[*g*]quinoxaline-7-carboxylic acid (**9**) (0.20 g, 0.79 mmol) was dissolved in toluene (25 mL) and treated with ethanol (1 mL) and H_2SO_4 (3 drop). The mixture was heated to reflux for 24 h. The resulting mixture was cooled and concentrated *in vacuo*. The residue was diluted with dichloromethane (200 mL) and washed with saturated sodium bicarbonate solution (50 mL x 3). The combined organic layers were dried over anhydrous sodium sulfate and concentrated *in vacuo*. The residue was purified by flash column chromatography (silica gel, CH_2Cl_2) to give **10** as oil (0.18 g, 81%): IR (neat) 2983, 1729, 1465 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 8.37 (s, 1H), 8.16 (d, J = 8.0 Hz, 1H), 7.72 (d, J = 8.0 Hz, 1H), 4.45 – 4.30 (m, 6H), 1.45 – 1.25 (m, 9H).

2,3-Dihydroxy-5,10-dioxopyrido[2,3-*g*]quinoxaline-8-carboxylic acid (11)

Following the procedure for the preparation of the compound (**9**), from 8-methypyrido[2,3-*g*]quinoxaline-5,10-dione (**8**) (1.5 g, 6.6 mmol) and 18 % HNO_3 (30 mL) was obtained **11** (1.0 g, 58%) as a brown solid (needles from EtOH): mp 155-157 °C; IR (KBr) 3500-2900, 1729, 1635, 1577 cm^{-1}; ^{1}H-NMR (DMSO-d_6, 300 MHz) δ 9.10 (s, 1H), 8.83 (s, 1H); Anal. Calcd for $C_{12}H_5N_3O_6$: C, 50.19; H, 1.75; N, 14.63. Found: C, 50.34; H, 1.70; N, 14.47.

2,3-Diethoxy-5,10-dioxopyrido[2,3-*g*]quinoxaline-8-carboxylic acid ethyl ester (12)

Following the procedure for the preparation of the compound (**10**), from 2,3-dihydroxy-5,10-dioxopyrido[2,3-*g*]quinoxaline-8-carboxylic acid (**11**) (0.20 g, 0.78 mmol) was obtained **12** (0.11 g, 50 %) as oil: IR (neat) 2925, 1728, 1599 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 9.37 (s, 1H), 8.87 (s, 1H), 4.50 - 4.30 (m, 6H), 1.50 – 1.35 (m, 9H).

2,3-Dihydroxy-5,10-dioxobenzo[*g*]quinoxaline-7,8-dicarboxylic acid (13)

Following the procedure for the preparation of the compound (**9**), from 7,8-dimethylbenzo[*g*]quinoxaline-5,10-dione (**6b**) (1.0 g, 4.2 mmol) and 18 % HNO_3 (30 mL) was obtained **13** (0.79 g, 56 %) as a cream-colored solid (needles from EtOH): mp 264-265 °C; IR (KBr)

3500-2900, 1705, 1417 cm^{-1}; ^{1}H-NMR (DMSO-d_6, 300 MHz) δ 8.96 (s, 2H); ^{13}C-NMR (DMSO-d_6, 125 MHz) δ 167.2, 134.6, 128.5; MS *m/z* EI 331 (M^++1); Anal. Calcd for $C_{14}H_6N_2O_8$: C, 50.92; H, 1.83; N, 8.48. Found: C, 50.80; H, 1.70; N, 8.62.

General Procedure of Trisubstituted Isoindolo[5,6-*g*]quinoxaline-5,7,9,11-tetraone (3a - j)

2,3-Dihydroxy-5,10-dioxobenzo[*g*]quinoxaline-7,8-dicarboxylic acid (**13**) (0.15 g, 0.50 mmol) was treated with $SOCl_2$ (10 mL) and heated to reflux for 5 h under nitrogen atmosphere. The reaction mixture was concentrated *in vacuo* to remove $SOCl_2$. The residue was suspended in anhydrous THF (10 mL) and a solution of a corresponding amine (0.55 mmol) in THF (2 mL) was added dropwise. The reaction mixture was stirred at ambient temperature for 2 h. The mixture was then concentrated *in vacuo*. The residue was treated with acetic anhydride (1 mL, 2.90 mmol) and sodium acetate (26 mg, 0.32 mmol), and stirred in water bath (60-70 °C). The resulting mixture was diluted with ice-cold water to give the precipitate. The precipitate was purified by flash column chromatography (silica gel, CH_2Cl_2).

8-Propyl-2,3-dipropylamino-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3a)

Light brown solid (90 mg, 56%): mp 241–242 °C (needles from EtOAc); IR (KBr) 3456, 3038, 2966, 1703, 1402 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 8.46 (s, 2H), 3.91 (t, *J* = 7.2 Hz, 6H), 1.94 (m, 6H), 1.18 (t, *J* = 7.5 Hz, 9H); ^{13}C-NMR ($CDCl_3$, 125 MHz) δ 166.3, 137.2, 118.1, 40.3, 21.8, 11.3; MS *m/z* EI 457 (M^++Na); Anal. Calcd for $C_{23}H_{25}N_5O_4$: C, 63.44; H, 5.79; N, 16.08. Found: C, 63.60; H, 5.85; N, 16.10.

2,3-Dianilino-8-phenyl-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3b)

Brown solid (48 mg, 30%): mp >300 °C (needles from EtOAc, decomp); IR (KBr) 3448, 3067, 2926, 1718, 1654, 1596 cm^{-1}; ^{1}H-NMR (CD_3OD, 300 MHz) δ 8.30 (s, 2H), 8.12 (s, 2H), 7.14-7.57 (m, 15H); MS *m/z* EI 538 (M^++1); Anal. Calcd for $C_{32}H_{19}N_5O_4$: C, 71.50; H, 3.56; N, 13.03. Found: C, 71.67; H, 3.65; N, 13.12.

2,3-Di(2-hydroxyanilino)-8-(2-hydroxyphenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3c)

Brown solid (79 mg, 32%): mp 276-277 °C (needles from EtOAc); IR (KBr) 3448, 3070, 2955, 1728, 1654, 1587 cm^{-1}; ^{1}H-NMR (CD_3OD, 300 MHz) δ 8.31(s, 2H), 8.26 (s, 2H), 7.50-7.66 (m, 12H); ^{13}C-NMR (CD_3OD, 125 MHz) δ 169.1, 166.9, 148.0, 131.0, 130.8, 127.3, 125.2, 125.0, 124.6, 124.5; MS *m/z* EI 608 (M^++Na); Anal. Calcd for $C_{32}H_{19}N_5O_7$: C, 65.64; H, 3.27; N, 11.96. Found: C, 65.95; H, 3.15; N, 11.75.

2,3-Di(2-methoxyanilino)-8-(2-methoxyphenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3d)

Brown solid (86 mg, 33%): mp >300 °C (needles from EtOAc, decomp); IR (KBr) 3447, 3019, 2926, 1728, 1600 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 8.48 (s, 2H), 7.50 (m, 3H), 7.30 (m, 3H), 7.10 (m, 6H), 3.81 (s, 9H); ^{13}C-NMR ($CDCl_3$, 125 MHz) δ 165.2, 155.1, 137.4, 131.2, 129.6, 121,0, 119.5, 119.1, 112.2,

55.8; MS *m/z* EI 649 (M^++Na); Anal. Calcd for $C_{35}H_{25}N_5O_7$: C, 66.98; H, 4.02; N, 11.16. Found: C, 67.15; H, 3.95; N, 11.02.

2,3-Di(2-nitroanilino)-8-(2-nitrophenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3e)

Yellow solid (80 mg, 30%): mp 261-262 °C (needles from EtOAc, decomp); IR (KBr) 3447, 2958, 1731, 1583 cm^{-1}; ^{1}H-NMR (CD_3OD, 300 MHz) δ 7.38 (m, 3H), 8.48 (s, 2H), 8.45 (s, 2H), 7.89-8.20 (m, 6H), 7.76 (m, 3H); MS *m/z* EI 695 (M^++Na); Anal. Calcd for $C_{32}H_{16}N_8O_{10}$: C, 57.15; H, 2.40; N, 16.66. Found: C, 57.34; H, 2.16; N, 16.52.

2,3-Di(3-chloroanilino)-8-(3-chlorophenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3f)

Brown solid (95 mg, 36%): mp >300 °C (needles from EtOAc, decomp); IR (KBr) 3473, 3097, 2924, 1725, 1588 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 8.48 (s, 2H), 7.63 (s, 3H), 7.45 (br s, 2H), 7.34 (d, J = 7.5 Hz, 3H), 7.24 (m, 3H), 7.08 (d, J = 7.5 Hz, 3H); ^{13}C-NMR (CD_3OD, 125 MHz) δ 166.9, 150.0, 141.2, 132.8, 131.3, 128.7, 126.9, 119.8, 115.8; MS *m/z* EI 663 (M^++Na); Anal. Calcd for $C_{32}H_{16}N_5O_4Cl_3$: C, 59.97; H, 2.52; N, 10.93. Found: C, 60.23; H, 2.43; N, 10.85.

2,3-Di(3-hydroxyanilino)-8-(3-hydroxyphenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3g)

Light yellow solid (73 mg, 29%): mp >300 °C (needles from EtOH, decomp); IR (KBr) 3430, 3105, 2925, 1771, 1718, 1599 cm^{-1}; ^{1}H-NMR (DMSO-d_6, 300 MHz) δ 8.31 (s, 2H), 7.53 (m, 3H), 7.37 (d, J = 8.0 Hz, 3H), 7.28 (s, 3H), 7.21 (dd, J = 8.0, 1.7 Hz, 3H); ^{13}C-NMR (DMSO-d_6, 125 MHz) δ 169.1, 165.2, 150.4, 137.0, 132.3, 129.6, 124.6, 122.0, 120.7, 117.9; MS *m/z* EI 608 (M^++Na); Anal. Calcd for $C_{32}H_{19}N_5O_7$: C, 65.64; H, 3.27; N, 11.96. Found: C, 65.89; H, 3.16; N, 11.78.

2,3-Di(3-methoxyanilino)-8-(3-methoxyphenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3h)

Brown solid (86 mg, 33%): mp 212-213 °C (needles from EtOAc); IR (KBr) 3307, 2955, 1721, 1665 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 8.35 (s, 2H), 7.27 (s, 3H), 7.16 (t, J = 8.1 Hz, 3H), 7.01 (d, J = 8.1 Hz, 3H), 6.63 (dd, J = 8.1, 2.1 Hz, 3H), 3.81 (s, 9H); ^{13}C-NMR ($CDCl_3$, 125 MHz) δ 168.3, 160.1, 139.1, 129.6, 111.9, 110.0, 105.6, 55.2; MS *m/z* EI 534 (M^+-3OCH_3); Anal. Calcd for $C_{35}H_{25}N_5O_7$: C, 66.98; H, 4.02; N, 11.16. Found: C, 67.12; H, 3.98; N, 11.05.

2,3-Di(3-nitroanilino)-8-(3-nitrophenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3i)

Light brown solid (105 mg, 39%): mp >300 °C (needles from EtOAc, decomp); IR (KBr) 3448, 3103, 2955, 1729, 1532 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 8.66 (s, 2H), 8.28 (s, 2H), 8.01 (m, 6H), 7.80 (m, 3H), 7.53-7.60 (m, 3H); Anal. Calcd for $C_{32}H_{16}N_8O_{10}$: C, 57.15; H, 2.40; N, 16.66. Found: C, 57.30; H, 2.23; N, 16.50.

2,3-Di(4-chloroanilino)-8-(4-chlorophenyl)-7*H*-isoindolo[5,6-*g*]quinoxaline-5,7,9,11(8*H*)-tetraone (3j)

Brown solid (95 mg, 36%): mp 271-272 °C (needles from EtOAc, decomp); IR (KBr) 3447, 2954, 1728,

1598 cm^{-1}; ^{1}H-NMR ($CDCl_3$, 300 MHz) δ 8.29 (s, 2H), 7.64 (d, *J* = 7.7 Hz, 6H), 7.31 (d, *J* = 7.7 Hz, 6H); MS *m/z* EI 663 (M^++Na); Anal. Calcd for $C_{32}H_{16}N_5O_4Cl_3$: C, 59.97; H, 2.52; N, 10.93. Found: C, 60.31; H, 2.37; N, 10.80.

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