Supporting Information

Synthesis and Biological Evaluation of Tylophorine-Derived Dibenzoquinolines as Orally Active Agents–Exploration of the Role of Tylophorine E Ring on Biological Activity

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Contents:

Table S1. Influence of reductants on the formation of dibenzoquinolines in tetrahydrofuran.

Product ID	Reductant	Time (h)	% Yield
10b	$LiAlH_4 + AlCl_3$	4	76
	$LiAlH_4$	48	7
10c	$LiAlH_4 + AlCl_3$	4	66
	$LiAlH_4$	48	11
10e	$LiAlH_4 + AlCl_3$	4	59
	$LiAlH_4$	48	2
10g	$LiAlH_4 + AlCl_3$	4	95
	$LiAlH_4$	48	3
29a	$LiAlH_4 + AlCl_3$	4	40
	$LiAlH_4$	48	16

Table S2. Purities of tylophorine and dibenzoquinolines compounds analyzed by reverse phase HPLC. The purities of compounds **2**, **9a-c**, **10a-n**, **11a-c**, **28a-d**, **29a-c**, **30a-b**, **31**, **32**, and **33a-d** that were assayed for the biological activities were determined as described in the experimental section. The peak purity was checked with UV spectra at 254 nm.

Compound ID	Retention Time (min)	Relative Purity (%)
2	16.87	98.9
9a	19.04	95.5
9b	19.69	95.5
9c	21.33	99.0
10a	18.05	95.8
10b	19.83	97.1
10c	21.59	98.8
10d	23.33	99.7
10e	19.47	95.7
10f	20.49	98.7
10g	20.35	98.8
10h	22.07	95.8
10i	19.03	96.9
10j	19.21	96.5
10k	22.54	98.2
10l	22.97	95.9
10’m	16.68	98.1
10’n	14.88	87.8
11a	16.53	96.1
11b	17.95	96.4
11c	17.66	95.6
28a	20.43	97.6
28b	22.11	97.1
28c	23.73	96.5
28d	21.44	98.3
29a	19.99	98.0
29b	21.91	99.0
29c	23.65	97.8
30a	19.94	96.4
30b	21.66	95.8
31	21.16	97.3
32	22.69	97.7
33a	19.67	99.6
33b	17.95	97.1
33c	19.46	98.8
33d	21.05	98.7

Figure S1. Dose dependence and time course studies on the pharmacological activities of dibenzoquinoline **33b** in three biological systems. **A.** Western analysis for cyclin A2 expression and GAPDH in HONE1 carcinoma cells after dibenzoquinoline **33b** treatment for 24 h at the dose indicated (**a**) and for indicated time at the concentration of 0.5 μM (**b**). **B.** Western analysis for iNOS, COX-2, and GAPDH protein expression in LPS/INFγ stimulated RAW264.7 cells after compound treatment for 24 h at the dose indicated (**a**) and for indicated time at the concentration of 0.1 μM (**b**). **C.** Western analysis for TGEV nucleocapsid (N) protein and GAPDH in TGEV infected ST cells at 6 hpi at the dose indicated (**a**) and for indicated time at the concentration of 0.5 μM (**b**). Shown are representative of at least three independent experiments.

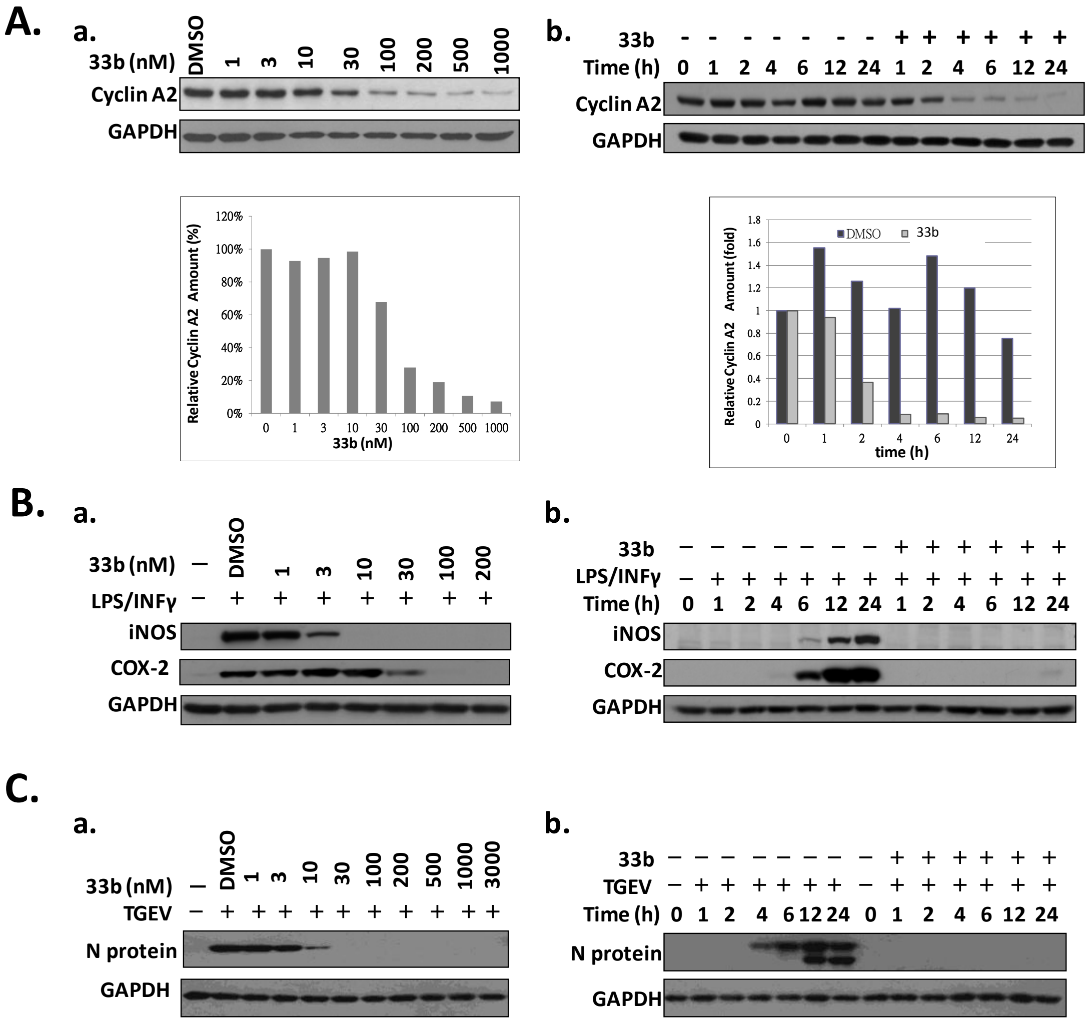
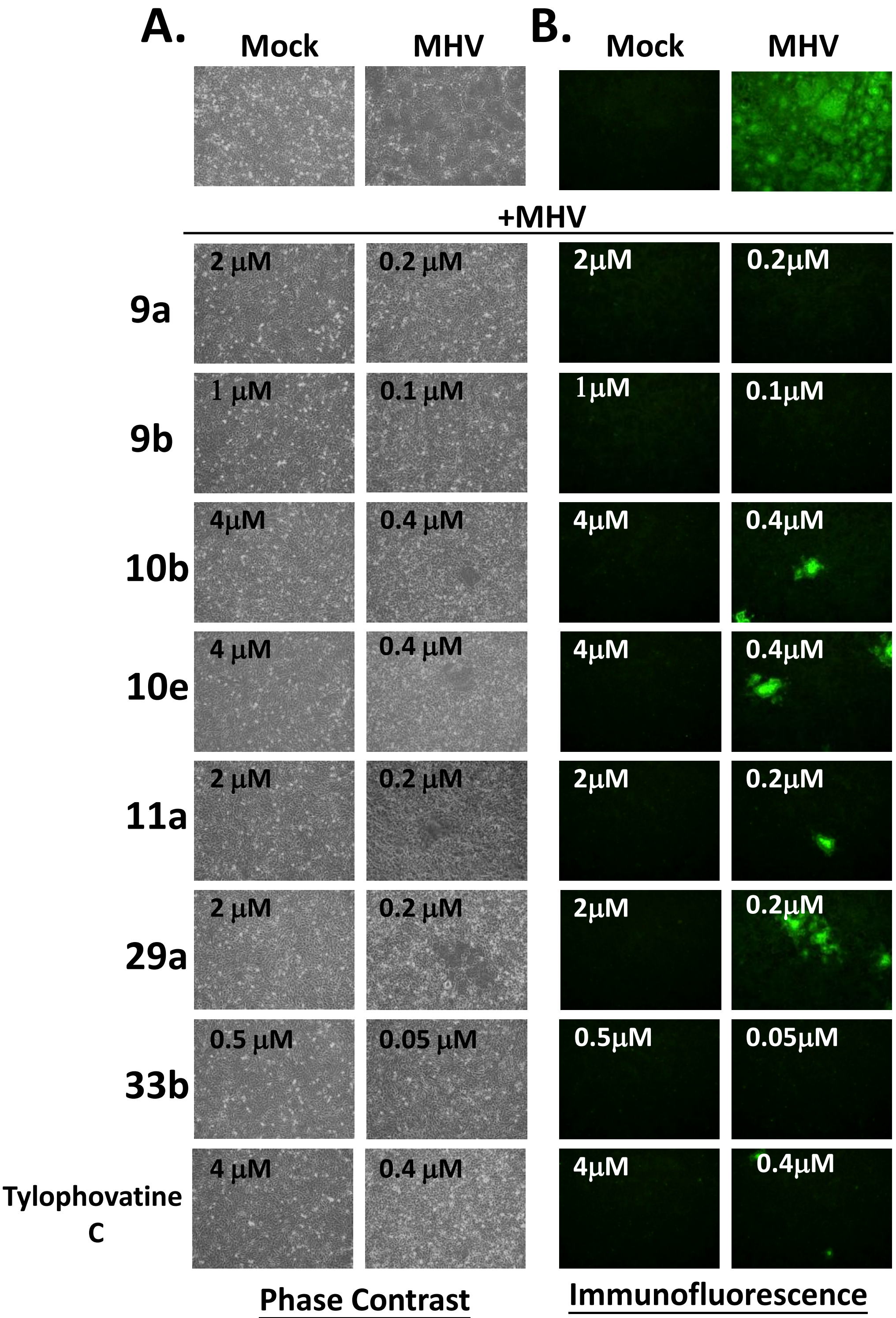
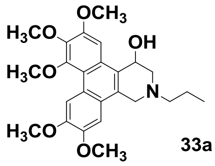


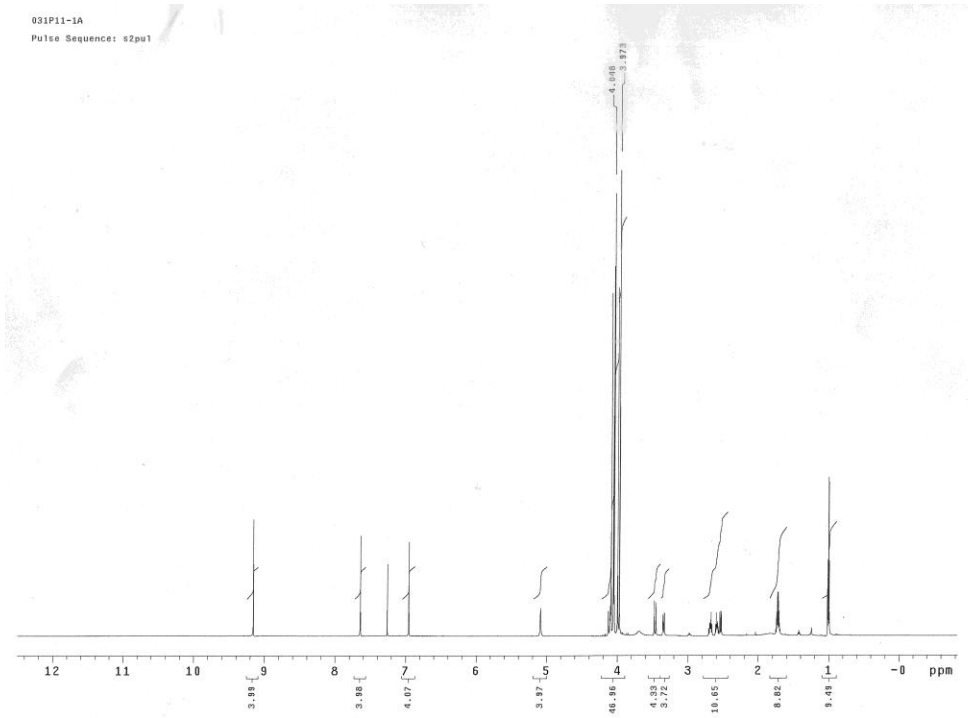
Figure S2: Tylophorine and dibenzoquinolines compounds exerted activities for anti-MHV induced cytopathic effect and anti-viral protein expression in infected DBT cells at 24 hpi. **A.** Phase contrast images were shown for cytopathic effect in MHV infected DBT cells. **B.** Immunofluorescent assay for MHV N protein expression in MHV infected DBT cells. Compound concentrations used as indicated. Shown are representative of at least three independent experiments.



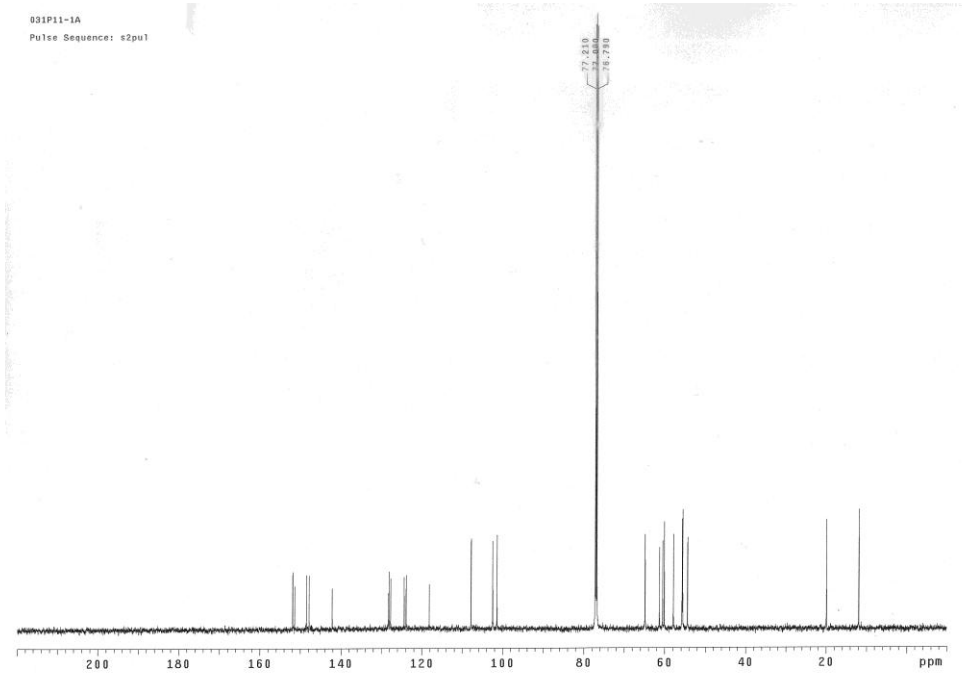
<u>1D, 2D-NMR data of 33a-</u>Supplementary raw ^{1}H-NMR, ^{13}C-NMR, DEPT, COSY, HSQC, HMBC, and NOESY data of compound **33a.**



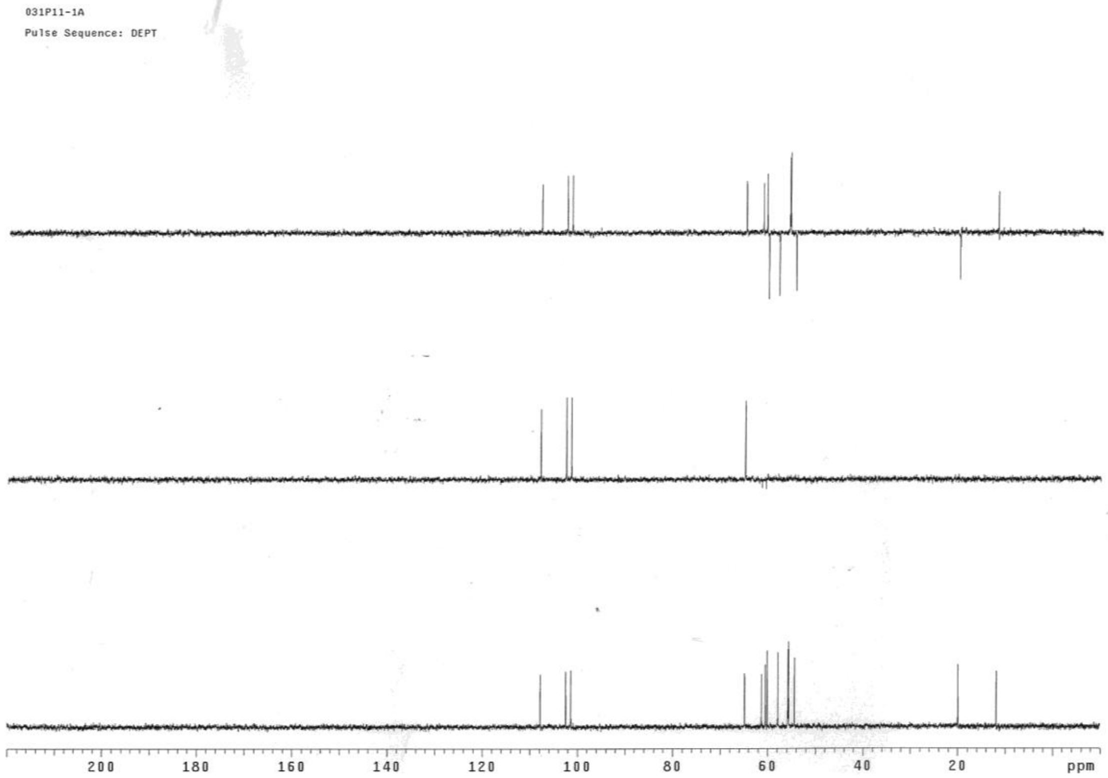
^{1}H-NMR spectrum_**33a**



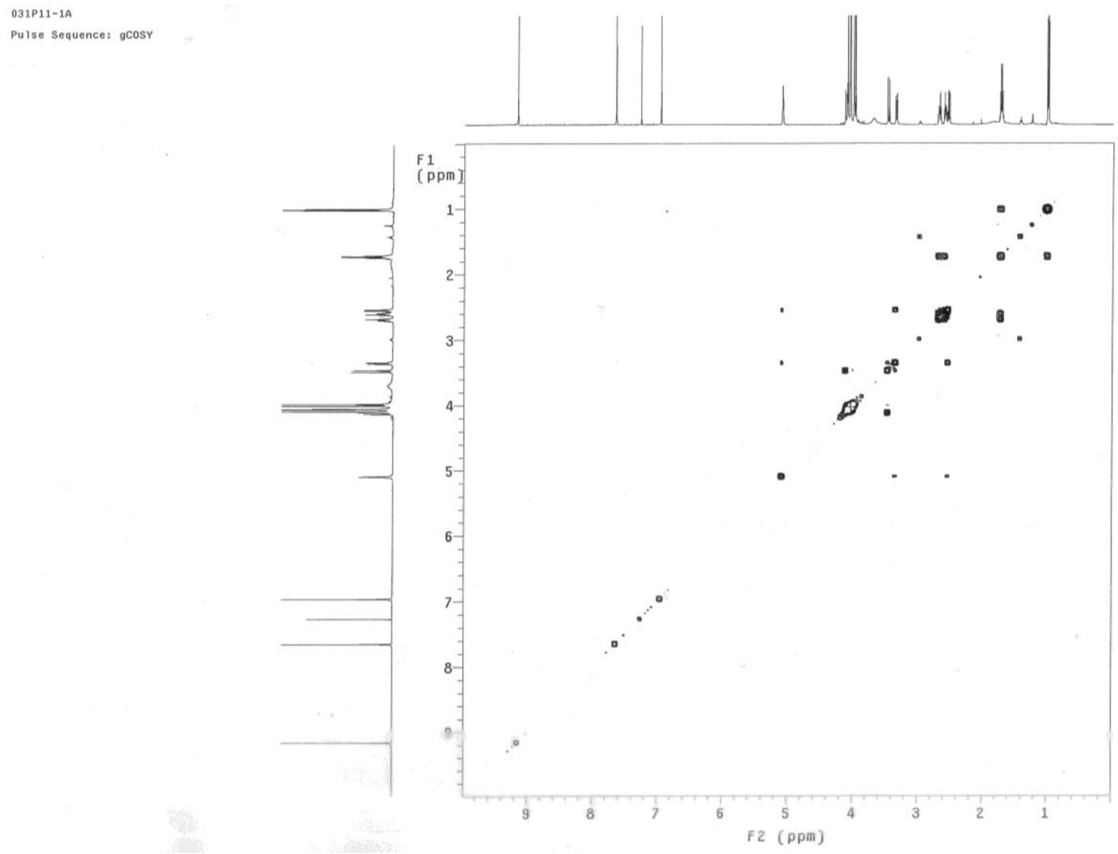
^{13}C-NMR spectrum_**33a**



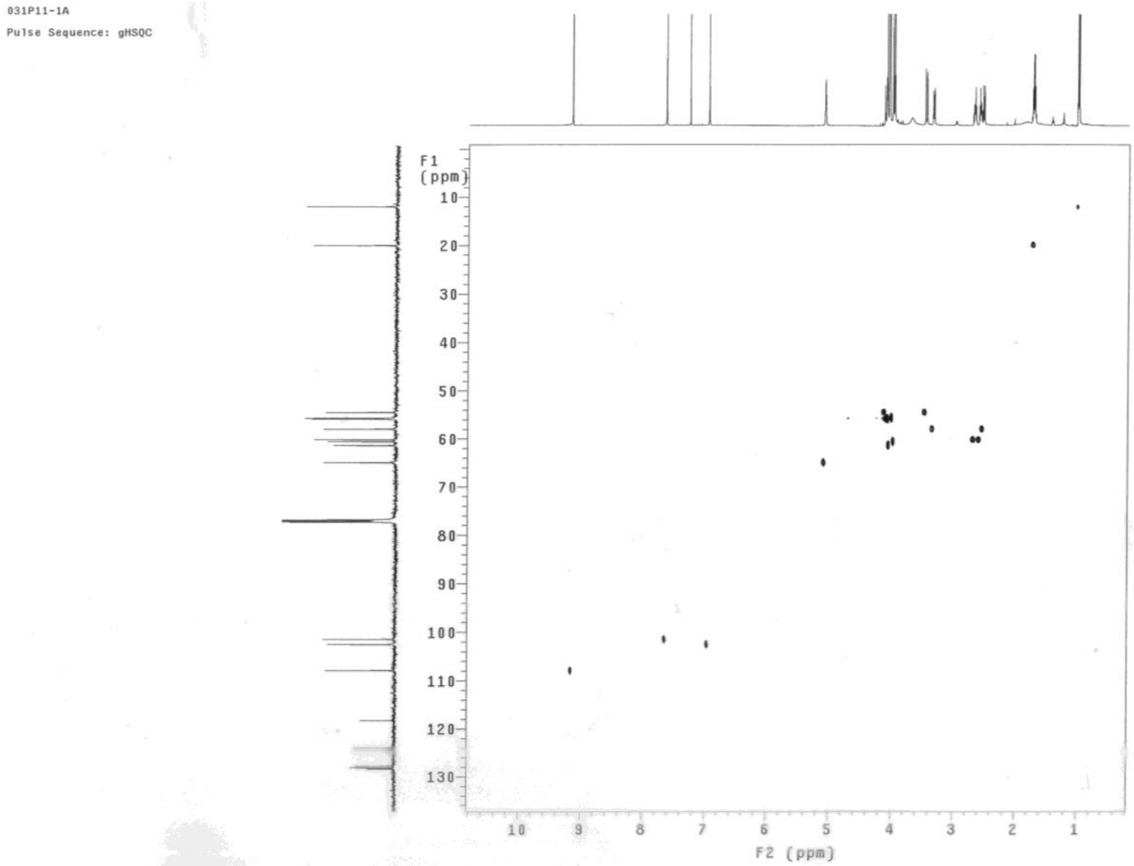
DEPT spectrum_**33a**



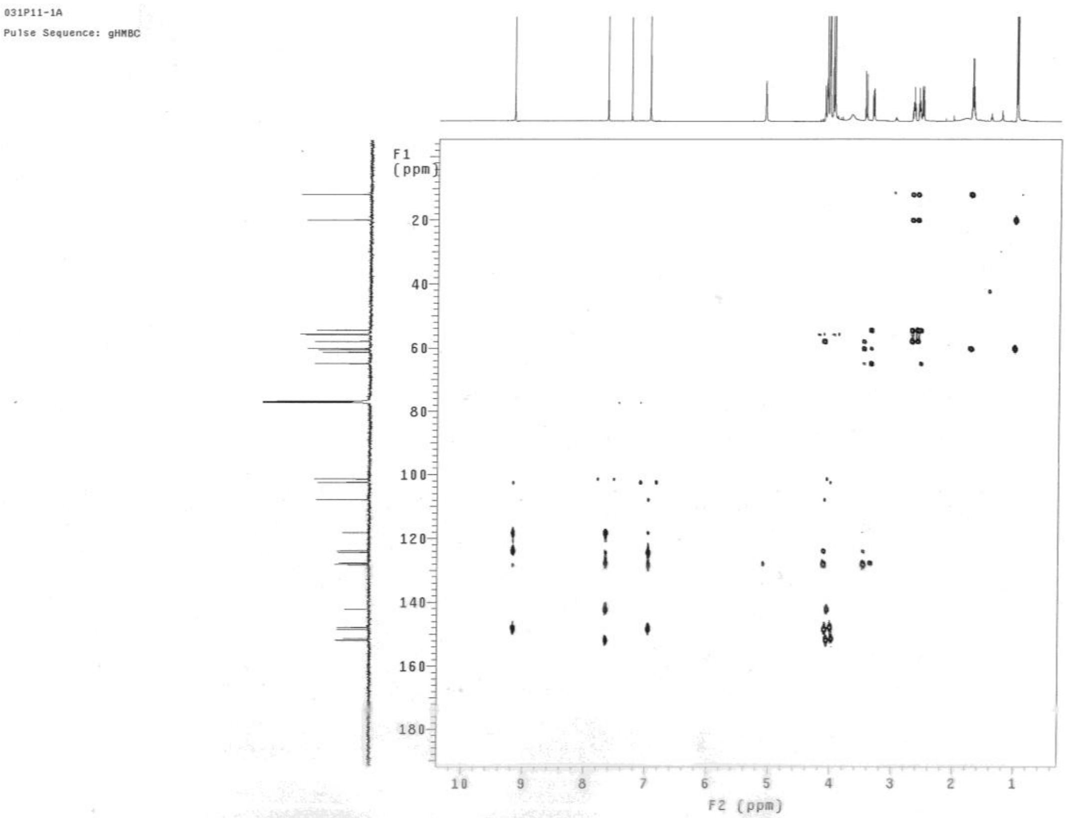
COSY spectrum_**33a**



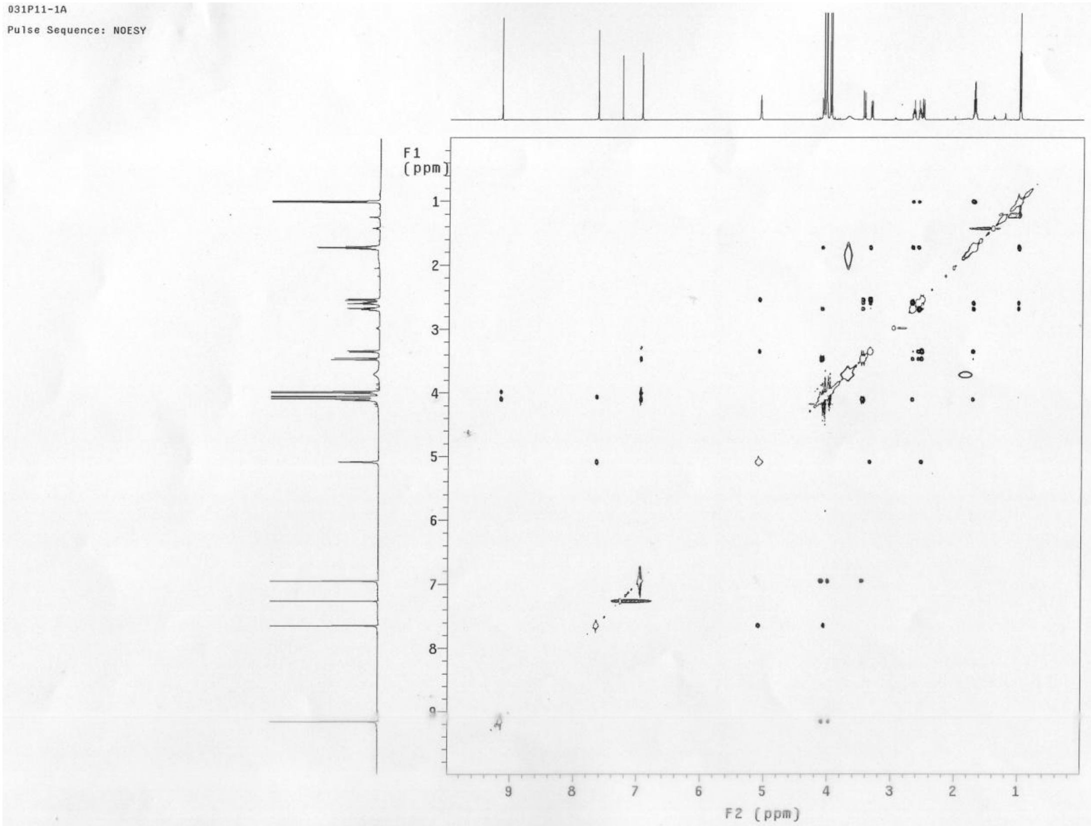
HSQC spectrum_**33a**



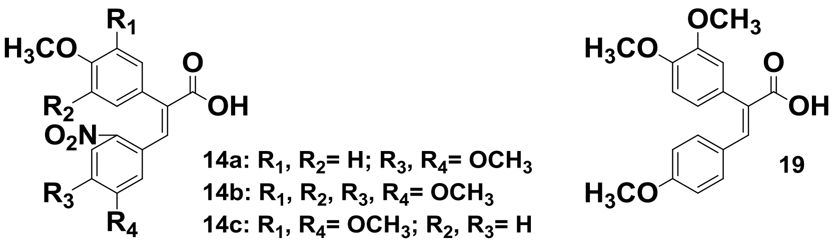
HMBC spectrum_**33a**



NOSEY spectrum_**33a**



Experimental details for intermediates 14a-14c and 19



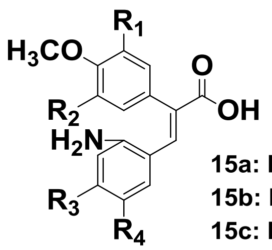
(*E*)-3-(4,5-Dimethoxy-2-nitrophenyl)-2-(4-methoxyphenyl)acrylic acid (14a). Yield = 81%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.44 (s, 3H), 3.77 (s, 3H), 3.96 (s, 3H), 6.32 (s, 1H), 6.80 (d, *J* = 9.2 Hz, 2H), 7.11 (d, *J* = 8.8 Hz, 2H), 7.65 (s, 1H), 8.24 (s, 1H). MS (APCI) *m/z* 357.7 $[M-H]^-$.

(*E*)-3-(4,5-Dimethoxy-2-nitrophenyl)-2-(3,4,5-trimethoxyphenyl)acrylic acid(14b). Yield = 86%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.49 (s, 3H), 3.71 (s, 6H), 3.82 (s, 3H), 3.94 (s, 3H), 6.40 (s, 1H), 6.42 (s, 2H), 7.65 (s, 1H), 8.28 (s, 1H). MS (APCI) *m/z* 417.7 $[M-H]^-$.

(*E*)-2-(3,4-Dimethoxyphenyl)-3-(5-methoxy-2-nitrophenyl)acrylic acid (14c).
Yield = 94%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.58 (s, 3H), 3.69 (s, 3H), 3.85 (s, 3H), 6.40 (d, *J* = 2.8 Hz, 1H), 6.63 (s, 1H), 6.76 (s, 2H), 6.82 (dd, *J* = 9.2, 2.8 Hz, 1H), 8.14 (d, *J* = 9.2 Hz, 1H), 8.24 (s, 1H). MS (APCI) *m/z* 358.1 $[M-H]^-$.

(*E*)-2-(3,4-Dimethoxyphenyl)-3-(4-methoxyphenyl)acrylic acid (19).
Yield = 51%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.77 (s, 3H), 3.81 (s, 3H), 3.93 (s, 3H), 6.71 (d, *J* = 8.8 Hz, 1H), 6.76 (d, *J* = 2.0 Hz, 1H), 6.82 (dd, *J* = 8.4, 2.0 Hz, 1H), 6.92 (d, *J* = 8.4 Hz, 1H), 7.06 (d, *J* = 8.8 Hz, 1H), 7.88 (s, 1H). MS (APCI) *m/z* 297.2 $[M-H_2O+H]^+$.

Experimental details for intermediates 15a-15c



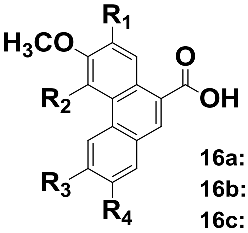
15a: R_1, R_2= H; R_3, R_4= OCH_3
15b: R_1, R_2, R_3, R_4= OCH_3
15c: R_1, R_4= OCH_3; R_2, R_3= H

(*E*)-3-(2-Amino-4,5-dimethoxyphenyl)-2-(4-methoxyphenyl)acrylic acid (15a).
Yield = 83%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.27 (s, 3H), 3.80 (s, 3H), 3.81 (s, 3H), 6.18 (s, 1H), 6.23 (s, 1H), 6.90 (d, *J* = 8.7 Hz, 2H), 7.22 (d, *J* = 9.0 Hz, 2H), 7.92 (s, 1H). MS (APCI) *m/z* 327.7 $[M-H]^-$.

(*E*)-3-(2-Amino-4,5-dimethoxyphenyl)-2-(3,4,5-trimethoxyphenyl)acrylic acid (15b).
Yield = 89%, MS (APCI) *m/z* 387.7 $[M-H]^-$.

(*E*)-3-(2-Amino-5-methoxyphenyl)-2-(3,4-dimethoxyphenyl)acrylic acid (15c).
Yield = 88%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.37 (s, 3H), 3.73 (s, 3H), 3.87 (s, 3H), 6.31 (d, *J* = 2.7 Hz, 1H), 6.64 (m, 2H), 6.77 (s, 1H), 6.84 (s, 2H), 7.86 (s, 1H). MS (APCI) *m/z* 328.1 $[M-H]^-$.

Experimental details for intermediates 16a-16d



16a: R_1, R_2= H; R_3, R_4= OCH_3
16b: R_1, R_2, R_3, R_4= OCH_3
16c: R_1, R_4= OCH_3; R_2, R_3= H
16d: R_1, R_3= H; R_2, R_4= H

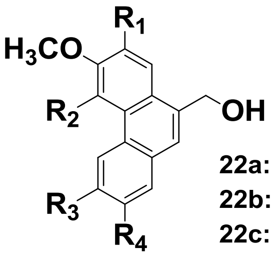
2,3,6-Trimethoxyphenanthrene-9-carboxylic acid (16a).
Yield = 75%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 4.05 (s, 3H), 4.07 (s, 3H), 4.15 (s, 3H), 7.31 (s, 1H), 7.33 (dd, *J* = 9.3, 2.7 Hz, 1H), 7.88 (s, 1H), 7.92 (d, *J* = 2.7 Hz, 1H), 8.52 (s, 1H), 9.11 (d, *J* = 9.3 Hz, 1H). MS (APCI) *m/z* 310.7 $[M-H]^-$.

2,3,5,6,7-Pentamethoxyphenanthrene-9-carboxylic acid (16b).
Yield = 74%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 4.01 (s, 3H), 4.06 (s, 3H), 4.08 (s, 6H), 4.13 (s, 3H), 7.31 (s, 1H), 8.60 (s, 1H), 8.64 (s, 1H), 9.15 (s, 1H). MS (APCI) *m/z* 370.8 $[M-H]^-$.

2,6,7-Trimethoxyphenanthrene-9-carboxylic acid (16c).
Yield = 54%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.97 (s, 3H), 4.06 (s, 3H), 4.12 (s, 3H), 7.31 (d, *J* = 3.0 Hz, 1H), 7.36 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.94 (s, 1H), 8.45 (d, *J* = 9.3 Hz, 1H), 8.49 (s, 1H), 8.59 (s, 1H). MS (APCI) *m/z* 311.1 $[M-H]^-$.

2,5,6-Trimethoxyphenanthrene-9-carboxylic acid (16d).
Yield = 22%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.93 (s, 3H), 3.99 (s, 3H), 4.06 (s, 3H), 7.34 (d, *J* = 2.7 Hz, 1H), 7.38 (d, *J* = 9.3 Hz, 1H), 7.39 (dd, *J* = 9.3, 3.0 Hz, 1H), 7.96 (s, 1H), 8.82 (d, *J* = 9.3 Hz, 1H), 9.60 (d, *J* = 9.3 Hz, 1H). MS (APCI) *m/z* 311.1 $[M-H]^-$.

Experimental details for intermediates 22a-22d



22a: R_1, R_2= H; R_3, R_4= OCH_3
22b: R_1, R_2, R_3, R_4= OCH_3
22c: R_1, R_4= OCH_3; R_2, R_3= H
22d: R_1, R_3= H; R_2, R_4= OCH_3

(2,3,6-Trimethoxyphenanthren-9-yl)methanol (22a).
Yield = 89%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 1.76 (t, *J* = 6.0 Hz, D_2O-exchangeable,

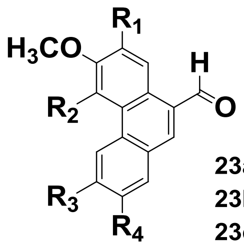
OH), 4.03 (s, 6H), 4.12 (s, 3H), 5.15 (d, *J* = 5.1 Hz, 2H), 7.21 (s, 1H), 7.26 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.56 (s, 1H), 7.87 (s, 1H), 7.91 (d, *J* = 2.7 Hz, 1H), 8.11 (d, *J* = 9.3 Hz, 1H). MS (APCI) *m/z* 280.9 $[M\text{-}H_2O+H]^+$.

(2,3,5,6,7-Pentamethoxyphenanthren-9-yl)methanol (22b).
Yield = 89%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 4.01 (s, 3H), 4.02 (s, 3H), 4.04 (s, 3H), 4.05 (s, 3H), 4.09 (s, 3H), 5.11 (br s, 2H), 7.18 (s, 1H), 7.43 (s, 1H), 7.62 (s, 1H), 9.09 (s, 1H). MS (APCI) *m/z* 341.0 $[M\text{-}H_2O+H]^+$.

(2,6,7-Trimethoxyphenanthren-9-yl)methanol (22c).
Yield = 95%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 1.78 (t, *J* = 6.0 Hz, D_2O-exchangeable, OH), 3.96 (s, 3H), 4.05 (s, 3H), 4.11 (s, 3H), 5.14 (d, *J* = 5.7 Hz, 2H), 7.23 (d, *J* = 2.7 Hz, 1H), 7.25 (m, 1H), 7.52 (s, 1H), 7.62 (s, 1H), 7.94 (s, 1H), 8.41 (d, *J* = 8.7 Hz, 1H). MS (ESI) *m/z* 281 $[M\text{-}H_2O+H]^+$.

(2,5,6-Trimethoxyphenanthren-9-yl)methanol (22d).
Yield = 90%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 1.81 (br s, D_2O-exchangeable, OH), 3.92 (s, 3H), 3.96 (s, 3H), 4.04 (s, 3H), 5.13 (d, *J* = 4.4 Hz, 2H), 7.22 (d, *J* = 2.8 Hz, 1H), 7.24 (dd, *J* = 9.2, 2.8 Hz, 1H), 7.31 (d, *J* = 9.2 Hz, 1H), 7.57 (s, 1H), 7.91 (d, *J* = 8.8 Hz, 1H), 9.53 (d, *J* = 9.2 Hz, 1H). MS (ESI) *m/z* 281.1 $[M\text{-}H_2O+H]^+$.

Experimental details for intermediates 23a-23e



23a: R_1, R_2= H; R_3, R_4= OCH_3
23b: R_1, R_2, R_3, R_4= OCH_3
23c: R_1, R_4= OCH_3; R_2, R_3= H
23d: R_1, R_3= H; R_2, R_4= OCH_3
23e: R_1, R_3= OCH_3; R_2, R_4= H

2,3,6-Trimethoxyphenanthrene-9-carbaldehyde (23a).
Yield = 87%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 4.04 (s, 3H), 4.07 (s, 3H), 4.15 (s, 3H), 7.33 (dd, *J* = 9.6, 2.7 Hz, 1H), 7.35 (s, 1H), 7.87 (s, 1H), 7.89 (d, *J* = 2.7 Hz, 1H), 8.04 (s, 1H), 9.34 (d, *J* = 9.3 Hz, 1H), 10.28 (s, 1H). MS (APCI) *m/z* 296.9 $[M+H]^+$.

2,3,5,6,7-Pentamethoxyphenanthrene-9-carbaldehyde (23b).
Yield = 91%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.01 (s, 3H), 4.06 (s, 3H), 4.07 (s, 3H), 4.08 (s, 3H), 4.13 (s, 3H), 7.34 (s, 1H), 8.10 (s, 1H), 8.94 (s, 1H), 9.15 (s, 1H), 10.25 (s, 1H). MS (ESI) *m/z* 357.1 $[M+H]^+$.

2,6,7-Trimethoxyphenanthrene-9-carbaldehyde (23c).

Yield = 81%, ^{1}H NMR (300 MHz, CDCl$_3$): δ 3.99 (s, 3H), 4.10 (s, 3H), 4.12 (s, 3H), 7.37 (d, *J* = 2.7 Hz, 1H), 7.42 (dd, *J* = 9.3, 2.7 Hz, 1H), 7.92 (s, 1H), 8.11 (s, 1H), 8.46 (d, *J* = 9.0 Hz, 1H), 8.92 (s, 1H), 10.31 (s, 1H). MS (ESI) *m/z* 297 [M+H]$^+$.

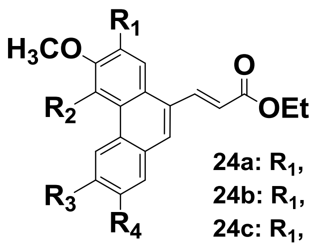
2,5,6-Trimethoxyphenanthrene-9-carbaldehyde (23d).

Yield = 94%, ^{1}H NMR (400 MHz, CDCl$_3$): δ 3.92 (s, 3H), 3.99 (s, 3H), 4.05 (s, 3H), 7.36-7.42 (m, 3H), 8.03 (s, 1H), 9.18 (d, *J* = 9.2 Hz, 1H), 9.60 (d, *J* = 9.2 Hz, 1H), 10.29 (s, 1H). MS (ESI) *m/z* 297.1 [M+H]$^+$.

3,6,7-Trimethoxyphenanthrene-9-carbaldehyde (23e).

Yield = 78%, ^{1}H NMR (300 MHz, CDCl$_3$): δ 4.05 (s, 3H), 4.10 (s, 3H), 4.11 (s, 3H), 7.23 (dd, *J* = 8.7, 2.4 Hz, 1H), 7.77 (d, *J* = 2.1 Hz, 1H), 7.80 (s, 1H), 7.90 (d, *J* = 8.7 Hz, 1H), 8.04 (s, 1H), 8.94 (s, 1H), 10.21 (s, 1H). MS (ESI) *m/z* 297.1 [M+H]$^+$.

Experimental details for intermediates 24a-24e



24a: R_1, R_2= H; R_3, R_4= OCH_3
24b: R_1, R_2, R_3, R_4= OCH_3
24c: R_1, R_4= OCH_3; R_2, R_3= H
24d: R_1, R_3= H; R_2, R_4= OCH_3
24e: R_1, R_3= OCH_3; R_2, R_4= H

(*E*)-Ethyl-3-(2,3,6-trimethoxyphenanthren-9-yl)acrylate (24a).

Yield = 99%, ^{1}H NMR (400 MHz, CDCl$_3$): δ 1.39 (t, *J* = 7.2 Hz, 3H), 4.04 (s, 3H), 4.05 (s, 3H), 4.12 (s, 3H), 4.33 (quartet, *J* = 7.2 Hz, 2H), 6.57 (d, *J* = 15.6, 1H), 7.23 (s, 1H), 7.27 (dd, *J* = 8.8, 2.4, 1H), 7.80 (s, 1H), 7.85 (s, 1H), 7.90 (d, *J* = 2.4 Hz, 1H), 8.15 (d, *J* = 8.8 Hz, 1H), 8.49 (d, *J* = 15.6 Hz, 1H). MS (APCI) *m/z* 367.0 [M+H]$^+$.

(*E*)-Ethyl-3-(2,3,5,6,7-pentamethoxyphenanthren-9-yl)acrylate (24b).

Yield = 92%, ^{1}H NMR (400 MHz, CDCl$_3$): δ 1.39 (t, *J* = 7.2 Hz, 3H), 4.01 (s, 3H), 4.04 (s, 3H), 4.05 (s, 3H), 4.06 (s, 3H), 4.10 (s, 3H), 4.33 (quartet, *J* = 7.2 Hz, 2H), 6.56 (d, *J*=15.2 Hz, 1H), 7.22 (s, 1H), 7.32 (s, 1H), 7.85 (s, 1H), 8.43 (d, *J* = 15.2 Hz, 1H), 9.09 (s, 1H). MS (APCI) *m/z* 427 [M+H]$^+$.

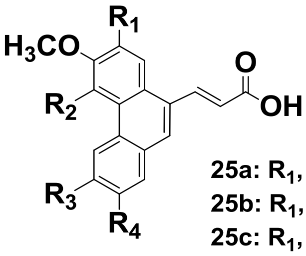
(*E*)-Ethyl-3-(2,6,7-trimethoxyphenanthren-9-yl)acrylate (24c).

Yield = 99%, ^{1}H NMR (300 MHz, CDCl$_3$): δ 1.39 (t, *J* = 7.2 Hz, 3H), 3.96 (s, 3H), 4.06 (s, 3H), 4.11 (s, 3H), 4.34 (quartet, *J* = 7.2 Hz, 2H), 6.60 (d, *J* = 15.3 Hz, 1H), 7.23 (d, *J* = 3.0, Hz, 1H), 7.27 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.43 (s, 1H), 7.82 (s, 1H), 7.91 (s, 1H), 8.39 (d, *J* = 9.0 Hz, 1H), 8.43 (d, *J* = 15.3 Hz, 1H). MS (APCI) *m/z* 367.2 $[M+H]^+$.

(*E*)-Ethyl-3-(2,5,6-trimethoxyphenanthren-9-yl)acrylate (24d).
Yield = 95%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 1.39 (t, *J* = 7.2 Hz, 3H), 3.93 (s, 3H), 3.97 (s, 3H), 4.05 (s, 3H), 4.33 (quartet, *J* = 7.2 Hz, 2H), 6.56 (d, *J* = 15.3 Hz, 1H), 7.25 (d, *J* = 3.0 Hz, 1H), 7.28 (dd, *J* = 9.3, 3.0 Hz, 1H), 7.32 (d, *J* = 9.0 Hz, 1H), 7.74 (s, 1H), 7.91 (d, *J* = 9.0 Hz, 1H), 8.44 (d, *J* = 15.9 Hz, 1H), 9.54 (d, *J* = 9.3 Hz, 1H). MS (ESI) *m/z* 367.1 $[M+H]^+$.

(*E*)-Ethyl-3-(3,6,7-trimethoxyphenanthren-9-yl)acrylate (24e)
Yield = 98%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 1.39 (t, *J* = 7.2 Hz, 3H), 4.04 (s, 3H), 4.08 (s, 3H), 4.13 (s, 3H), 4.33 (quartet, *J* = 7.2 Hz, 2H), 6.59 (d, *J* = 15.6 Hz, 1H), 7.21 (dd, *J* = 8.7, 2.4 Hz, 1H), 7.47 (s, 1H), 7.81 (d, *J* = 9.3 Hz, 1H), 7.83 (s, 1H), 7.88 (s, 1H), 7.91 (s, 1H), 8.44 (d, *J* = 15.6 Hz, 1H). MS (ESI) *m/z* 389.1 $[M+Na]^+$.

Experimental details for intermediates 25a-25e



25a: R_1, R_2= H; R_3, R_4= OCH_3
25b: R_1, R_2, R_3, R_4= OCH_3
25c: R_1, R_4= OCH_3; R_2, R_3= H
25d: R_1, R_3= H; R_2, R_4= OCH_3
25e: R_1, R_3= OCH_3; R_2, R_4= H

(*E*)-3-(2,3,6-Trimethoxyphenanthren-9-yl)acrylic acid (25a).
Yield = 97%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.05 (s, 3H), 4.06 (s, 3H), 4.14 (s, 3H), 6.61 (d, *J* = 15.6, 1H), 7.26 (s, 1H), 7.29 (dd, *J* = 9.2, 2.4, 1H), 7.87 (s, 2H), 7.91 (d, *J* = 2.4 Hz, 1H), 8.16 (d, *J* = 9.2 Hz, 1H), 8.62 (d, *J* = 15.6 Hz, 1H). MS (APCI) *m/z* 337.1 $[M-H]^-$.

(*E*)-3-(2,3,5,6,7-Pentamethoxyphenanthren-9-yl)acrylic acid (25b).
Yield = 95%, ^{1}H NMR [300 MHz, $(CD_3)_2SO$]: δ 3.91 (s, 6H), 3.94 (s, 3H), 3.96 (s, 3H), 4.00 (s, 3H), 6.56 (d, *J* = 15.6 Hz, 1H), 7.36 (s, 1H), 7.52 (s, 1H), 8.11 (s, 1H), 8.31 (d, *J* = 15.6 Hz, 1H), 8.94 (s, 1H). MS (APCI) *m/z* 398.8 $[M+H]^+$.

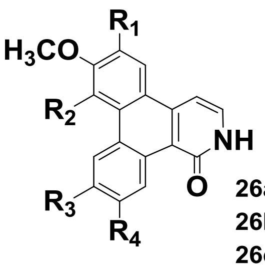
(*E*)-3-(2,6,7-Trimethoxyphenanthren-9-yl)acrylic acid (25c).

Yield = 97%, ^{1}H NMR [300 MHz, $(CD_3)_2SO$]: δ 3.90 (s, 3H), 3.95 (s, 3H), 4.01 (s, 3H), 6.62 (d, *J* = 15.6 Hz, 1H), 7.28 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.45 (s, 1H), 7.47 (d, *J* = 2.7 Hz, 1H), 8.08 (s, 1H), 8.12 (s, 1H), 8.35 (d, *J* = 15.9 Hz, 1H), 8.68 (d, *J* = 9.0 Hz, 1H). MS (APCI) *m/z* 337.1 $[M-H]^-$.

(*E*)-3-(2,5,6-Trimethoxyphenanthren-9-yl)acrylic acid (25d).
Yield = 96%, ^{1}H NMR [300 MHz, $(CD_3)_2SO$]: δ 3.83 (s, 3H), 3.91 (s, 3H), 3.97 (s, 3H), 6.58 (d, *J* = 15.6 Hz, 1H), 7.30 (d, *J* = 9.3 Hz, 1H), 7.49-7.52 (m, 2H), 7.91 (d, *J* = 9.3 Hz, 1H), 8.01 (s, 1H), 8.29 (d, *J* = 15.9 Hz, 1H), 9.40 (d, *J* = 9.3 Hz, 1H). MS (APCI) *m/z* 337.1 $[M-H]^-$.

(*E*)-3-(3,6,7-Trimethoxyphenanthren-9-yl)acrylic acid (25e)
Yield = 95%, ^{1}H NMR [400 MHz, $(CD_3)_2SO$]: δ 3.98 (s, 3H), 4.01 (s, 3H), 4.05 (s, 3H), 6.62 (d, *J* = 15.6 Hz, 1H), 7.25 (dd, *J* = 8.8, 2.0 Hz, 1H), 7.48 (s, 1H), 7.93 (d, *J* = 8.8 Hz, 1H), 8.07 (d, *J* = 2.4 Hz, 1H), 8.11 (s, 1H), 8.13 (s, 1H), 8.35 (d, *J* = 15.6 Hz, 1H). MS (APCI) *m/z* 337.2 $[M-H]^-$.

Experimental details for intermediates 26a-26e



26a: R_1, R_2= H; R_3, R_4= OCH_3
26b: R_1, R_2, R_3, R_4= OCH_3
26c: R_1, R_4= OCH_3; R_2, R_3= H
26d: R_1, R_3= H; R_2, R_4= OCH_3
26e: R_1, R_3= OCH_3; R_2, R_4= H

7,10,11-Trimethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (26a).
Yield = 81%, ^{1}H NMR [400 MHz, $(CD_3)_2SO$]: δ 3.94 (s, 3H), 4.05 (s, 3H), 4.06 (s, 3H), 7.33 (dd, *J* = 9.2, 1.6 Hz, 1H), 7.45-7.51 (m, 2H), 8.12 (s, 1H), 8.14 (d, *J* = 2.0 Hz, 1H), 8.60 (d, *J* = 8.8 Hz, 1H), 10.06 (s, 1H), 11.66 (br s, NH). MS (APCI) *m/z* 335.9 $[M+H]^+$.

6,7,8,10,11-Pentamethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (26b).
Yield = 69%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 3.95 (s, 3H), 4.09 (s, 3H), 4.11 (s, 6H), 4.17 (s, 3H), 7.31 (d, *J* = 7.2 Hz, 1H), 7.42 (d, *J* = 7.2 Hz, 1H), 7.69 (s, 1H), 9.24 (s, 1H), 10.09 (s, 1H), 11.16 (br s, NH). MS (APCI) *m/z* 398.8 $[M+H]^+$.

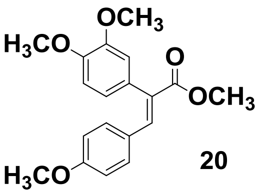
6,7,11-Trimethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (26c).

Yield = 72%, ^{1}H NMR [300 MHz, $(CD_3)_2SO$]: δ 3.91 (s, 3H), 4.00 (s, 3H), 4.04 (s, 3H), 7.29 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.51-7.52 (m, 2H), 7.92 (s, 1H), 8.10 (s, 1H), 8.72 (d, *J* = 9.3 Hz, 1H), 9.97 (d, *J* = 2.7 Hz, 1H), 11.72 (br s, NH). MS (ESI) *m/z* 336.1 $[M+H]^+$.

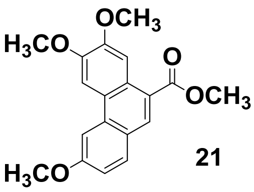
7,8,11-Trimethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (26d).
Yield = 68%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.86 (s, 3H), 4.07 (s, 6H), 7.28-7.35 (m, 3H), 7.45 (d, *J* = 9.6 Hz, 1H), 8.25 (d, *J* = 9.2 Hz, 1H), 9.63 (d, *J* = 9.2 Hz, 1H), 9.99 (d, *J* = 2.8 Hz, 1H), 10.99 (br s, NH). MS (ESI) *m/z* 336.1 $[M+H]^+$.

6,7,10-Trimethoxydibenzo[f,h]isoquinolin-1(2H)-one (26e)
Yield = 53%, ^{1}H NMR [300 MHz, $(CD_3)_2SO$]: δ 4.00 (s, 3H), 4.01 (s, 3H), 4.07 (s, 3H), 7.28 (dd, *J* = 9.3, 2.7 Hz, 1H), 7.44-7.52 (m, 2H), 7.94 (s, 1H), 8.11 (s, 1H), 8.12 (s, 1H), 10.26 (d, *J* = 9.3 Hz, 1H), 11.71 (br s, NH). MS (ESI) *m/z* 336.1 $[M+H]^+$.

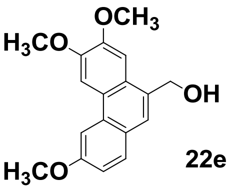
Experimental details for intermediates 20, 21, and 22e



20



21



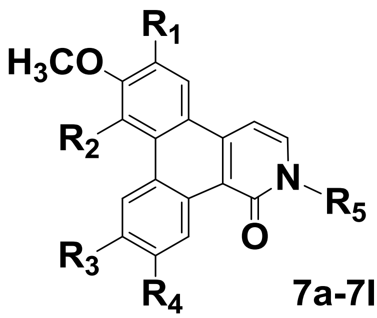
22e

(*E*)-2-(3,4-Dimethoxyphenyl)-3-(4-methoxyphenyl)acrylic acid methyl ester (20).
Yield = 96%, ^{1}H NMR (400 MHz, $CDCl_3$): δ 3.76 (s, 3H), 3.79 (s, 3H), 3.81 (s, 3H), 3.93 (s, 3H), 6.70 (d, *J* = 8.8 Hz, 1H), 6.74 (d, *J* = 2.0 Hz, 1H), 6.79 (dd, *J* = 8.0, 2.0 Hz, 1H), 6.90 (d, *J* = 8.4 Hz, 1H), 7.02 (d, *J* = 8.8 Hz, 1H), 7.78 (s, 1H). MS (APCI) *m/z* 329.2 $[M +H]^+$.

3,6,7-Trimethoxyphenanthrene-9-carboxylic acid methyl ester (21). Yield = 53%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 4.02 (s, 3H), 4.04 (s, 3H), 4.09 (s, 3H), 4.13 (s, 3H), 7.23 (dd, *J* = 8.7, 2.4 Hz, 1H), 7.84 (d, *J* = 2.4 Hz, 1H), 7.89 (d, *J* = 8.7 Hz, 1H), 8.46 (s, 1H), 8.67 (s, 1H). MS (ESI) *m/z* 327.1 $[M +H]^+$.

(3,6,7-Trimethoxyphenanthren-9-yl)methanol (22e).
Yield = 88%, ^{1}H NMR (300 MHz, $CDCl_3$): δ 1.79 (br s, D_2O-exchangeable, OH), 4.02 (s, 3H), 4.06 (s, 3H), 4.11 (s, 3H), 5.10 (br s, 2H), 7.19 (dd, *J* = 9.0, 2.4 Hz, 1H), 7.54 (s, 1H), 7.59 (s, 1H), 7.76 (d, *J* = 8.7 Hz, 1H), 7.82 (d, *J* = 2.4 Hz, 1H), 7.89 (s, 1H). MS (APCI) *m/z* 281.1 $[M-H_2O+H]^+$.

Experimental details for intermediates 7a-7l, and 27a-27k



7a-7l; 27a-27k

Comp	Substitution				
ID	**R1**	**R2**	**R3**	**R4**	**R5**
7a	OCH_3	H	OCH_3	OCH_3	CH_2CH_3
7b	OCH_3	H	OCH_3	OCH_3	$(CH_2)_2CH_3$
7c	OCH_3	H	OCH_3	OCH_3	$(CH_2)_3CH_3$
7d	OCH_3	H	OCH_3	OCH_3	$(CH_2)_4CH_3$
7e	OCH_3	H	OCH_3	OCH_3	$CH(CH_3)_2$
7f	OCH_3	H	OCH_3	OCH_3	$CH_2CH(CH_3)_2$
7g	OCH_3	H	OCH_3	OCH_3	$CH(CH_3)CH_2CH_3$
7h	OCH_3	H	OCH_3	OCH_3	3-cyclohexene
7i	OCH_3	H	OCH_3	OCH_3	2-methyl-[1,3]dioxolane
7j	OCH_3	H	OCH_3	OCH_3	2-ethyl-[1,3]dioxolane
7k	OCH_3	H	OCH_3	OCH_3	$(CH_2)_3$OTHP
7l	OCH_3	H	OCH_3	OCH_3	$(CH_2)_3$NHBoc
27a	OCH_3	OCH_3	OCH_3	OCH_3	CH_2CH_3
27b	OCH_3	OCH_3	OCH_3	OCH_3	$(CH_2)_2CH_3$
27c	OCH_3	OCH_3	OCH_3	OCH_3	$(CH_2)_3CH_3$
27d	OCH_3	OCH_3	OCH_3	OCH_3	$CH(CH_3)_2$
27e	H	H	OCH_3	OCH_3	CH_2CH_3
27f	H	H	OCH_3	OCH_3	$(CH_2)_2CH_3$
27g	H	H	OCH_3	OCH_3	$(CH_2)_3CH_3$
27h	OCH_3	H	H	OCH_3	CH_2CH_3
27i	OCH_3	H	H	OCH_3	$(CH_2)_2CH_3$
27j	OCH_3	H	OCH_3	H	$(CH_2)_2CH_3$
27k	H	OCH_3	H	OCH_3	$(CH_2)_2CH_3$

2-Ethyl-6,7,10,11-tetramethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (7a).
^{1}H NMR (300 MHz, $CDCl_3$): 1.47 (t, *J* = 7.2 Hz, 3H), 4.07 (s, 3H), 4.11 (s, 6H), 4.16 (s, 3H), 4.19 (quartet, *J* = 7.2 Hz, 2H), 7.15 (d, *J* = 7.5 Hz, 1H), 7.37 (d, *J* = 7.2 Hz, 1H), 7.64 (s, 1H), 7.74 (s, 1H), 7.76 (s, 1H), 10.10 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): 14.8, 45.1, 55.8, 55.9, 101.6, 102.7, 103.1, 104.9, 109.1, 117.5, 121.0, 124.1, 124.7, 127.0, 131.8, 135.6, 148.5, 148.6, 148.8, 150.8, 162.4. MS (ESI) *m/z* 394.6 $[M+H]^+$.

6,7,10,11-Tetramethoxy-2-propyldibenzo[*f*,*h*]isoquinolin-1(2H)-one (7b).
^{1}H NMR (300 MHz, $CDCl_3$): 1.02 (t, *J* = 7.5 Hz, 3H), 1.90 (sextet, *J* = 7.5 Hz, 2H), 4.04 (s, 3H), 4.04-4.07 (m, 2H), 4.09 (s, 3H), 4.10 (s, 3H), 4.15 (s, 3H), 7.09 (d, *J* = 7.5 Hz, 1H), 7.32 (d, *J* = 7.5 Hz, 1H), 7.60 (s, 1H), 7.70 (s, 1H), 7.72 (s, 1H), 10.07 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): 11.3, 22.5, 51.8, 55.7, 55.8, 55.9, 101.1, 102.6, 103.0, 104.8, 109.1, 117.5, 121.0, 124.0, 124.7, 126.9, 132.4, 135.5, 148.4, 148.5, 148.7, 150.8, 162.5. MS (ESI) *m/z* 408.2 $[M+H]^+$.

2-Butyl-6,7,10,11-tetramethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (7c).
^{1}H NMR (300 MHz, $CDCl_3$): 1.01 (t, *J* = 7.5 Hz, 3H), 1.46 (sextet, *J* = 7.5 Hz, 2H), 1.86 (quintet, *J* = 7.5 Hz, 2H), 4.08 (s, 3H), 4.08-4.10 (m, 2H), 4.12 (s, 6H), 4.16 (s, 3H), 7.15 (d, *J* = 7.8 Hz, 1H), 7.36 (d, *J* = 7.5 Hz, 1H), 7.67 (s, 1H), 7.77 (s, 1H), 7.79 (s, 1H), 10.10 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): 13.8, 20.1, 31.4, 50.1, 55.8, 55.9, 56.0, 101.2, 102.7, 103.1, 104.9, 109.1, 117.6, 121.0, 124.1, 124.8, 127.0, 132.4, 135.6, 148.5, 148.6, 148.8, 150.9, 162.5. MS (ESI) *m/z* 422.2 $[M+H]^+$

6,7,10,11-Tetramethoxy-2-pentyldibenzo[*f*,*h*]isoquinolin-1(2H)-one (7d).
MS (ESI) *m/z* 422.2 $[M+H]^+$.

2-Isopropyl-6,7,10,11-tetramethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (7e).
^{1}H NMR (300 MHz, $CDCl_3$): 1.47 (d, *J* = 6.9 Hz, 6H), 4.09 (s, 3H), 4.12 (s, 3H), 4.13 (s, 3H), 4.16 (s, 3H), 5.61 (septet, *J* = 6.9 Hz, 1H), 7.28 (d, *J* = 7.5 Hz, 1H), 7.47 (d, *J* = 7.8 Hz, 1H), 7.72 (s, 1H), 7.80 (s, 1H), 7.81 (s, 1H), 10.14 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): 22.1, 22.6, 45.9, 55.8, 55.9, 101.8, 102.8, 103.3, 105.0, 109.2, 117.4, 121.1, 124.2, 124.9, 127.1, 127.5, 135.0, 148.5, 148.7, 148.8, 151.0, 162.3. MS (ESI) *m/z* 408.2 $[M+H]^+$.

2-Isobutyl-6,7,10,11-tetramethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (7f).
^{1}H NMR (300 MHz, $CDCl_3$): 1.00 (d, *J* = 6.6 Hz, 6H), 2.37 (septet, *J* = 6.6 Hz, 1H), 3.94 (d, *J* = 6.6 Hz, 2H), 4.08 (s, 3H), 4.12 (s, 6H), 4.16 (s, 3H), 7.14 (d, *J* = 7.5 Hz,

1H), 7.32 (d, *J* = 7.5 Hz, 1H), 7.68 (s, 1H), 7.77 (s, 1H), 7.79 (s, 1H), 10.09 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): 20.0, 27.8, 55.8, 55.9, 56.0, 57.6, 100.8, 102.7, 103.1, 104.9, 109.1, 117.6, 121.1, 124.1, 124.8, 127.0, 133.1, 135.6, 148.5, 148.6, 148.8, 150.9, 162.7. MS (ESI) *m/z* 422.6 $[M+H]^+$.

2-(*sec*-Butyl)-6,7,10,11-tetramethoxydibenzo[*f,h*]isoquinolin-1(2H)-one (7g).
^{1}H NMR (300 MHz, $CDCl_3$): 0.94 (t, *J* = 7.2 Hz, 3H), 1.44 (d, *J* = 6.6 Hz, 3H), 1.82 (quintet, *J* = 7.5 Hz, 1H), 4.09 (s, 3H), 4.13 (s, 3H), 4.14 (s, 3H), 4.17 (s, 3H), 5.42 (sextet, *J* = 6.9 Hz, 1H), 7.29 (d, *J* = 7.2 Hz, 1H), 7.40 (d, *J* = 7.2 Hz, 1H), 7.75 (s, 1H), 7.82 (s, 1H), 7.83 (s, 1H), 10.14 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): 10.7, 20.3, 29.2, 51.2, 55.8, 55.9, 101.7, 102.9, 103.3, 105.1, 109.3, 117.4, 121.1, 124.2, 125.0, 127.2, 127.8, 134.9, 148.5, 148.7, 148.8, 151.0, 162.7. MS (ESI) *m/z* 422.2 $[M+H]^+$.

2-(Cyclohex-2-en-1-yl)-6,7,10,11-tetramethoxydibenzo[*f,h*]isoquinolin-1(2H)-one (7h).
^{1}H NMR (300 MHz, $CDCl_3$): 1.65-1.74 (m, 1H), 1.75-1.85 (m, 2H), 2.16-2.21 (m, 2H), 2.22-2.32 (m, 1H), 4.08 (s, 3H), 4.12 (s, 3H), 4.13 (s, 3H), 4.16 (s, 3H), 5.70 (dd, *J* = 10.2, 2.4 Hz, 1H), 5.87-5.93 (m, 1H), 6.18-6.24 (m, 1H), 7.23 (d, *J* = 8.1 Hz, 1H), 7.55 (d, *J* = 7.8 Hz, 1H), 7.72 (s, 1H), 7.80 (s, 1H), 7.81 (s, 1H), 10.12 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): 20.1, 24.8, 29.8, 51.3, 55.8, 55.9, 101.2, 102.8, 103.2, 105.1, 109.2, 117.3, 121.1, 124.2, 124.9, 126.9, 127.2, 129.6, 133.6, 135.4, 148.5, 148.7, 148.8, 151.0, 162.5. MS (ESI) *m/z* 446.1 $[M+H]^+$.

2-((1,3-Dioxolan-2-yl)methyl)-6,7,10,11-tetramethoxydibenzo[*f,h*]isoquinolin-1(2H)-one (7i).
^{1}H NMR (300 MHz, $CDCl_3$): 3.90 (AA'BB', 2H), 3.98 (AA'BB', 2H), 4.07 (s, 3H), 4.11 (s, 3H), 4.12 (s, 3H), 4.15 (s, 3H), 4.36 (d, *J* = 4.2 Hz, 2H), 5.31 (t, *J* = 4.2 Hz, 1H), 7.15 (d, *J* = 7.5 Hz, 1H), 7.47 (d, *J* = 7.5 Hz, 1H), 7.66 (s, 1H), 7.76 (s, 1H), 7.77 (s, 1H), 10.04 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): 51.3, 55.8, 55.9, 56.0, 65.2, 101.1, 101.2, 102.8, 103.2, 105.1, 109.1, 117.4, 121.1, 124.1, 124.8, 127.2, 133.5, 135.9, 148.6, 148.7, 148.9, 151.0, 162.8. MS (ESI) *m/z* 452.0 $[M+H]^+$.

2-(2-(1,3-Dioxolan-2-yl)ethyl)-6,7,10,11-tetramethoxydibenzo[*f,h*]isoquinolin-1(2H)-one (7j).
^{1}H NMR (300 MHz, $CDCl_3$): 2.30 (td, *J* = 7.2, 4.8 Hz, 2H), 3.89 (AA'BB', 2H), 4.03 (AA'BB', 2H), 4.11 (s, 3H), 4.14 (s, 3H), 4.16 (s, 3H), 4.17 (s, 3H), 4.30 (t, *J* = 7.2 Hz, 2H), 4.99 (t, *J* = 4.8 Hz, 1H), 7.22 (d, *J* = 7.5 Hz, 1H), 7.46 (d, *J* = 7.5 Hz, 1H), 7.74 (s, 1H), 7.85 (s, 2H), 10.11 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): 32.8, 46.1, 55.8, 55.9,

56.0, 64.8, 65.0, 101.3, 102.2, 102.8, 103.2, 105.0, 109.1, 117.6, 121.1, 124.1, 124.8, 127.1, 132.8, 135.7, 148.6, 148.7, 148.9, 151.0, 162.5. MS (ESI) *m/z* 466.1 $[M+H]^+$.

6,7,10,11-Tetramethoxy-2-(3-((tetrahydro-2H-pyran-2-yl)oxy)propyl)dibenzo[*f,h*] isoquinolin-1(2H)-one (7k).

^{1}H NMR [400 MHz, $(CD_3)_2CO$]: 1.45-1.56 (m, 4H), 1.63-1.71 (m, 1H), 1.78-1.86 (m, 1H), 2.10-2.18 (m, 2H), 3.43-3.49 (m, 2H), 3.78-3.87 (m, 2H), 4.02 (s, 3H), 4.06 (s, 6H), 4.10 (s, 3H), 4.23-4.32 (m, 2H), 4.60-4.62 (m, 1H), 7.41 (d, *J* = 7.6 Hz, 1H), 7.66 (d, *J* = 7.6 Hz, 1H), 7.91 (s, 1H), 8.02 (s, 1H), 8.03 (s, 1H), 10.19 (s, 1H). MS (APCI) *m/z* 508.0 $[M+H]^+$.

***tert*-Butyl-(2-(6,7,10,11-tetramethoxy-1-oxodibenzo[*f,h*]isoquinolin-2(1H)-yl)ethyl)carbamate (7l).**

^{1}H NMR (300 MHz, $CDCl_3$): 1.45 (s, 9H), 3.64 (quartet, *J* = 5.7 Hz, 2H), 4.04 (s, 3H), 4.06 (s, 3H), 4.07 (s, 3H), 4.13 (s, 3H), 4.27 (t, *J* = 5.4 Hz, 2H), 5.31 (t, *J* = 5.4 Hz, 1H), 7.07 (d, *J* = 7.8 Hz, 1H), 7.32 (d, *J* = 7.5 Hz, 1H), 7.48 (s, 2H), 7.56 (s, 1H), 9.97 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): 28.4, 39.8, 50.1, 55.6, 55.8, 55.9, 79.6, 101.2, 102.5, 103.0, 104.8, 108.9, 117.3, 120.8, 124.0, 124.4, 126.9, 133.0, 135.7, 148.3, 148.5, 148.6, 150.7, 156.2, 162.8.

2-Ethyl-6,7,8,10,11-pentamethoxydibenzo[*f,h*]isoquinolin-1(2H)-one (27a).

^{1}H NMR (400 MHz, $CDCl_3$): 1.48 (t, *J* = 7.2 Hz, 3H), 3.93 (s, 3H), 4.08 (s, 3H), 4.10 (s, 6H), 4.16 (s, 3H), 4.21 (quartet, *J* = 7.2 Hz, 2H), 7.22 (d, *J* = 7.6 Hz, 1H), 7.40 (d, *J* = 7.6 Hz, 1H), 7.66 (s, 1H), 9.23 (s, 1H), 10.13 (s, 1H). MS (ESI) *m/z* 424.2 $[M+H]^+$.

6,7,8,10,11-Pentamethoxy-2-propyldibenzo[*f,h*]isoquinolin-1(2H)-one (27b).

^{1}H NMR (300 MHz, $CDCl_3$): 1.04 (t, *J* = 7.2 Hz, 3H), 1.92 (sextet, *J* = 7.2 Hz, 2H), 3.93 (s, 3H), 4.07-4.11 (m, 2H), 4.09 (s, 3H), 4.10 (s, 6H), 4.16 (s, 3H), 7.21 (d, *J* = 7.5 Hz, 1H), 7.39 (d, *J* = 7.5 Hz, 1H), 7.66 (s, 1H), 9.23 (s, 1H), 10.11 (s, 1H). MS (ESI) *m/z* 438.3 $[M+H]^+$.

2-Butyl-6,7,8,10,11-pentamethoxydibenzo[*f,h*]isoquinolin-1(2H)-one (27c).

^{1}H NMR (300 MHz, $CDCl_3$): 0.99 (t, *J* = 7.5 Hz, 3H), 1.47 (sextet, *J* = 7.5 Hz, 2H), 1.87 (quintet, *J* = 7.5 Hz, 2H), 3.93 (s, 3H), 4.09 (s, 3H), 4.10 (s, 6H), 4.15 (t, *J* = 7.5 Hz, 2H), 4.17 (s, 3H), 7.21 (d, *J* = 7.8 Hz, 1H), 7.39 (d, *J* = 7.5 Hz, 1H), 7.66 (s, 1H), 9.23 (s, 1H), 10.12 (s, 1H). MS (ESI) *m/z* 452.2 $[M+H]^+$.

2-Isopropyl-6,7,8,10,11-pentamethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (27d).
^{1}H NMR (400 MHz, $CDCl_3$): 1.48 (d, *J* = 6.8 Hz, 6H), 3.93 (s, 3H), 4.09 (s, 3H), 4.10 (s, 6H), 4.17 (s, 3H), 5.61 (septet, *J* = 6.8 Hz, 1H), 7.29 (d, *J* = 8.0 Hz, 1H), 7.47 (d, *J* = 7.6 Hz, 1H), 7.68 (s, 1H), 9.23 (s, 1H), 10.13 (s, 1H). MS (ESI) *m/z* 438.2 $[M+H]^+$.

2-Ethyl-7,10,11-trimethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (27e).
^{1}H NMR (300 MHz, $CDCl_3$): 1.48 (t, *J* = 6.9 Hz, 3H), 4.05 (s, 3H), 4.13 (s, 3H), 4.17 (s, 3H), 4.21 (quartet, *J* = 6.9 Hz, 2H), 7.25 (dd, *J* = 9.3, 2.4 Hz, 1H), 7.30 (d, *J* = 7.5 Hz, 1H), 7.42 (d, *J* = 7.5 Hz, 1H), 7.91 (d, *J* = 2.7 Hz, 1H), 7.92 (s, 1H), 8.37 (d, *J* = 9.3 Hz, 1H), 10.13 (s, 1H). MS (APCI) *m/z* 364.0 $[M+H]^+$.

7,10,11-Trimethoxy-2-propyldibenzo[*f*,*h*]isoquinolin-1(2H)-one (27f).
^{1}H NMR (400 MHz, $CDCl_3$): 1.04 (t, *J* = 7.6 Hz, 3H), 1.92 (sextet, *J* = 7.6 Hz, 2H), 4.04 (s, 3H), 4.11 (t, *J* = 8.0 Hz, 2H), 4.13 (s, 3H), 4.17 (s, 3H), 7.25 (dd, *J* = 9.2, 2.4 Hz, 1H), 7.27 (d, *J* = 7.2 Hz, 1H), 7.40 (d, *J* = 7.2 Hz, 1H), 7.90 (d, *J* = 2.4 Hz, 1H), 7.92 (s, 1H), 8.36 (d, *J* = 9.2 Hz, 1H), 10.12 (s, 1H). MS (APCI) *m/z* 378.1 $[M+H]^+$.

2-Butyl-7,10,11-trimethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (27g).
^{1}H NMR (400 MHz, $CDCl_3$): 0.99 (t, *J* = 7.6 Hz, 3H), 1.46 (sextet, *J* = 7.6 Hz, 2H), 1.86 (quintet, *J* = 7.6 Hz, 2H), 4.04 (s, 3H), 4.09-4.14 (m, 2H), 4.12 (s, 3H), 4.17 (s, 3H), 7.23 (dd, *J* = 9.2, 2.4 Hz, 1H), 7.25 (d, *J* = 7.6 Hz, 1H), 7.37 (d, *J* = 7.6 Hz, 1H), 7.87 (d, *J* = 2.4 Hz, 1H), 7.89 (s, 1H), 8.33 (d, *J* = 9.2 Hz, 1H), 10.11 (s, 1H). MS (APCI) *m/z* 392.2 $[M+H]^+$.

2-Ethyl-6,7,11-trimethoxydibenzo[*f*,*h*]isoquinolin-1(2H)-one (27h).
^{1}H NMR (300 MHz, $CDCl_3$): 1.50 (t, *J* = 7.2 Hz, 3H), 4.08 (s, 3H), 4.10 (s, 3H), 4.14 (s, 3H), 4.22 (quartet, *J* = 7.2 Hz, 2H), 7.24 (d, *J* = 7.5 Hz, 1H), 7.31 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.47 (d, *J* = 7.5 Hz, 1H), 7.72 (s, 1H), 7.95 (s, 1H), 8.45 (d, *J* = 9.3 Hz, 1H), 10.06 (s, 1H). MS (ESI) *m/z* 364.2 $[M+H]^+$.

6,7,11-Trimethoxy-2-propyldibenzo[*f*,*h*]isoquinolin-1(2H)-one (27i).
^{1}H NMR (300 MHz, $CDCl_3$): 1.05 (t, *J* = 7.5 Hz, 3H), 1.93 (sextet, *J* = 7.5 Hz, 2H), 4.08 (s, 3H), 4.07-4.11 (m, 2H), 4.10 (s, 3H), 4.14 (s, 3H), 7.21 (d, *J* = 7.5 Hz, 1H), 7.30 (dd, *J* = 9.0, 2.7 Hz, 1H), 7.45 (d, *J* = 7.5 Hz, 1H), 7.72 (s, 1H), 7.95 (s, 1H), 8.45 (d, *J* = 9.3 Hz, 1H), 10.06 (d, *J* = 2.7 Hz, 1H). MS (ESI) *m/z* 378.1 $[M+H]^+$.

6,7,10-Trimethoxy-2-propyldibenzo[*f*,*h*]isoquinolin-1(2H)-one (27j).
^{1}H NMR (300 MHz, $CDCl_3$): 1.03 (t, *J* = 7.5 Hz, 3H), 1.91 (sextet, *J* = 7.5 Hz, 2H),

4.03 (s, 3H), 4.07-4.11 (m, 2H), 4.09 (s, 3H), 4.13 (s, 3H), 7.15 (d, J = 7.5 Hz, 1H), 7.31 (dd, J = 9.3, 2.4 Hz, 1H), 7.38 (d, J = 7.5 Hz, 1H), 7.70 (s, 1H), 7.91 (s, 1H), 7.92 (d, J = 2.4 Hz, 1H), 10.36 (d, J = 9.3 Hz, 1H). MS (ESI) *m/z* 378.2 $[M+H]^+$.

7,8,11-Trimethoxy-2-propyldibenzo[*f*,*h*]isoquinolin-1(2H)-one (27k).
^{1}H NMR (600 MHz, $CDCl_3$): 1.03 (t, J = 7.5 Hz, 3H), 1.91 (sextet, J = 7.5 Hz, 2H), 3.84 (s, 3H), 4.06 (s, 6H), 4.10 (t, J = 7.2 Hz, 2H), 7.23 (d, J = 7.8 Hz, 1H), 7.26 (dd, J = 9.0, 3.0 Hz, 1H), 7.30 (d, J = 9.0 Hz, 1H), 7.41 (d, J = 7.2 Hz, 1H), 8.20 (d, J = 8.4 Hz, 1H), 9.59 (d, J = 9.0 Hz, 1H), 10.01 (d, J = 3.0 Hz, 1H). MS (ESI) *m/z* 378.1 $[M+H]^+$.