Synthesis of Pyrrolo[2,1-*a*]isoquinolines by a Tandem 1,5-Electrocyclisation–Oxidation Process

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Abstract: A simple protocol for the convenient synthesis of 5,6-dihydropyrrolo[2,1-*a*]isoquinolines, utilising a one-pot, sequential azomethine ylide 1,5-electrocyclisation–oxidation process is described.

Key words: alkaloids, azomethine ylides, electrocyclic reaction, cycloaddition, pyrroles

Considerable interest has been shown in substituted pyrrolo[2,1-*a*]isoquinolines due to their diverse biological activities. They are constituents of several natural products such as erythrina,[1] lamellarin[2] and jamtine[3] alkaloids (Figure 1).

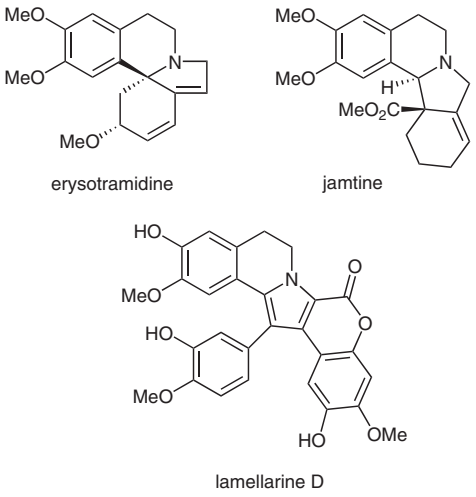
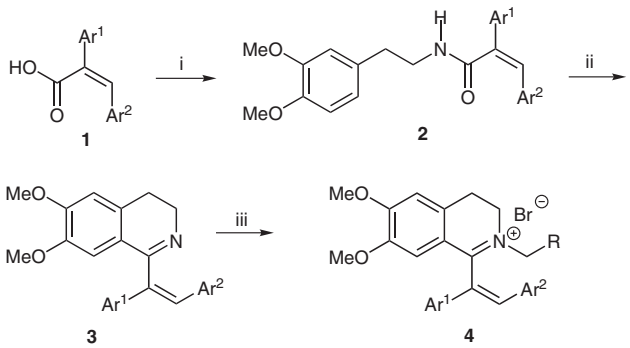


Figure 1 Alkaloids with pyrrolo[2,1-*a*]isoquinoline skeleton.

These classes of compounds are traditionally synthesised by the ring closure of iminium intermediates.[4] Since the discovery of the potent cytotoxic and topoisomerase I inhibitory activity of lamellarines, a number of new synthetic strategies have been developed, based on, for example, intramolecular oxidative biaryl coupling,[5] 1,3-dipolar cycloaddition of azomethine ylides,[6] thermal reactions of 4-ixovazoline derivatives (obtained by cycloadditions of 3,4-dihydroisoquinoline *N*-oxides with alkynes),[7] intramolecular Heck reactions[8] and cyclisation of 1- or 2-benzylisoquinolines.[9,10]

Our own interest in the development of new protocols for the synthesis of nitrogen-containing heterocycles by 1,5- or 1,7-electrocyclisation of azomethine ylides,[11] prompted us to investigate the feasibility of a tandem electrocyclisation–oxidation process for the synthesis of pyrrolo[2,1-*a*]isoquinolines using our recent observations on the reactivity of various stabilised α,β:γ,δ-unsaturated azomethine ylides generated, by the deprotonation method, from isoquinolinium salts.[12] We report here a practical and general method for the synthesis of 1,2-diaryl-5,6-dihydropyrrolo[2,1-*a*]isoquinolines.

Initially, the required 1-(1′,2′-diaryl-1′-ethenyl)-3,4-dihydroisoquinolines **3** were prepared from known stilbenic acids[13] in two straightforward steps. Treatment of stilbenic acid chlorides with a slight excess of 2-(3,4-dimethoxyphenyl)ethylamine gave the amides **2**, which could be cyclised using the standard Bischler–Napieralski procedure,[14] in the presence of $POCl_3$, to give the 3,4-dihydroisoquinolines **3** (Scheme 1, Table 1).



Scheme 1 *Reagents and conditions*: (i) (a) $SOCl_2$, CH_2Cl_2 (b) (3,4-dimethoxyphenyl)ethylamine, Et_3N, CH_2Cl_2; (ii) $POCl_3$, toluene, reflux; (iii) RCH_2Br, Et_2O, r.t.

Subsequent reaction with ethyl bromoacetate or benzyl bromide, in anhydrous ether gave the quaternary salts **4**. The dehydrohalogenation of **4** (R = Ph), in an ethanolic solution at ambient temperature, afforded pyrrolines **5** as the main product, which could be isolated in moderate to good yields by simple filtration (Scheme 2). The relative stereochemistry of this type of cycloadduct was deduced by NOE studies.

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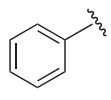
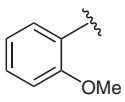
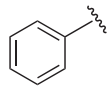
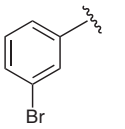
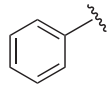
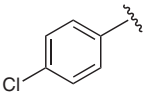
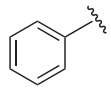
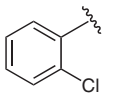
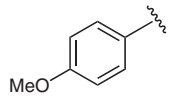
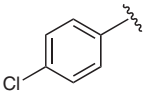
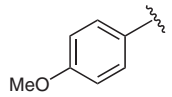
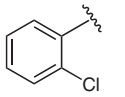
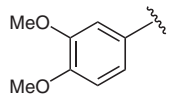
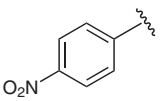
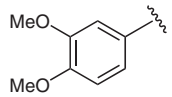
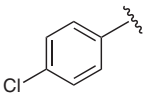
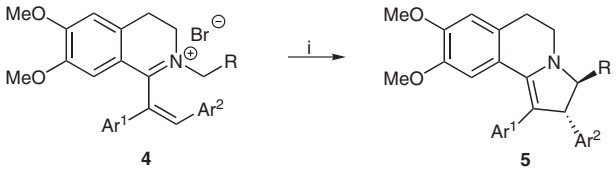
Table 1 Compounds **2a–h** and **3a–h** Prepared[a]

Entry	Ar^1	Ar^2	Isolated yield of **2**	Isolated yield of **3**
1			**2a** 91%	**3a** 96%
2			**2b** 95%	**3b** 98%
3			**2c** 85%	**3c** 86%
4			**2d** 82%	**3d** 90%
5			**2e** 91%	**3e** 92%
6			**2f** 90%	**3f** 81%
7			**2g** 93%	**3g** 85%
8			**2h** 93%	**3h** 80%

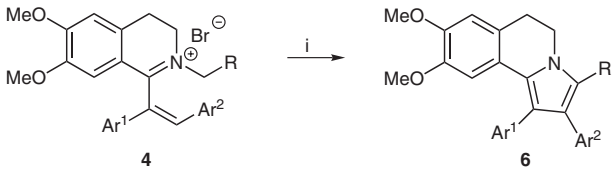
[a] Satisfactory microanalyses were obtained for each product: C ± 0.3, H ± 0.3, N ± 0.2.

When compound **4** (R = CO_2Et) was used under the same conditions, a complex mixture of products were formed with the main components, pyrrole derivatives **6**, obtained after column chromatography in about 50% yield. In two cases, the corresponding **5** pyrrolines were also precipitated and could be isolated, in low yields, by filtration.

Reacting the isoquinolinium salts **4** with triethylamine, in dichloromethane at ambient temperature, in the presence of manganese dioxide, led to the clean and rapid formation of 5,6-dihydropyrrolo[2,1-*a*]isoquinolines **6**, which were isolated in good yields after flash chromatography (Scheme 3, Table 2).



Scheme 2 *Reagents and conditions*: (i) Et_3N, EtOH, r.t.



Scheme 3 *Reagents and conditions*: (i) Et_3N, MnO_2, CH_2Cl_2, r.t.

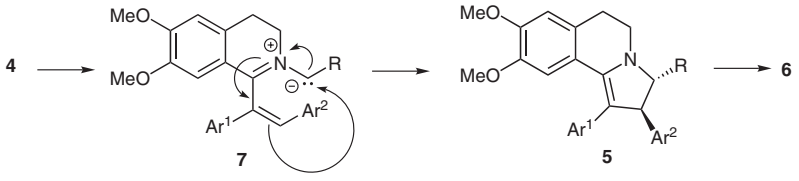
In this sequence, the azomethine ylides **7** are produced by dehydrohalogenation of the isoquinolinium salts[15] which leads, via a 1,5-electrocyclisation, to the pyrrolines **5**. In the presence of manganese dioxide, in a tandem oxidation process, the pyrrole derivatives **6** were obtained as the sole product (Scheme 4).

In summary, we have successfully developed a fast and efficient protocol for the convenient synthesis of 5,6-dihydropyrrolo[2,1-*a*]isoquinolines **6**, utilising a one-pot, sequential electrocyclisation–oxidation process as a key step. This methodology may find application in the synthesis of the pharmacologically interesting lamellarine derivatives.[2]

Column chromatography was performed using Merck Kieselgel 60 (70–230 mesh), TLC was performed on aluminium sheets coated with Kieselgel 60 F_{254}. Plates were stained with anisaldehyde solution [glacial AcOH (100 mL), H_2SO_4 (2 mL) and anisaldehyde (1 mL)] and heated at ~150 °C. IR spectra were measured on a Bruker VECTOR 22 FT-IR instrument. NMR spectra were recorded on a Bruker Avance DRX-500 spectrometer. Chemical shifts (δ) are given relative to TMS. All solvents were purified according to standard procedures.

Preparation of *N*-(3,4-Dimethoxyphenethyl)-(*E*)-2,3-diaryl-2-propenamides (2); General Procedure

2-(3,4-Dimethoxyphenyl)ethylamine (1.82 g, 10 mmol) was dissolved in CH_2Cl_2 (40 mL) and Et_3N (0.71 mL, 1.01 g, 10 mmol) was added. This mixture was cooled to 0 °C and freshly prepared stilbenic acid chloride (10 mmol; prepared from the corresponding stilbenic acid by the action of thionyl chloride), dissolved in CH_2Cl_2 (40 mL) was added dropwise. The reaction mixture was stirred at r.t. for 5 h then the organic layer was washed with H_2O (2 × 30 mL) and brine (30 mL) then dried ($MgSO_4$) and evaporated in vacuo to yield the product. See Table 3 for spectral data.



Scheme 4

Table 2 Compounds **4a–p**, **5a–i** and **6a–j** Prepared[a]

Entry	Starting material	Isolated yield of **4**	R[b]	Reaction conditions[c]	Isolated yield of **5**	Isolated yield of **6**
1	**3a**	**4a** 98%	CO_2Et	A	**5a** 10%	**6a** 27%
2	**3a**	–	CO_2Et	B	–	**6a** 52%
3	**3a**	**4b** 98%	Ph	A	**5b** 30%	–
4	**3b**	**4c** 91%	CO_2Et	B	–	**6b** 62%
5	**3b**	**4d** 88%	Ph	A	**5c** 40%	–
6	**3b**	–	Ph	B	–	**6c** 60%
7	**3c**	**4e** 95%	CO_2Et	B	–	**6d** 71%
8	**3c**	**4f** 87%	Ph	A	**5d** 51%	–
9	**3d**	**4g** 94%	CO_2Et	B	–	**6e** 66%
10	**3d**	**4h** 97%	Ph	A	**5e** 48%	–
11	**3e**	**4i** 92%	CO_2Et	A	**5f** 12%	**6f** 20%
12	**3e**	–	CO_2Et	B	–	**6f** 71%
13	**3e**	**4j** 96%	Ph	A	**5g** 50%	–
14	**3f**	**4k** 95%	CO_2Et	B	–	**6g** 70%
15	**3f**	**4l** 93%	Ph	A	**5h** 33%	–
16	**3g**	**4m** 94%	CO_2Et	B	–	**6h** 63%
17	**3g**	**4n** 99%	Ph	B	–	**6i** 66%
18	**3h**	**4o** 91%	CO_2Et	B	–	**6j** 57%
19	**3h**	**4p** 91%	Ph	A	**5i** 42%	–

[a] Satisfactory microanalyses were obtained for each product: C ±0.3, H ±0.3, N ±0.2.
[b] For Ar^1 and Ar^2 refer to Table 1.
[c] (A) Et_3N, EtOH, r.t.; (B) Et_3N, MnO_2, r.t., CH_2Cl_2.

Preparation of 6,7-Dimethoxy-1-(1′,2′-diaryl-1′-ethenyl)-3,4-dihydroisoquinolines (3); General Procedure

To a well-stirred, externally ice-water cooled solution of the corresponding propenamide **1** (8 mmol) in anhydrous toluene (30 mL) was added, dropwise, a solution of phosphoryl chloride (4 mL, 6.28 g, 41 mmol) in anhydrous toluene (10 mL). The reaction mixture was stirred at reflux for 3 h, then the excess of reagent was destroyed by the addition of H_2O, with external ice-water cooling. The residue was stirred for 2 h with an excess of 10% aq NaOH solution then the aqueous phase was extracted with EtOAc (3 × 20 mL). The combined organic extracts were washed with brine (30 mL), dried ($MgSO_4$) and evaporated in vacuo to yield the product. See Table 4 for spectral data.

Preparation of 2-Substituted 1-(1,2-Diarylvinyl)-6,7-dimethoxy-3,4-dihydroisoquinolinium Bromides (4); General Procedure

The corresponding 6,7-dimethoxy-1-(1′,2′-diaryl-1′-ethenyl)-3,4-dihydroisoquinoline (2 mmol) was dissolved in anhydrous Et_2O (30 mL) and either methyl bromoacetate (0.56 mL, 0.82 g, 6 mmol) or benzyl bromide (0.72 mL, 1.00 g, 6 mmol) was added. The reaction mixture was stirred at r.t. overnight. The yellow precipitate was filtered off, washed with Et_2O (2 × 10 mL) and dried in vacuo to give the product as a yellow powder. See Table 5 for spectral data.

Preparation of 8,9-Dimethoxy-1,2-diaryl-2,3,5,6-tetrahydropyrrolo[2,1-*a*]isoquinolines (5); General Procedure (A)

To the corresponding 3,4-dihydroisoquinolinium bromide (1.0 mmol) dissolved in anhydrous EtOH (10 mL) was added Et_3N (0.11 mL, 1.5 mmol) and the reaction mixture was stirred for 24 h at r.t. under an argon atmosphere. The precipitated product was filtered off, washed with EtOH (1 × 5 mL) and dried in vacuo. In several cases the corresponding 5,6-dihydropyrrolo[2,1-*a*]isoquinolines (**6**) could be isolated from the filtrate after column chromatography on silica gel (*n*-hexane–acetone, 3:1). See Table 6 for spectral data.

Preparation of 8,9-Dimethoxy-1,2-diaryl-5,6-dihydropyrrolo[2,1-*a*]isoquinolines (6); General Procedure (B)

To the corresponding 3,4-dihydroisoquinolinium bromide (1.0 mmol) dissolved in CH_2Cl_2 (10 mL) was added Et_3N (0.11 mL, 1.5 mmol) and MnO_2 (0.90 g, 10 mmol) and the reaction mixture was stirred at r.t. for 24 h. The solvent was then removed in vacuo and the residue was purified by flash column chromatography on silica gel (*n*-hexane–acetone, 3:1). See Table 7 for spectral data.

Table 3 Spectral Data of Compounds **2a–h**

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
2a	3349, 3062, 2993, 2961, 2926, 2831, 1651, 1612, 1508, 1480, 1466, 1437, 1290, 1263, 1240, 1158, 1136, 1115, 1052	8.13 (1 H, s, H-3), 7.28 (3 H, m, $Ar^{3'}$-6′H, Ph-2′ and 6′H), 7.11 (3 H, m, Ph-3′,4′ and 5′H), 6.80 (1 H, d, *J* = 8.3 Hz, $Ar^{3'}$-3′H), 6.71 (1 H, d, *J* = 8.2 Hz, Ar-5′H), 6.62 (1 H, d, *J* = 2 Hz, Ar-2′H), 6.55 (2 H, m, Ar-6′H and $Ar^{3'}$-4′H), 6.51 (1 H, t, *J* = 8.3 Hz, $Ar^{3'}$-5′H), 5.62 (1 H, t, *J* = 5.6 Hz, NH), 3.83 (3 H, s, OMe), 3.81 (3 H, s, OMe), 3.80 (3 H, s, OMe), 3.53 (2 H, m, NCH_2), 2.73 (2 H, t, *J* = 7.0 Hz, $ArCH_2$)	167.0 (q), 158.0 (q), 148.7 (q), 147.3 (q), 136.0 (q), 134.4 (q), 131.7 (CH), 131.1 (q), 129.8 (CH), 129.7 (2 × CH), 129.4 (CH), 128.8 (2 × CH), 127.8 (CH), 123.9 (q), 120.3 (CH), 119.5 (CH), 111.6 (CH), 111.1 (CH), 110.2 (CH), 55.7 (CH_3), 55.5 (CH_3), 55.1 (CH_3), 41.1 (CH_2), 34.7 (CH_2)
2b	3058, 2999, 2934, 2834, 1660, 1616, 1591, 1505, 1464, 1418, 1263, 1200, 1157, 1141, 1074, 1029	7.72 (1 H, s, H-3), 7.38 (3 H, m, Ph-H), 7.25 (1 H, d, *J* = 7.9 Hz, $Ar^{3'}$-4′H), 7.09 (2 H, m, Ph-H), 7.05 (1 H, s, $Ar^{3'}$-2′H), 6.96 (1 H, t, *J* = 7.9 Hz, $Ar^{3'}$-5′H), 6.86 (1 H, d, *J* = 7.9 Hz, $Ar^{3'}$-6′H), 6.70 (1 H, d, *J* = 8.2 Hz, Ar-5′H), 6.60 (1 H, d, *J* = 2.0 Hz, Ar-2′H), 6.56 (1 H, dd, *J* = 2.0, 8.2 Hz, Ar-6′H), 5.55 (1 H, t, *J* = 5.6 Hz, NH), 3.83 (3 H, s, OMe), 3.80 (3 H, s, OMe), 3.52 (2 H, m, NCH_2), 2.71 (2 H, t, *J* = 7.0 Hz, $ArCH_2$)	166.2 (q), 148.8 (q),147.4 (q), 136.8 (q), 135.7 (q), 135.1 (q), 135.0 (q), 132.7 (CH), 131.1 (q), 129.4 (CH), 128.5 (2 × CH), 128.4 (CH), 126.9 (q), 126.0 (CH), 121.9 (CH), 120.3 (CH), 111.6 (CH), 111.1 (CH), 55.7 (CH_3), 55.6 (CH_3), 41.1 (CH_2), 34.6 (CH_2)
2c	2932, 2921, 2835, 1667, 1592, 1513, 1454, 1412, 1343, 1310, 1255, 1138, 1111, 1025	7.79 (1 H, s, H-3), 7.38 (3 H, m, Ar^2-H), 7.07 (4 H, m, Ar^2-H and Ar^3-H), 6.88 (2 H, m, Ar^3-H), 6.71 (1 H, d, *J* = 8.1 Hz, Ar-5′H), 6.60 (1 H, s, $Ar^{2'}$-2′H), 6.56 (1 H, d, *J* = 8.1 Hz, $Ar^{2'}$-6′H), 5.48 (1 H, t, *J* = 5.6 Hz, NH), 3.86 (3 H, s, OMe), 3.82 (3 H, s, OMe), 3.53 (2 H, m, NCH_2), 2.72 (2 H, t, *J* = 6.6 Hz, $ArCH_2$)	166.5 (q), 148.7 (q),147.4 (q), 136.1 (q), 135.7 (q), 134.9 (q), 134.2 (q), 130.7 (q), 130.5 (2 × CH), 129.5 (2 × CH), 129.4 (2 × CH), 129.2 (CH), 126.6 (2 × CH), 120.5 (CH), 120.2 (CH), 111.6 (CH), 111.1 (CH), 55.8 (CH_3), 55.7 (CH_3), 41.0 (CH_2), 34.5 (CH_2)
2d	3021, 2935, 2832, 1652, 1570, 1507, 1454, 1359, 1292, 1172, 1165, 1110	7.94 (1 H, s, H-3),), 7.32 (1 H, d, *J* = 7.1 Hz, $Ar^{3'}$-6′H), 7.26 (3 H, m, Ph-H), 7.06 (3 H, m, Ph-H and $Ar^{3'}$-4′H), 6.86 (1 H, t, *J* = 7.1 Hz, $Ar^{3'}$-5′H), 6.81 (1 H, d, *J* = 8.1 Hz, Ar-5′H), 6.62 (3 H, m, Ar-2′, 5′H and $Ar^{3'}$-2′H), 5.57 (1 H, t, *J* = 5.6 Hz, NH), 3.85 (3 H, s, OMe), 3.83 (3 H, s, OMe), 3.57 (2 H, m, NCH_2), 2.76 (2 H, t, *J* = 7.0 Hz, $ArCH_2$)	166.6 (q), 148.6 (q), 147.6 (q), 135.3 (q), 134.3 (q), 134.0 (q), 132.7 (CH), 130.9 (q), 129.6 (2 × CH), 129.4 (CH), 129.3 (CH), 128.95 (CH), 128.9 (2 × CH), 127.1 (CH), 126.8 (q), 125.6 (CH), 120.1 (CH), 111.6 (CH), 111.1 (CH), 55.7 (CH_3), 55.5 (CH_3), 41.0 (CH_2), 34.3 (CH_2)
2e	2936, 2837, 1661, 1614, 1513, 1248, 1157, 1091, 1030	7.73 (1 H, s, H-3), 7.08 (2 H, d, *J* = 8.5 Hz, $Ar^{3'}$-3′ and 5′H), 6.98 (2 H, d, *J* = 8.7 Hz, $Ar^{2'}$-2′ and 6′H), 6.91 (2 H, d, *J* = 8.5 Hz, $Ar^{3'}$-2′ and 6′H), 6.87 (2 H, d, *J* = 8.7 Hz, $Ar^{2'}$-3′ and 5′H), 6.71 (1 H, d, *J* = 8.2 Hz, Ar-5′H), 6.61 (1 H, d, *J* = 2.0 Hz, Ar-2′H), 6.55 (1 H, dd, *J* = 2.0, 8.2 Hz, Ar-6′H), 5.70 (1 H, t, *J* = 5.6 Hz, NH), 3.83 (3 H, s, OMe), 3.82 (3 H, s, OMe), 3.80 (3 H, s, OMe), 3.54 (2 H, m, NCH_2), 2.72 (2 H, t, *J* = 7.0 Hz, $ArCH_2$)	166.8 (q), 159.3 (q), 148.6 (q), 147.2 (q), 135.0 (q), 134.4 (q), 133.8 (q), 133.3 (q), 131.1 (2 × CH), 130.7 (CH), 130.5 (2 × CH), 128.2 (q), 128.0 (2 × CH), 126.9 (q), 120.2 (CH), 114.6 (2 × CH), 111.5 (CH), 111.0 (CH), 55.5 (CH_3), 55.4 (CH_3), 54.8 (CH_3), 40.9 (CH_2), 34.5 (CH_2)

Table 3 Spectral Data of Compounds **2a–h** (continued)

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
2f	3061, 3000, 2935, 2836, 1651, 1573, 1505, 1455, 1361, 1292, 1175, 1158, 1111, 1307	7.94 (1 H, s, H-3), 7.31 (1 H, d, *J* = 6.8 Hz, $Ar^{3'}$-6′H), 7.05 (1 H, t, *J* = 6.8 Hz, $Ar^{3'}$-4′H), 6.96 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-2′ and 6′H), 6.85 (1 H, t, *J* = 6.8 Hz, $Ar^{3'}$-5′H), 6.77 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-3′ and 5′H), 6.73 (1 H, d, *J* = 8.1 Hz, Ar-5′H), 6.70 (1 H, d, *J* = 6.8 Hz, $Ar^{3'}$-2′H), 6.64 (1 H, d, *J* = 2.0 Hz, Ar-2′H), 6.61 (1 H, dd, *J* = 2.0, 8.1 Hz, Ar-6′H), 5.70 (1 H, t, *J* = 4.8 Hz, NH), 3.84 (3 H, s, OMe), 3.82 (3 H, s, OMe), 3.78 (3 H, s, OMe), 3.56 (2 H, m, NCH_2), 2.76 (2 H, t, *J* = 7.0 Hz, $ArCH_2$)	166.9 (q), 159.2 (q), 148.8 (q), 147.4 (q), 136.6 (q), 134.7 (q), 134.0 (q), 132.9 (CH), 131.0 (2 × CH), 130.9 (q), 130.5 (CH), 129.1 (CH), 128.8 (CH), 126.7 (q), 125.8 (CH), 120.4 (CH), 114.2 (2 × CH), 111.6 (CH), 111.1 (CH), 55.6 (CH_3), 55.5 (CH_3), 54.9 (CH_3), 41.0 (CH_2), 34.6 (CH_2)
2g	2934, 2820, 1666, 1592, 1515, 1464, 1416, 1343, 1258, 1139, 1025	8.00 (2 H, d, *J* = 8.8 Hz, $Ar^{3'}$-3′ and 5′H), 7.83 (1 H, s, H-3), 7.17 (2 H, d, *J* = 8.8 Hz, $Ar^{3'}$-2′ and 6′H), 6.86 (1 H, d, *J* = 8.2 Hz, $Ar^{2'}$- 6′H), 6.61 (1 H, d, *J* = 8.2 Hz, Ar-5′H), 6.64 (2 H, m $Ar^{2'}$-2′ and 5′H), 6.54 (2 H, m Ar-2′ and 6′H), 5.79 (1 H, t, *J* = 4.4 Hz, NH), 3.94 (3 H, s, OMe), 3.86 (3 H, s, OMe), 3.83 (3 H, s, OMe), 3.72 (3 H, s, OMe), 3.57 (2 H, m, NCH_2), 2.75 (2 H, t, *J* = 6.8 Hz, $ArCH_2$)	166.2 (q), 149.8 (q), 149.5 (q), 149.0 (q), 147.7 (q), 146.9 (q), 141.6 (q), 138.0 (q), 133.9 (CH), 130.8 (q), 130.6 (2 × CH), 126.7 (q), 123.3 (2 × CH), 121.8 (CH), 120.4 (CH), 111.9 (CH), 111.8 (CH), 111.7 (CH), 111.1 (CH), 55.9 (CH_3), 55.82 (CH_3), 55.80 (CH_3), 55.75 (CH_3), 41.2 (CH_2), 34.6 (CH_2)
2h	2934, 2835, 1666, 1616, 1515, 1414, 1256, 1139, 1090, 1027	7.76 (1 H, s, H-3), 7.11 (2 H, d, *J* = 8.7 Hz, $Ar^{3'}$-3′ and 5′H), 6.94 (2 H, d, *J* = 8.7 Hz, $Ar^{3'}$-2′ and 6′H), 6.85 (1 H, d, *J* = 8.2 Hz, $Ar^{2'}$-5′H), 6.70 (1 H, d, *J* = 8.1 Hz, Ar-5′H), 6.64 (1 H, dd, *J* = 8.2, 2.0 Hz, $Ar^{2'}$-6′H), 6.63 (1 H, d, *J* = 2.0 Hz, $Ar^{2'}$-2′H), 6.57 (1 H, d, *J* = 2.0 Hz, Ar-2′H), 6.53 (1 H, dd, *J* = 8.1, 2.0 Hz, $Ar^{2'}$-2′H), 5.67 (1 H, t, *J* = 5.4 Hz, NH), 3.93 (3 H, s, OMe), 3.85 (3 H, s, OMe), 3.82 (3 H, s, OMe), 3.72 (3 H, s, OMe), 3.55 (2 H, m, NCH_2), 2.74 (2 H, t, *J* = 6.8 Hz, $ArCH_2$)	166.8 (q), 149.6 (q), 149.0 (q), 148.8 (q), 147.5 (q), 135.3 (q), 134.3 (q), 134.2 (q), 133.3 (q), 131.3 (2 × CH), 130.8 (CH), 128.2 (2 × CH), 127.4 (q), 121.7 (CH), 120.3 (CH), 112.0 (CH), 111.7 (CH), 111.6 (CH), 111.0 (CH), 55.7 (CH_3), 55.65 (2 × CH_3), 55.6 (CH_3), 41.1 (CH_2), 34.6 (CH_2)

Table 4 Spectral Data of Compounds **3a–h**

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
3a	2937, 2834, 1604, 1568, 1511, 1464, 1318, 1280, 1205, 1143, 1111, 1029	7.49 (2 H, d, *J* = 7.1 Hz, Ph-2′ and 6′H), 7.40 (1 H, s, H-2′), 7.24 (2 H, t, *J* = 7.1 Hz, Ph-3′ and 5′H), 7.16 (2 H, m, Ph-4′H and $Ar^{1'}$-6′H), 7.08 (1 H, t, *J* = 8.3 Hz, $Ar^{1'}$-4′H), 6.87 (1 H, s, H-8), 6.75 (1 H, d, *J* = 8.3 Hz, $Ar^{1'}$-3′H), 6.68 (1 H, t, *J* = 8.3 Hz, $Ar^{1'}$-5′H), 6.61 (1 H, s, H-5), 3.84 (3 H, s, OMe), 3.82 (2 H, m, H-3), 3.77 (3 H, s, OMe), 3.62 (3 H, s, OMe), 2.70 (2 H, m, H-4)	167.3 (q), 157.0 (q), 150.6 (q), 147.3 (q), 141.2 (q), 139.3 (q), 130.9 (q), 129.4 (q), 128.7 (CH), 128.4 (2 × CH), 128.1 (CH), 127.4 (CH), 126.7 (2 × CH), 125.9 (CH), 122.1 (q), 119.8 (CH), 110.0 (CH), 109.9 (CH), 55.8 (CH_3), 55.6 (CH_3), 55.1 (CH_3), 47.6 (CH_2), 25.4 (CH_2)
3b	3058, 3002, 2935, 2832, 1605, 1559, 1507, 1464, 1375, 1318, 1278, 1206, 1142, 1075, 1043, 1029	7.49 (3 H, m, Ph), 7.32 (2 H, m, Ph), 7.27 (1 H, d, *J* = 7.8 Hz, $Ar^{1'}$-4′H), 7.23 (2 H, m, $Ar^{1'}$-2′ and 6′H), 7.07 (1 H, s, H-2′), 7.03 (1 H, t, *J* = 7.8 Hz, $Ar^{1'}$-5′H), 6.77 (1 H, s, H-8), 6.69 (1 H, s, H-5), 3.86 (2 H, m, H-3), 3.84 (3 H, s, OMe), 3.58 (3 H, s, OMe), 2.80 (2 H, t, *J* = 7.7 Hz, H-4)	166.3 (q), 151.0 (q), 147.4 (q), 141.3 (q), 140.0 (q), 138.5 (q), 131.4 (CH), 131.1 (q), 130.0 (CH), 129.3 (CH), 128.4 (2 × CH), 128.1 (CH), 127.9 (CH), 127.2 (CH), 126.3 (2 × CH), 121.9 (q), 110.1 (CH), 109.7 (CH), 55.7 (CH_3), 55.65 (CH_3), 47.6 (CH_2), 25.1 (CH_2)
3c	2941, 2831, 1600, 1562, 1510, 1409, 1363, 1316, 1281, 1250, 1208, 1177, 1032, 1012	8.05 (2 H, d, *J* = 8.2 Hz, $Ar^{2'}$-3′ and 5′H), 7.97 (2 H, d, *J* = 8.2 Hz, $Ar^{2'}$-2′ and 6′H), 7.88 (2 H, m, Ph-H), 7.56 (3 H, m, Ph-H), 7.13 (1 H, s, H-2′), 6.89 (1 H, s, H-8), 6.80 (1 H, s, H-5), 3.85 (3 H, s, OMe), 3.81 (2 H, m, H-3), 3.65 (3 H, s, OMe), 2.75 (2 H, t, *J* = 7.4 Hz, H-4)	166.1 (q), 151.2 (q), 147.7 (q), 135.1 (q), 133.6 (q), 131.5 (q), 130.6 (q), 130.0 (q), 129.6 (2 × CH), 129.5 (q), 129.3 (2 × CH), 128.6 (2 × CH), 126.9 (2 × CH), 125.9 (CH), 124.2 (CH), 121.5 (q), 109.9 (CH), 109.5 (CH), 55.7 (CH_3), 55.2 (CH_3), 47.3 (CH_2), 25.3 (CH_2)
3d	3100, 2934, 2810, 1603, 1569, 1505, 1464, 1278, 1141, 1030	7.53 (2 H, d, *J* = 7.1 Hz, $Ar^{2'}$-2′ and 6′H), 7.37 (1 H, s, H-2′), 7.33 (2 H, t, *J* = 7.1 Hz, $Ar^{2'}$-3′ and 5′H), 7.23 (2 H, m, $Ar^{2'}$-6′H and Ph-4′H), 7.14 (2 H, m, $Ar^{2'}$-4′ and 5′H), 6.98 (1 H, d, *J* = 8.8 Hz, $Ar^{2'}$-3′H), 6.84 (1 H, s, H-8), 6.58 (1 H, s, H-5), 3.82 (2 H, m, H-3), 3.81 (3 H, s, OMe), 3.68 (3 H, s, OMe), 2.68 (2 H, t, *J* = 7.7 Hz, H-4)	166.6 (q), 150.6 (q), 147.3 (q), 141.3 (q), 135.1 (q), 131.4 (q), 130.6 (q), 130.1 (q), 129.2 (CH), 128.9 (CH), 128.5 (CH), 128.4 (2 × CH), 128.1 (CH), 128.0 (CH), 126.7 (2 × CH), 125.8 (CH), 121.7 (q), 109.8 (CH), 109.4 (CH), 55.65 (CH_3), 55.6 (CH_3), 47.4 (CH_2), 25.2 (CH_2)

Table 4 Spectral Data of Compounds **3a–h** (continued)

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
3e	2940, 2835, 1603, 1567, 1512, 1465, 1404, 1353, 1316, 1285, 1251, 1208, 1174, 1142, 1089, 1036, 1013	7.17 (6 H, m, $Ar^{2'}$- and $Ar^{3'}$-H), 6.94 (1 H, s, H-2′), 6.77 (1 H, s, H-8), 6.74 (2 H, d, *J* = 8.5 Hz, $Ar^{1'}$-3′ and 5′H), 6.67 (1 H, s, H-5), 3.87 (3 H, s, OMe), 3.80 (2 H, m, H-3), 3.75 (3 H, s, OMe), 3.60 (3 H, s, OMe), 2.71 (2 H, t, *J* = 7.8 Hz, H-4)	168.1 (q), 159.1 (q), 150.4 (q), 146.9 (q), 141.2 (q), 135.2 (q), 132.8 (q), 131.9 (q), 131.0 (2 × CH), 130.7 (2 × CH), 130.1 (q), 129.9 (CH), 128.1 (2 × CH), 121.2 (q), 114.0 (2 × CH), 111.1 (CH), 110.0 (CH), 55.84 (CH_3), 55.77 (CH_3), 55.1 (CH_3), 47.8 (CH_2), 25.8 (CH_2)
3f	3001, 2936, 2834, 1605, 1567, 1511, 1465, 1441, 1371, 1349, 1318, 1279, 1249, 1207, 1179, 1144, 1033	7.46 (2 H, d, *J* = 8.8 Hz, $Ar^{1'}$-2′ and 6′H), 7.28 (1 H, s, H-2′), 7.25 (1 H, d, *J* = 7.9 Hz, $Ar^{2'}$-6′H), 7.11 (1 H, d, *J* = 7.9 Hz, $Ar^{2'}$-3′H), 7.00 (2 H, m, $Ar^{2'}$-4′ and 5′H), 6.87 (2 H, d, *J* = 8.8 Hz, $Ar^{1'}$-3′ and 5′H), 6.83 (1 H, s, H-8), 6.59 (1 H, s, H-5), 3.86 (2 H, m, H-3), 3.83 (3 H, s, OMe), 3.78 (3 H, s, OMe), 3.69 (3 H, s, OMe), 2.74 (1 H, t, *J* = 7.1 Hz, H-4), 2.69 (1 H, t, *J* = 7.1 Hz, H-4)	166.8 (q), 159.5 (q), 150.7 (q), 147.4 (q), 140.8 (q), 135.3 (q), 132.8 (q), 131.4 (q), 130.7 (q), 130.5 (CH), 129.0 (CH), 128.3 (CH), 128.0 (2 × CH), 125.9 (CH), 124.8 (CH), 121.8 (q), 113.9 (2 × CH), 109.9 (CH), 109.5 (CH), 55.8 (CH_3), 55.7 (CH_3), 55.2 (CH_3), 47.4 (CH_2), 25.3 (CH_2)
3g	3002, 2936, 2835, 1592, 1567, 1515, 1464, 1418, 1341, 1319, 1268, 1208, 1169, 1139, 1110, 1081, 1026	8.02 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-3′ and 5′H), 7.34 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-2′ and 6′H), 7.12 (1 H, s, H-2′), 6.85 (1 H, s, H-8), 6.79 (3 H, m, $Ar^{1'}$-H), 6.72 (1 H, s, H-5), 3.90 (3 H, s, OMe), 3.88 (3 H, s, OMe), 3.85 (2 H, m, H-3), 3.84 (3 H, s, OMe), 3.63 (3 H, s, OMe), 2.80 (1 H, t, *J* = 7.7 Hz, H-4), 2.74 (1 H, t, *J* = 7.7 Hz, H-4)	166.1 (q), 151.3 (q), 149.6 (q), 148.9 (q), 147.6 (q), 146.1 (q), 143.9 (q), 143.3 (q), 131.1 (q), 129.1 (2 × CH), 128.0 (CH), 126.0 (q), 123.3 (2 × CH), 121.2 (q), 119.7 (CH), 111.1 (CH), 110.3 (CH), 109.7 (CH), 109.4 (CH), 55.8 (CH_3), 55.7 (CH_3), 55.65 (CH_3), 55.62 (CH_3), 47.8 (CH_2), 25.1 (CH_2)
3h	2935, 2830, 1604, 1566, 1517, 1465, 1443, 1372, 1318, 1272, 1241, 1200, 1149, 1030	7.96 (2 H, d, *J* = 8.1 Hz, $Ar^{2'}$-3′ and 5′H), 7.92 (2 H, d, *J* = 8.1 Hz, $Ar^{2'}$-2′ and 6′H), 7.10 (1 H, s, H-2′), 6.84 (1 H, s, H-8), 6.82 (1 H, d, *J* = 7.8 Hz, $Ar^{1'}$-5′H), 6.78 (2 H, m, $Ar^{1'}$-H), 6.75 (1 H, s, H-5), 3.94 (3 H, s, OMe), 3.89 (3 H, s, OMe), 3.87 (3 H, s, OMe), 3.83 (2 H, m, H-3), 3.62 (3 H, s, OMe), 2.82 (2 H, t, *J* = 7.5 Hz, H-4)	166.5 (q), 151.0 (q), 149.8 (q), 149.1 (q), 147.4 (q), 146.2 (q), 142.9 (q), 140.3 (q), 130.0 (q), 129.9 (2 × CH), 129.7 (2 × CH), 128.1 (CH), 126.0 (q), 121.0 (q), 119.3 (CH), 111.2 (CH), 110.1 (CH), 109.3 (CH), 109.1 (CH), 55.85 (CH_3), 55.8 (CH_3), 55.6 (CH_3), 55.2 (CH_3), 47.7 (CH_2), 25.3 (CH_2)

Table 5 Spectral Data of Compounds **4a–p**

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
4a	2937, 2835, 1743, 1600, 1549, 1520, 1485, 1464, 1394, 1337, 1294, 1272, 1251, 1214, 1169, 1112, 1020	7.75 (1 H, s, H-2′), 7.42 (3 H, m, Ph), 7.38 (2 H, m, Ph), 7.27 (1 H, t, *J* = 7.6 Hz, $Ar^{2'}$-4′H), 7.24 (1 H, d, *J* = 7.6 Hz, $Ar^{2'}$-6′H), 6.99 (1 H, t, *J* = 7.6 Hz, $Ar^{2'}$-5′H), 6.98 (1 H, s, H-8), 6.95 (1 H, s, H-5), 6.80 (1 H, d, *J* = 7.6 Hz, $Ar^{2'}$-3′H), 5.57 (1 H, d, *J* = 17.3 Hz, NCH_2), 5.13 (1 H, d, *J* = 17.3 Hz, NCH_2), 4.62 (1 H, m, H-3), 4.50 (1 H, m, H-3), 4.00 (3 H, s, OMe), 3.83 (2 H, q, *J* = 7.1 Hz, OCH_2), 3.80 (3 H, s, OMe), 3.64 (3 H, s, OMe), 3.63 (1 H, m, H-4), 3.42 (1 H, m, H-4), 1.08 (3 H, t, *J* = 7.1 Hz, CH_3)	175.3 (q), 164.9 (q), 157.4 (q), 156.8 (q), 148.4 (q), 136.6 (q), 135.7 (q), 135.2 (q), 131.8 (CH), 130.3 (CH), 129.52 (2 × CH), 129.49 (CH), 129.43 (CH), 126.6 (2 × CH), 122.7 (q), 121.5 (CH), 118.3 (q), 113.8 (CH), 110.9 (CH), 110.6 (CH), 62.1 (CH_2), 58.8 (CH_2), 56.9 (CH_3), 55.8 (CH_3), 55.4 (CH_2), 52.5 (CH_3), 26.0 (CH_2), 13.7 (CH_3)
4b	2998, 2933, 2833, 1604, 1554, 1519, 1485, 1463, 1396, 1337, 1292, 1276, 1246, 1211, 1165, 1113, 1050, 1029, 1007	7.84 (1 H, s, H-2′), 7.49 (5 H, m, Ph-H), 7.30 (1 H, t, *J* = 8.0 Hz, $Ar^{2'}$-4′H), 7.25 (1 H, d, *J* = 8.0 Hz, $Ar^{2'}$-6′H), 7.19 (3 H, t, *J* = 7.3 Hz, Bn-H), 7.17 (2 H, d, *J* = 7.3 Hz, Bn-H), 7.03 (1 H, t, *J* = 8.0 Hz, $Ar^{2'}$-5′H), 6.97 (1 H, s, H-8), 6.95 (1 H, s, H-5), 6.85 (1 H, d, *J* = 8.0 Hz, $Ar^{2'}$-3′H), 5.56 (1 H, d, *J* = 14.3 Hz, NCH_2), 5,45 (1 H, d, *J* = 14.3 Hz, NCH_2), 4.28 (1 H, m, H-3), 4.07 (1 H, m, H-3), 4.00 (3 H, s, OMe), 3.78 (3 H, s, OMe), 3.66 (3 H, s, OMe), 3.55 (1 H, m, H-4), 3.36 (1 H, m, H-4)	173.7 (q), 157.1 (q), 157.0 (q), 148.5 (q), 137.2 (q), 134.8 (q), 133.2 (q), 131.5 (q), 130.7 (CH), 130.4 (CH), 129.5 (CH), 129.4 (2 × CH), 129.0 (CH), 128.9 (2 × CH), 128.4 (2 × CH), 126.3 (2 × CH), 122.9 (q), 121.6 (2 × CH), 118.5 (q), 113.6 (CH), 111.1 (CH), 110.8 (CH), 60.2 (CH_2), 56.9 (CH_3), 55.8 (CH_3), 55.4 (CH_3), 49.2 (CH_2), 25.8 (CH_2)
4c	2933, 1742, 1600, 1547, 1520, 1465, 1421, 1392, 1337, 1294, 1271, 1214, 1168, 1121, 1006	7.49 (5 H, m, Ph-H), 7.40 (3 H, m, $Ar^{2'}$-H), 7.31 (1 H, d, *J* = 7.8 Hz, $Ar^{2'}$-6′H), 7.27 (1 H, s, H-2′), 6.96 (1 H, s, H-8), 6.89 (1 H, s, H-5), 5.44 (1 H, d, *J* = 17.5 Hz, NCH_2), 5.37 (1 H, d, *J* = 17.5 Hz, NCH_2), 4.65 (2 H, m, H-3), 4.03 (3 H, s, OMe), 3.86 (2 H, q, *J* = 6.6 Hz, OCH_2), 3.72 (1 H, m, H-4), 3.62 (3 H, s, OMe), 3.54 (1 H, m, H-4), 1.09 (3 H, t, *J* = 6.6 Hz, CH_3)	174.3 (q), 164.9 (q), 158.1 (q), 148.9 (q), 136.1 (q), 135.5 (q), 135.3 (q), 135.2 (q), 132.9 (CH), 132.0 (q), 131.6 (CH), 131.4 (CH), 130.3 (CH), 129.9 (2 × CH), 127.3 (CH), 126.5 (2 × CH), 122.9 (CH), 117.8 (q), 113.8 (CH), 111.3 (CH), 62.4 (CH_2), 59.2 (CH_2), 57.1 (CH_3), 56.2 (CH_3), 52.8 (CH_2), 26.1 (CH_2), 13.8 (CH_3)

Table 5 Spectral Data of Compounds **4a–p** (continued)

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
4d	3006, 2938, 2830, 1602, 1554, 1518, 1456, 1407, 1338, 1293, 1274, 1165, 1047	7.54 (6 H, m, Ph-H), 7.41 (4 H, m, Ph-H), 7.33 (1 H, s, $Ar^{2'}$-2′H), 7.26 (1 H, t, *J* = 7.5 Hz, $Ar^{2'}$-5′H), 7.18 (1 H, d, *J* = 7.5 Hz, $Ar^{2'}$-4′H), 7.16 (1 H, d, *J* = 7.5 Hz, $Ar^{2'}$-6′H), 7.05 (1 H, s, H-2′), 6.96 (1 H, s, H-8), 6.94 (1 H, s, H-5), 5.61 (1 H, d, *J* = 14.2 Hz, NCH_2), 5.51 (1 H, d, *J* = 14.2 Hz, NCH_2), 4.37 (1 H, m, H-3), 4.27 (1 H, m, H-3), 4.02 (3 H, s, OMe), 3.64 (3 H, s, OMe), 3.60 (1 H, m, H-4), 3.48 (1 H, m, H-4)	172.8 (q), 157.8 (q), 148.9 (q), 136.1 (q), 135.5 (q), 135.3 (q), 133.8 (q), 132.7 (q), 132.1 (q), 131.7 (CH), 131.6 (CH), 130.6 (CH), 130.3 (CH), 130.2 (2 × CH), 129.7 (2 × CH), 129.3 (CH), 129.1 (2 × CH), 127.2 (CH), 126.3 (2 × CH), 123.0 (CH), 117.9 (q), 113.6 (CH), 111.4 (CH), 60.7 (CH_2), 57.1 (CH_3), 56.2 (CH_3), 49.6 (CH_2), 26.0 (CH_2)
4e	2977, 2935, 1739, 1602, 1550, 1520, 1495, 1467, 1427, 1393, 1338, 1294, 1271, 1241, 1219, 1190, 1171, 1125, 1009	7.61 (1 H, s, H-2′), 7.44–7.31 (9 H, m, $Ar^{2'}$-H and Ph-H), 7.00 (1 H, s, H-8), 6.90 (1 H, s, H-5), 5.63 (1 H, d, *J* = 17.5 Hz, NCH_2), 5.08 (1 H, d, *J* = 17.5 Hz, NCH_2), 4.66 (1 H, m, H-3), 4.53 (1 H, m, H-3), 4.02 (3 H, s, OMe), 3.84 (3 H, m, H-4 and OCH_2), 3.61 (3 H, s, OMe), 3.45 (1 H, m, H-4), 1.06 (3 H, t, *J* = 7.2 Hz, CH_3)	174.8 (q), 164.7 (q), 158.1 (q), 148.8 (q), 136.1 (q), 136.0 (q), 135.7 (q), 131.8 (CH), 130.7 (q), 130.2 (2 × CH), 129.9 (CH), 129.6 (2 × CH), 129.55 (2 × CH), 129.0 (q), 126.4 (2 × CH), 117.5 (q), 113.7 (CH), 111.3 (CH), 62.2 (CH_2), 59.1 (CH_2), 57.0 (CH_3), 56.1 (CH_3), 52.6 (CH_2), 26.0 (CH_2), 13.7 (CH_3)
4f	3072, 2976, 2911, 2834, 1602, 1552, 1516, 1498, 1467, 1454, 1440, 1404, 1392, 1336, 1293, 1264, 1239, 1214, 1193, 1178, 1163, 1086, 1044, 1024, 1006	7.65 (1 H, s, H-2′), 7.53 (4 H, s, $Ar^{2'}$-H), 7.40 (5 H, s, Ph-H), 7.25 (1 H, t, *J* = 7.8 Hz, Ph-H), 7.16 (2 H, t, *J* = 7.8 Hz, Ph-H), 6.97 (2 H, s, H-5 and H-8), 6.91 (2 H, d, *J* = 7.8 Hz, Ph-H), 5.90 (1 H, d, *J* = 14.0 Hz, NCH_2), 5.41 (1 H, d, *J* = 14.0 Hz, NCH_2), 4.52 (1 H, m, H-3), 4.00 (3 H, s, OMe), 3.95 (1 H, m, H-3), 3.76 (1 H, m, H-4), 3.63 (3 H, s, OMe), 3.31 (1 H, m, H-4)	173.1 (q), 157.6 (q), 148.9 (q), 136.9 (q), 136.0 (q), 135.3 (q), 135.2 (q), 132.1 (q), 131.0 (q), 130.5 (CH), 130.2 (2 × CH), 130.1 (2 × CH), 130.0 (CH), 129.95 (2 × CH), 129.9 (2 × CH), 129.3 (CH), 129.0 (2 × CH), 126.4 (2 × CH), 117.8 (q), 113.6 (CH), 111.3 (CH), 60.6 (CH_2), 57.0 (CH_3), 56.2 (CH_3), 49.2 (CH_2), 26.1 (CH_2)
4g	2999, 2977, 2821, 1743, 1602, 1548, 1520, 1466, 1394, 1336, 1294, 1216, 1023	7.75 (1 H, s, H-2′), 7.65 (1 H, d, *J* = 7.3 Hz, $Ar^{2'}$-6′H), 7.47 (3 H, m, Ph-H), 7.41 (3 H, m, Ph-H and $Ar^{2'}$-4′H), 7.27 (1 H, d, *J* = 7.3 Hz, $Ar^{2'}$-3′H), 7.22 (1 H, t, *J* = 7.3 Hz, $Ar^{2'}$-5′H), 6.95 (1 H, s, H-8), 6.86 (1 H, s, H-5), 6.01 (1 H, d, *J* = 17.5 Hz, NCH_2), 5.04 (1 H, d, *J* = 17.5 Hz, NCH_2), 4.72 (1 H, m, H-3), 4.48 (1 H, m, H-3), 3.98 (3 H, s, OMe), 3.84 (2 H, q, *J* = 7.1 Hz, OCH_2), 3.80 (1 H, m, H-4), 3.74 (3 H, s, OMe), 3.22 (1 H, m, H-4), 1.06 (3 H, t, *J* = 7.1 Hz, CH_3)	174.6 (q), 164.9 (q), 148.8 (q), 135.9 (q), 135.8 (q), 135.4 (q), 133.1 (q), 132.8 (q), 131.9 (CH), 131.2 (CH), 130.5 (CH), 130.1 (CH), 129.7 (2 × CH), 129.5 (CH), 129.3 (q), 128.8 (CH), 126.8 (2 × CH), 118.3 (q), 113.3 (CH), 110.9 (CH), 62.2 (CH_2), 59.7 (CH_2), 56.9 (CH_3), 56.1 (CH_3), 52.7 (CH_2), 26.2 (CH_2), 13.7 (CH_3)
4h	2993, 2812, 1604, 1551, 1520, 1496, 1462, 1394, 1338, 1295, 1213, 1167, 1045, 1006	7.76 (1 H, s, H-2′), 7.56 (3 H, m, Ph-H), 7.52 (2 H, m, Ph-H), 7.25 (6 H, m, $Ar^{2'}$-H and Ph-H), 7.16 (1 H, t, *J* = 7.6 Hz, $Ar^{2'}$-4′H), 7.13 (1 H, s, H-8), 6.94 (2 H, d, *J* = 7.5 Hz, Ph-H), 6.87 (1 H, s, H-5), 6.24 (1 H, d, *J* = 14.2 Hz, NCH_2), 5.40 (1 H, d, *J* = 14.2 Hz, NCH_2), 4.63 (1 H, m, H-3), 4.32 (1 H, m, H-3), 3.97 (3 H, s, OMe), 3.76 (3 H, s, OMe), 3.69 (1 H, m, H-4), 3.10 (1 H, m, H-4)	172.9 (q), 157.3 (q), 148.7 (q), 137.3 (q),134.9 (q), 133.0 (q), 132.0 (q), 131.1 (CH), 130.4 (q), 130.1 (2 × CH), 129.9 (CH), 129.8 (2 × CH), 129.7 (q), 129.6 (CH), 129.3 (CH), 129.2 (CH), 129.15 (CH), 128.9 (2 × CH), 128.6 (CH), 126.7 (2 × CH), 118.4 (q), 113.2 (CH), 110.9 (CH), 60.6 (CH_2), 59.9 (CH_3), 56.1 (CH_3), 49.1 (CH_2), 26.1 (CH_2)
4i	2970, 2949, 2840, 1748, 1605, 1551, 1508, 1403, 1337, 1296, 1280, 1210, 1200, 1189, 1032, 1018	7.46 (1 H, s, H-2′), 7.32 (6 H, m, $Ar^{1'}$-and $Ar^{2'}$-H), 6.99 (1 H, s, H-8), 6.95 (2 H, d, *J* = 8.9 Hz, $Ar^{1'}$-3′ and 5′H), 6.89 (1 H, s, H-5), 5.56 (1 H, d, *J* = 17.5 Hz, NCH_2), 5.21 (1 H, d, *J* = 17.5 Hz, NCH_2), 4.61 (2 H, m, H-3), 4.02 (3 H, s, OMe), 3.80 (2 H, q, *J* = 7.3 Hz, OCH_2), 3.77 (3 H, s, OMe), 3.62 (3 H, s, OMe), 3.48 (2 H, m, H-4), 1.08 (3 H, t, *J* = 7.3 Hz, CH_3)	175.0 (q), 165.0 (q), 160.9 (q), 157.9 (q),148.8 (q), 135.9 (q), 135.7 (q), 133.8 (CH), 132.1 (q), 130.5 (q), 130.0 (2 × CH), 129.6 (2 × CH), 128.1 (q), 128.0 (2 × CH), 117.7 (q), 115.1 (2 × CH), 113.8 (CH), 111.2 (CH), 62.2 (CH_2), 59.2 (CH_2), 57.0 (CH_3), 56.2 (CH_3), 55.5 (CH_2), 52.7 (CH_3), 26.2 (CH_2), 15.2 (CH_2), 13.8 (CH_3)
4j	2935, 2840, 1605, 1549, 1506, 1462, 1394, 1334, 1289, 1214, 1161, 1097, 1028, 1007	7.56 (1 H, s, H-2′), 7.52 (2 H, d, *J* = 8.9 Hz, $Ar^{1'}$-2′ and 6′H), 7.36 (2 H, d, *J* = 8.6 Hz, $Ar^{2'}$-3′ and 5′H), 7.31 (2 H, d, *J* = 8.6 Hz, $Ar^{2'}$-2′ and 6′H), 7.26 (1 H, t, *J* = 7.4 Hz, Ph-4′H), 7.17 (2 H, t, *J* = 7.4 Hz, Ph-3′ and 5′H), 7.04 (2 H, d, *J* = 8.9 Hz, $Ar^{1'}$-3′ and 5′H), 7.00 (1 H, s, H-8), 6.88 (1 H, s, H-5), 6.94 (2 H, d, *J* = 7.4 Hz, Ph-2′ and 6′H), 5.70 (1 H, d, *J* = 14.2 Hz, NCH_2), 5.47 (1 H, d, *J* = 14.2 Hz, NCH_2), 4.34 (1 H, m, H-3), 4.11 (1 H, m, H-3), 4.00 (3 H, s, OMe), 3.85 (3 H, s, OMe), 3.63 (3 H, s, OMe), 3.62 (1 H, m, H-4), 3.41 (1 H, m, H-4)	173.2 (q), 160.9 (q), 148.8 (q), 135.5 (q), 135.0 (q), 132.4 (q), 132.2 (q), 130.7 (q), 130.6 (q), 130.0 (2 × CH), 129.8 (2 × CH), 129.7 (2 × CH), 129.2 (CH), 128.9 (2 × CH), 128.8 (q), 127.8 (2 × CH), 117.9 (q), 115.4 (2 × CH), 113.6 (CH), 111.3 (CH), 60.5 (CH_2), 57.0 (CH_3), 56.2 (CH_3), 55.5 (CH_3), 49.2 (CH_2), 26.0 (CH_2)

Table 5 Spectral Data of Compounds **4a**–**p** (continued)

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
4k	3000, 2835, 1753, 1604, 1464, 1394, 1339, 1296, 1255, 1214, 1187, 1170, 1032	7.63 (1 H, s, H-2′), 7.54 (1 H, d, *J* = 7.7 Hz, $Ar^{2'}$-6′H), 7.42 (1 H, t, *J* = 7.7 Hz, $Ar^{2'}$-5′H), 7.37 (2 H, d, *J* = 8.8 Hz, $Ar^{1'}$-2′ and 6′H), 7.26 (1 H, d, *J* = 7.7 Hz, $Ar^{2'}$-3′H), 7.19 (1 H, t, *J* = 7.7 Hz, $Ar^{2'}$-4′H), 6.97 (2 H, d, *J* = 8.8 Hz, $Ar^{1'}$-3′ and 5′H), 6.94 (1 H, s, H-7), 6.87 (1 H, s, H-5), 5.88 (2 H, d, *J* = 17.5 Hz, CH_2CO), 5.12 (2 H, d, *J* = 17.5 Hz, CH_2CO), 4.63 (1 H, m, H-3), 4.50 (1 H, m, H-3), 3.99 (3 H, s, OMe), 3.87 (2 H, q, *J* = 7.2 Hz, OCH_2), 3.84 (6 H, s, 2 × OMe), 3.73 (3 H, s, OMe), 3.72 (1 H, m, H-4), 3.29 (1 H, m, H-4), 1.09 (3 H, t, *J* = 7.2 Hz, CH_3)	174.8 (q), 165.0 (q), 161.0 (q), 157.7 (q), 148.7 (q), 135.7 (q), 133.1 (q), 133.0 (q), 132.4 (q), 132.1 (q), 130.9 (q), 130.1 (q), 129.4 (q), 128.5 (CH), 128.2 (2 × CH), 128.1 (CH), 118.3 (q), 113.3 (CH), 110.9 (CH), 62.2 (CH_2), 59.4 (CH_2), 56.9 (CH_3), 56.1 (CH_3), 55.4 (CH_3), 52.6 (CH_2), 26.1 (CH_2), 13.7 (CH_3)
4l	2933, 2835, 1603, 1550, 1512, 1455, 1392, 1339, 1294, 1268, 1216, 1181, 1163, 1026, 1003	7.56 (1 H, d, *J* = 7.0 Hz, $Ar^{2'}$-6′H), 7.47 (2 H, d, *J* = 8.8 Hz, $Ar^{1'}$-2′ and 6′H), 7.18–7.35 (6 H, m, Ph-H and $Ar^{2'}$-H), 7.17 (2 H, d, *J* = 8.8 Hz, $Ar^{1'}$-3′ and 5′H), 7.02 (1 H, s, H-2′), 6.99 (2 H, d, *J* = 8.4 Hz, Ph-H), 6.86 (1 H, s, H-5), 6.85 (1 H, s, H-7), 6.09 (1 H, d, *J* = 14.2 Hz, $PhCH_2$), 5.45 (1 H, d, *J* = 14.2 Hz, $PhCH_2$), 4.50 (2 H, m, H-3), 3.96 (3 H, s, OMe), 3.88 (3 H, s, OMe), 3.74 (3 H, s, OMe), 3.66 (1 H, m, H-4), 3.16 (1 H, m, H-4)	161.2 (q), 157.3 (q), 148.9 (q), 135.2 (q), 135.1 (q), 133.3 (q), 133.1 (q), 132.7 (q), 132.5 (q), 132.2 (CH), 130.6 (CH), 130.4 (q), 130.3 (CH), 129.9 (2 × CH), 129.6 (CH), 129.4 (CH), 129.2 (CH), 129.1 (2 × CH), 129.0 (CH), 128.8 (CH), 128.2 (2 × CH), 127.3 (q), 115.5 (2 × CH), 115.2 (CH), 113.3 (CH), 110.9 (CH), 60.6 (CH_2), 56.9 (CH_3), 56.2 (CH_3), 55.6 (CH_3), 49.3 (CH_2), 26.1 (CH_2)
4m	2937, 2780, 1743, 1597, 1517, 1466, 1341, 1268, 1140, 1024	8.19 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-3′ and 5′H), 7.78 (1 H, s, H-2′), 7.68 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-2′ and 6′H), 7.03 (1 H, s, $Ar^{1'}$-2′H), 6.92 (2 H, m, $Ar^{1'}$-5′ and 6′H), 6.89 (1 H, s, H-8), 6.83 (1 H, s, H-5), 5.72 (1 H, d, *J* = 17.7 Hz, NCH_2), 5.01 (1 H, d, *J* = 17.7 Hz, NCH_2), 4.67 (1 H, m, H-3), 4.56 (1 H, m, H-3), 4.00 (3 H, s, OMe), 3.98 (3 H, s, OMe), 3.91 (3 H, s, OMe), 3.87 (2 H, q, *J* = 7.0 Hz, OCH_2), 3.63 (3 H, s, OMe), 3.49 (1 H, m, H-4), 3.37 (1 H, m, H-4), 1.06 (3 H, t, *J* = 7.0 Hz, CH_3)	174.4 (q), 172.0 (q), 158.3 (q), 151.2 (q), 150.1 (q), 148.9 (q), 147.6 (q), 140.9 (q), 139.8 (q), 132.8 (q), 129.9 (2 × CH), 127.0 (q), 124.4 (2 × CH), 120.5 (q), 117.6 (CH), 113.6 (CH), 113.5 (CH), 111.7 (CH), 111.2 (CH), 108.9 (CH), 62.4 (CH_2), 59.5 (CH_2), 56.6 (CH_3), 56.4 (CH_3), 56.3 (CH_3), 55.9 (CH_3), 52.8 (CH_2), 26.2 (CH_2), 13.7 (CH_3)
4n	2937, 2850, 1602, 1555, 1520, 1468, 1393, 1344, 1297, 1264, 1220, 1154, 1017	8.19 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-3′ and 5′H), 7.83 (1 H, s, H-2′), 7.67 (2 H, d, *J* = 8.8 Hz, $Ar^{2'}$-2′ and 6′H), 7.28 (3 H, m, Ph-H), 7.17 (2 H, t, *J* = 7.8 Hz, Ph-H), 7.01 (1 H, d, *J* = 8.3 Hz, $Ar^{1'}$-6′H), 6.99 (1 H, s, $Ar^{1'}$-2′H), 6.97 (1 H, d, *J* = 8.3 Hz, $Ar^{1'}$-5′H), 6.92 (1 H, s, H-8), 6.90 (1 H, s, H-5), 5.99 (1 H, d, *J* = 14.0 Hz, NCH_2), 5.37 (1 H, d, *J* = 14.0 Hz, NCH_2), 4.58 (1 H, m, H-3), 4.02 (3 H, s, OMe), 3.98 (3 H, s, OMe), 3.95 (3 H, s, OMe), 3.92 (1 H, m, H-3), 3.80 (1 H, m, H-4), 3.63 (3 H, s, OMe), 3.27 (1 H, m, H-4)	172.6 (q), 157.8 (q), 151.5 (q), 150.5 (q), 149.0 (q), 147.5 (q), 140.0 (q), 135.2 (q), 133.7 (q), 131.9 (q), 130.4 (q), 130.0 (2 × CH), 129.7 (2 × CH), 129.5 (CH), 129.1 (2 × CH), 128.3 (q), 124.7 (2 × CH), 120.5 (CH), 117.8 (CH), 113.5 (CH), 111.9 (CH), 111.2 (CH), 109.0 (CH), 60.7 (CH_2), 57.0 (CH_3), 56.8 (CH_3), 56.3 (CH_3), 56.2 (CH_3), 49.3 (CH_2), 26.2 (CH_2)
4o	2938, 2815, 1740, 1601, 1551, 1518, 1465, 1391, 1339, 1269, 1219, 1021	7.57 (1 H, s, H-2′), 7.34 (4 H, s, $Ar^{2'}$-H), 6.96 (2 H, m, $Ar^{1'}$-5′ and 6′H), 6.92 (1 H, d, *J* = 2.0 Hz, $Ar^{1'}$-2′H), 6.90 (2 H, s, H-5 and H-8), 5.62 (1 H, d, *J* = 17.5 Hz, NCH_2), 5.14 (1 H, d, *J* = 17.5 Hz, NCH_2), 4.65 (1 H, m, H-3), 4.61 (1 H, m, H-3), 4.02 (3 H, s, OMe), 3.96 (3 H, s, OMe), 3.89 (3 H, s, OMe), 3.86 (2 H, q, *J* = 7.1 Hz, OCH_2), 3.77 (1 H, m, H-4), 3.63 (3 H, s, OMe), 3.45 (1 H, m, H-4), 1.08 (3 H, t, *J* = 7.1 Hz, CH_3)	174.9 (q), 165.1 (q), 157.9 (q), 150.7 (q), 149.8 (q), 148.8 (q), 135.9 (q), 135.8 (q), 134.3 (q), 132.1 (q), 130.6 (CH), 130.2 (2 × CH), 129.6 (2 × CH), 128.3 (q), 120.1 (CH), 117.8 (q), 113.8 (CH), 111.8 (CH), 111.1 (CH), 108.8 (CH), 62.2 (CH_2), 59.2 (CH_2), 57.0 (CH_3), 56.4 (CH_3), 56.2 (CH_3), 56.0 (CH_3), 52.7 (CH_2), 26.2 (CH_2), 13.7 (CH_3)
4p	2951, 2939, 2820, 1604, 1556, 1513, 1467, 1392, 1339, 1296, 1263, 1220, 1153, 1103, 1016	7.73 (1 H, s, H-2′), 7.35 (4 H, s, $Ar^{2'}$-H), 7.26 (1 H, t, *J* = 7.4 Hz, Ph-4′H), 7.21 (1 H, s, H-8), 7.18 (2 H, t, *J* = 7.4 Hz, Ph-3′ and 5′H), 6.98 (6 H, m, $Ar^{1'}$-H, H-5, Ph-2′ and 6′H), 5.66 (1 H, d, *J* = 14.2 Hz, NCH_2), 4.39 (1 H, d, *J* = 14.2 Hz, NCH_2), 4.36 (1 H, m, H-3), 4.07 (1 H, m, H-3), 4.00 (6 H, s, 2 × OMe), 3.92 (3 H, s, OMe), 3.64 (3 H, s, OMe), 3.62 (1 H, m, H-4), 3.39 (1 H, m, H-4);	173.2 (q), 157.5 (q), 150.8 (q), 150.1 (q), 148.8 (q), 135.3 (q), 134.8 (q), 132.6 (q), 132.4 (q), 130.6 (q), 130.5 (q), 130.0 (2 × CH), 129.9 (2 × CH), 129.7 (2 × CH), 129.2 (CH), 129.0 (CH), 128.9 (2 × CH), 120.0 (CH), 117.9 (q), 113.5 (CH), 111.8 (CH), 111.2 (CH), 108.6 (CH), 60.4 (CH_2), 56.9 (CH_3), 56.6 (CH_3), 56.2 (CH_3), 56.0 (CH_3), 49.1 (CH_2), 26.0 (CH_2)

Table 6 Spectral Data of Compounds **5a–i**

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ(ppm)]
5a	2933, 2782, 1745, 1608, 1515, 1491, 1464, 1387, 1347, 1246, 1222, 1162, 1112, 1035	7.32 (1 H, d, *J* = 7.5 Hz, $Ar^{2'}$-6′H), 7.19 (5 H, m, Ph-H), 7.12 (1 H, t, *J* = 7.5 Hz, $Ar^{2'}$-4′H), 6.85 (1 H, t, *J* = 7.5 Hz, $Ar^{2'}$-5′H), 6.80 (1 H, s, H-10), 6.75 (1 H, t, *J* = 7.5 Hz, $Ar^{2'}$-3′H), 6.60 (1 H, s, H-7), 5.04 (1 H, d, *J* = 9.9 Hz, H-3), 4.22 (2 H, m, OCH_2), 3.90 (1 H, d, *J* = 9.9 Hz, H-2), 3.84 (3 H, s, OMe), 3.70 (3 H, s, OMe), 3.35 (1 H, m, H-5), 3.26 (3 H, s, OMe), 3.22 (1 H, m, H-5), 3.01 (1 H, m, H-6), 2.85 (1 H, m, H-6), 1.24 (3 H, t, *J* = 7.1 Hz, OCH_2CH_3)	172.7 (q), 157.7 (q), 148.6 (q), 146.5 (q), 139.3 (q), 137.8 (q), 130.1 (q), 130.0 (2 × CH), 129.8 (CH), 128.2 (q), 128.1 (2 × CH), 128.0 (CH), 127.7 (CH), 126.1 (CH), 121.0 (q), 120.5 (CH), 112.4 (q), 110.6 (CH), 109.5 (CH), 73.4 (CH), 60.8 (CH_2), 55.7 (CH_3), 55.3 (CH_3), 54.9 (CH_3), 47.6 (CH), 29.9 (CH_2), 14.2 (CH_3)
5b	3060, 2940, 2810, 1608, 1515, 1491, 1462, 1451, 1422, 1385, 1342, 1267, 1243, 1218, 1159, 1094, 1022	7.37 (2 H, d, *J* = 7.0 Hz, Ph-H), 7.25 (6 H, m, Ph-H), 7.16 (2 H, t, *J* = 7.0 Hz, Ph-H), 7.08 (1 H, d, *J* = 8.0 Hz, $Ar^{2'}$-6′H), 7.04 (1 H, t, *J* = 8.0 Hz, $Ar^{2'}$-4′H), 6.94 (1 H, s, H-10), 6.86 (1 H, t, *J* = 8.0 Hz, $Ar^{2'}$-5′H), 6.67 (1 H, d, *J* = 8.0 Hz, $Ar^{2'}$-3′H), 6.62 (1 H, s, H-7), 4.82 (1 H, d, *J* = 9.8 Hz, H-2), 4.19 (1 H, d, *J* = 9.8 Hz, H-3), 3.85 (3 H, s, OMe), 3.37 (3 H, s, OMe), 3.29 (3 H, s, OMe), 3.11 (2 H, m, H-5), 2.84 (2 H, m, H-6)	158.0 (q), 148.6 (q), 146.6 (q), 142.2 (q), 138.6 (q), 130.0 (2 × CH), 129.9 (q), 128.3 (q), 128.1 (CH), 128.07 (2 × CH), 128.05 (2 × CH), 127.4 (2 × CH), 127.3 (q), 127.2 (CH), 127.1 (CH), 126.7 (q), 125.8 (CH), 121.4 (q), 120.5 (CH), 112.8 (q), 111.0 (CH), 110.7 (CH), 109.5 (CH), 76.5 (CH), 55.8 (CH_3), 55.3 (CH_3), 55.0 (CH_3), 54.8 (CH), 46.6 (CH_2), 30.0 (CH_2)
5c	2994, 2951, 2934, 2905, 2833, 1621, 1567, 1513, 1464, 1439, 1422, 1384, 1350, 1339, 1311, 1267, 1239, 1220, 1204, 1182, 1154, 1067	7.35 (1 H, s, $Ar^{2'}$-2′H), 7.29 (6 H, m, Ph-H), 7.19 (4 H, m, Ph-H), 7.08 (1 H, t, *J* = 6.8 Hz, $Ar^{2'}$-5′H), 7.03 (2 H, m, $Ar^{2'}$-4′ and 6′H), 6.86 (1 H, s, H-10), 6.62 (1 H, s, H-7), 4.18 and 4.14 (2 H, 2 × d, *J* = 11.3 Hz, H-2 and H-3), 3.85 (3 H, s, OMe), 3.27 (3 H, s, OMe), 3.18 (1 H, m, H-5), 3.07 (1 H, m, H-5), 2.87 (1 H, m, H-6), 2.80 (1 H, m, H-6)	148.8 (q), 146.7 (q), 144.8 (q), 141.1 (q), 141.0 (q), 138.1 (q), 132.1 (q), 130.2 (CH), 129.6 (CH), 129.5 (CH), 128.41 (2 × CH), 128.39 (2 × CH), 128.3 (q), 128.0 (CH), 127.5 (CH), 127.33 (2 × CH), 127.31 (2 × CH), 126.29 (CH), 122.1 (q), 120.8 (q), 110.6 (CH), 109.4 (CH), 63.5 (CH), 55.7 (CH_3), 55.0 (CH_3), 46.7 (CH_2), 29.9 (CH_2)
5d	2998, 2955, 2925, 2823, 1607, 1515, 1490, 1459, 1439, 1421, 1410, 1384, 1358, 1339, 1308, 1266, 1231, 1221, 1191, 1152, 1096, 1063, 1039, 1020, 1012	7.29 (5 H, m, Ph-H), 7.19 (5 H, m, Ph-H), 7.14 (2 H, d, *J* = 8.1 Hz, Ar^2-3 and 5′H), 7.08 (2 H, d, *J* = 8.1 Hz, Ar^2-2 and 6′H), 6.87 (1 H, s, H-10), 6.62 (1 H, s, H-7), 4.20 (1 H, d, *J* = 11.5 Hz, H-3), 4.09 (1 H, d, *J* = 11.5 Hz, H-2), 3.85 (3 H, s, OMe), 3.27 (3 H, s, OMe), 3.18 (1 H, m, H-5), 3.08 (1 H, m, H-5), 2.86 (1 H, m, H-6), 2.80 (1 H, m, H-6)	148.8 (q), 146.7 (q), 141.1 (q), 141.0 (q), 140.7 (q), 138.2 (q), 132.0 (q), 130.5 (2 × CH), 130.2 (2 × CH), 128.4 (2 × CH), 128.3 (2 × CH), 128.25 (q), 128.2 (2 × CH), 127.5 (CH), 127.4 (2 × CH), 126.3 (q), 120.9 (q), 112.1 (q), 110.6 (CH), 109.4 (CH), 78.7 (CH), 63.3 (CH), 55.8 (CH_3), 55.0 (CH_3), 46.9 (CH_2), 29.8 (CH_2)
5e[a]	3155, 2910, 2850, 1604, 1559, 1524, 1453, 1388, 1289, 1222, 1172, 1048	7.81 (1 H, s, H-10), 7.72 (2 H, d, *J* = 7.2 Hz, Ph-H), 7.50 (3 H, m, Ph-H), 7.33 (1 H, s, H-7), 7.31 (1 H, d, *J* = 7.2 Hz, $Ar^{2'}$-6′H), 7.26 (5 H, m, Ph-H), 7.07 (1 H, t, *J* = 7.2 Hz, $Ar^{2'}$-5′H), 6.88 (1 H, t, *J* = 7.2 Hz, $Ar^{2'}$-4′H), 6.83 (1 H, d, *J* = 7.2 Hz, $Ar^{2'}$-3′H), 6.19 (1 H, d, *J* = 10.2 Hz, H-2), 5.13 (1 H, d, *J* = 10.2 Hz, H-3), 4.13 (1 H, m, H-5), 3.93 (3 H, s, OMe), 3.65 (2 H, m, H-5), 3.32 (3 H, s, OMe), 3.31 (1 H, m, H-6), 3.26 (2 H, m, H-6)	175.9 (q), 157.0 (q), 147.5 (q), 137.1 (q), 135.6 (q), 135.0 (q), 134.2 (CH), 130.2 (CH), 130.2 (q), 129.7 (4 × CH), 129.65 (4 × CH), 129.2 (CH), 129.0 (CH), 128.8 (CH), 128.7 (q), 126.5 (q), 125.2 (CH), 113.8 (q), 112.8 (CH), 112.1 (CH), 72.8 (CH), 60.0 (CH), 56.7 (CH_3), 55.8 (CH_3), 44.5 (CH_2), 25.5 (CH_2)
5f	2997, 2957, 2834, 1738, 1683, 1605, 1507, 1489, 1465, 1442, 1422, 1387, 1267, 1243, 1220, 1174, 1105, 1081, 1066, 1012	7.21 (4 H, s, $Ar^{2'}$-H), 7.04 (2 H, d, *J* =8.6 Hz, $Ar^{2'}$-2′ and 6′H), 6.77 (1 H, s, H-10), 6.75 (2 H, d, *J* = 8.6 Hz, $Ar^{2'}$-3′ and 5′H), 6.60 (1 H, s, H-7), 4.49 (1 H, d, *J* = 10.5 Hz, H-3), 4.23 (2 H, m, OCH_2), 3.84 (3 H, s, OMe), 3.76 (1 H, d, *J* = 10.5 Hz, H-2), 3.71 (3 H, s, OMe), 3.43 (1 H, m, H-5), 3.29 (3 H, s, OMe), 3.25 (1 H, m, H-5), 2.96 (1 H, m, H-6), 2.85 (1 H, m, H-6), 1.25 (3 H, t, *J* = 7.2 Hz, OCH_2CH_3)	172.0 (q), 158.2 (q), 148.8 (q), 146.6 (q), 140.8 (q), 139.8 (q), 132.2 (q), 132.0 (q), 131.3 (2 × CH), 130.2 (2 × CH), 128.4 (2 × CH), 128.1 (q), 127.2 (q), 120.6 (q), 113.9 (2 × CH), 110.5 (CH), 109.3 (CH), 74.6 (CH), 61.1 (CH_2), 57.1 (CH_2), 55.7 (CH_3), 55.1 (CH_3), 55.0 (CH_3), 48.0 (CH), 29.8 (CH_2), 14.2 (CH_3)
5g	3107, 2950, 2812, 1608, 1561, 1515, 1496, 1460, 1387, 1336, 1289, 1251, 1223, 1173, 1092, 1049	7.55 (1 H, s, H-10), 7.39 (5 H, m, Ph-H), 6.98 (2 H, d, *J* = 8.8 Hz, Ar^1-2′ and 6′H), 6.96 (2 H, d, *J* = 8.4 Hz, Ar^2-3′ and 5′H), 6.87 (2 H, d, *J* = 8.4 Hz, Ar^2-2 and 6′H), 6.77 (1 H, s, H-7), 6.75 (2 H, d, *J* = 8.8 Hz, Ar^1-3′ and 5′H), 5.46 (1 H, d, *J* = 10.6 Hz, H-3), 5.31 (1 H, d, *J* = 10.6 Hz, H-2), 3.93 (3 H, s, OMe), 3.88 (1 H, m, H-5), 3.79 (1 H, m, H-5), 3.72 (3 H, s, OMe), 3.58 (3 H, s, OMe), 3.58 (1 H, m, H-6), 3.07 (1 H, m, H-6)	179.2 (q), 159.6 (q), 157.0 (q), 148.3 (q), 134.1 (q), 133.5 (q), 133.2 (q), 130.5 (2 × CH), 130.2 (q), 130.1 (2 × CH), 129.8 (3 × CH), 128.6 (q), 128.1 (2 × CH), 126.3 (2 × CH), 115.6 (q), 114.1 (2 × CH), 113.8 (CH), 110.6 (CH), 86.4 (q), 73.6 (CH), 63.5 (CH), 56.5 (CH_3),56.0 (CH_3), 55.2 (CH_3), 44.1 (CH_2), 26.3 (CH_2)

Table 6 Spectral Data of Compounds **5a–i** (continued)

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ(ppm)]
5h	3161, 2941, 2837, 1627, 1605, 1553, 1516, 1462, 1387, 1332, 1290, 1250, 1221, 1176, 1037, 1023	7.53 (1 H, d, *J* = 7.4 Hz, $Ar^{2'}$-6′H), 7.24 (2 H, d, *J* = 8.9 Hz, $Ar^{1'}$-2′ and 6′H), 7.16 (2 H, m, Ph-2′ and 6′H), 7.12 (1 H, s, H-10), 7.07 (4 H, m, Ph-3′, 4′, 5′H and $Ar^{2'}$-5′H), 6.89 (2 H, m, $Ar^{2'}$-3′ and 4′H), 6.78 (2 H, d, *J* = 8.9 Hz, $Ar^{1'}$-3′ and 5′H), 6.66 (1 H, s, H-7), 4.98 (1 H, d, *J* = 10.0 Hz, H-2), 4.70 (1 H, d, *J* = 10.0 Hz, H-3), 3.88 (3 H, s, OMe), 3.73 (3 H, s, OMe), 3.39 (3 H, s, OMe), 3.20 (1 H, ddd, *J* = 14.0, 10.4, 5.4 Hz, H-6), 3.09 (1 H, ddd, *J* = 11.0, 5.4, 3.0 Hz, H-5), 2.75 (1 H, ddd, *J* = 14.0, 11.0, 3.0 Hz, H-6), 2.64 (1 H, ddd, *J* = 11.0, 10.4, 3.0 Hz, H-5)	158.1 (q), 148.8 (q), 146.7 (q), 141.9 (q), 137.7 (q), 136.5 (q), 134.2 (q), 131.8 (q), 131.5 (CH), 131.0 (2 × CH), 128.9 (q), 128.7 (CH), 128.4 (2 × CH), 127.4 (CH), 127.3 (2 × CH), 126.8 (CH), 125.9 (CH), 121.0 (q), 114.0 (q), 113.8 (2 × CH), 110.7 (CH), 109.5 (CH), 73.6 (CH), 55.8 (CH_3), 55.2 (2 × CH_3), 54.3 (CH), 46.1 (CH_2), 30.2 (CH_2)
5i	2934, 2833, 2677, 1627, 1602, 1556, 1513, 1494, 1462, 1387, 1358, 1311, 1291, 1269, 1179, 1167, 1016	7.58 (1 H, s, H-7), 7.39 (3 H, m, Ph-H), 7.02 (2 H, d, *J* = 8.6 Hz, Ar^2-3 and 5′H), 6.90 (2 H, d, *J* = 8.6 Hz, Ar^2-2 and 6′H), 6.83 (1 H, s, H-10), 6.72 (1 H, d, *J* = 8.3 Hz, Ar^1-5′H), 6.60 (1 H, d, *J* = 2.1 Hz, Ar^1-3′H), 6.40 (2 H, dd, *J* = 8.3 and 2.1 Hz, Ar^1-6′H), 5.41 (1 H, d, *J* = 10.6 Hz, H-2), 5.33 (1 H, d, *J* = 10.6 Hz, H-3), 3.95 (3 H, s, OMe), 3.79 (3 H, s, OMe), 3.62 (3 H, s, OMe), 3.55 (3 H, s, OMe), 3.75 (2 H, m, H-5), 3.15 (2 H, m, H-6)	178.9 (q), 157.1 (q), 149.5 (q), 149.1 (q), 148.2 (q), 134.1 (q), 133.6 (q), 133.0 (q), 130.5 (q), 130.1 (6 × CH), 129.8 (CH), 129.5 (q), 128.9 (q), 128.1 (2 × CH), 116.3 (CH), 115.6 (q), 113.8 (CH), 110.7 (CH), 110.1 (CH), 109.6 (CH), 73.2 (CH), 63.5 (CH), 56.5 (CH_3), 56.0 (CH_3), 55.8 (CH_3), 55.7 (CH_3), 44.1 (CH_2), 26.3 (CH_2)

[a] Both ^1H NMR and ^{13}C NMR recorded in DMSO-d_6.

Table 7 Spectral Data of Compounds **6a–j**

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
6a	3073, 2989, 2930, 2832, 1682, 1602, 1545, 1510, 1484, 1465, 1433, 1415, 1398, 1383, 1343, 1263, 1241, 1197, 1174, 1136, 1097, 1064	7.18 (6 H, m, Ph-H and $Ar^{2'}$-4′H), 7.00 (1 H, d, *J* = 8.1 Hz, $Ar^{2'}$-6′H), 6.78 (1 H, t, *J* = 8.1 Hz, $Ar^{2'}$-5′H), 6.73 (1 H, d, *J* = 8.1 Hz, $Ar^{2'}$-3′H), 6.71 (1 H, s, H-10), 6.54 (1 H, s, H-7), 4.64 (2 H, t, *J* = 6.6 Hz, H-5), 4.02 (2 H, q, *J* = 7.2 Hz, OCH_2), 3.86 (3 H, s, OMe), 3.58 (3 H, s, OMe), 3.27 (3 H, s, OMe), 3.06 (2 H, t, *J* = 6.6 Hz, H-6), 0.89 (3 H, t, *J* = 7.2 Hz, CH_2CH_3)	161.9 (q), 157.2 (q), 147.8 (q), 147.1 (q), 135.9 (q), 132.0 (CH), 130.9 (q), 130.7 (2 × CH), 128.6 (q), 127.9 (2 × CH), 127.8 (CH), 126.3 (CH), 125.7 (CH), 125.0 (q), 121.9 (q), 121.0 (q), 119.6 (CH), 118.9 (q), 110.6 (q), 110.1 (CH), 108.7 (CH), 59.5 (CH_2), 55.8 (CH_3), 55.3 (CH_3), 55.0 (CH_3), 42.7 (CH_2), 29.0 (CH_2), 13.6 (CH_3)
6b	2993, 2956, 2831, 1682, 1597, 1542, 1509, 1481, 1393, 1339, 1265, 1242, 1214, 1203, 1178, 1141, 1089	7.38 (1 H, s, $Ar^{2'}$-2′H), 7.26 (3 H, m Ph-H), 7.17 (3 H, m, Ph-H and $Ar^{2'}$-4′H), 7.01 (1 H, t, *J* = 7.6 Hz, $Ar^{2'}$-5′H), 6.99 (1 H, d, *J* = 7.6 Hz, $Ar^{2'}$-6′H), 4.66 (2 H, t, *J* = 6.7 Hz, H-5), 4.08 (2 H, q, *J* = 7.1 Hz, OCH_2), 3.87 (3 H, s, OMe), 3.26 (3 H, s, OMe), 3.06 (2 H, t, *J* = 6.7 Hz, H-6), 0.98 (3 H, t, *J* = 7.1 Hz, CH_2CH_3)	161.6 (q), 148.1 (q), 147.2 (q), 137.8 (q), 135.1 (q), 133.9 (CH), 131.2 (2 × CH), 131.1 (q), 129.1 (CH), 129.0 (CH), 128.5 (CH), 128.3 (2 × CH), 126.8 (CH), 125.9 (2 × q), 121.7 (q), 120.9 (q), 120.6 (q), 118.3 (q), 110.6 (CH), 108.6 (CH), 59.8 (CH_2), 55.9 (CH_3), 55.0 (CH_3), 42.8 (CH_2), 29.0 (CH_2), 13.6 (CH_3)
6c	3047, 2998, 2937, 2837, 1593, 1546, 1509, 1494, 1482, 1464, 1441, 1406, 1371, 1337, 1299, 1260, 1225, 1208, 1165, 1110, 1070, 1040, 1024	7.26 (10 H, m, Ph-H), 7.15 (1 H, d, *J* = 7.8 Hz, $Ar^{2'}$-4′H), 7.02 (1 H, s, $Ar^{2'}$-2′H), 6.87 (1 H, t, *J* = 7.8 Hz, $Ar^{2'}$-5′H), 6.81 (1 H, d, *J* = 7.8 Hz, $Ar^{2'}$-6′H), 6.70 (1 H, s, H-10), 6.54 (1 H, s, H-7), 4.03 (2 H, t, *J* = 6.5 Hz, H-5), 3.85 (3 H, s, OMe), 3.32 (3 H, s, OMe), 2.96 (2 H, t, *J* = 6.5 Hz, H-6)	147.3 (q), 146.9 (q), 137.5 (q), 136.0 (q), 133.4 (q), 131.4 (q), 131.2 (2 × CH), 131.0 (2 × CH), 130.1 (q),129.9 (q),129.2 (CH), 128.9 (CH), 128.4 (2 × CH), 128.2 (2 × CH), 128.0 (CH), 127.4 (CH), 126.4 (CH), 125.8 (q), 124.7 (CH), 122.1 (q), 121.4 (q), 119.8 (q), 110.8 (CH), 108.0 (CH), 55.8 (CH_3), 55.0 (CH_3), 42.4 (CH_2), 28.5 (CH_2)
6d	2974, 2837, 2879, 2831, 1688, 1606, 1547, 1512, 1490, 1461, 1414, 1404, 1384, 1263, 1240, 1220, 1212, 1200, 1176, 1139, 1111, 1091, 1059, 1016	7.25 (3 H, m, Ph-H), 7.14 (4 H, m, Ph-H, $Ar^{2'}$-3′ and 5′H), 7.06 (2H, d, *J* = 8.4 Hz, $Ar^{2'}$-2′ and 6′H), 6.72 (1 H, s, H-10), 6.47 (1 H, s, H-7), 4.65 (2 H, t, *J* = 6.6 Hz, H-5), 4.06 (2 H, q, *J* = 7.1 Hz, OCH_2), 3.87 (3 H, s, OMe), 3.25 (3 H, s, OMe), 3.06 (2 H, t, *J* = 6.6 Hz, H-6), 0.97 (3 H, t, *J* = 7.1 Hz, CH_2CH_3)	161.7 (q), 148.1 (q), 147.2 (q), 135.3 (q), 134.2 (q), 132.1 (q), 132.0 (2 × CH), 131.9 (q), 131.6 (q), 131.2 (2 × CH), 128.3 (2 × CH), 127.2 (2 × CH), 126.7 (CH), 125.9 (q), 121.7 (q), 120.6 (q), 118.3 (q), 110.6 (CH), 108.7 (CH), 59.8 (CH_2), 55.9 (CH_3), 55.0 (CH_3), 42.9 (CH_2), 29.1 (CH_2), 13.7 (CH_3)

Table 7 Spectral Data of Compounds **6a–j** (continued)

Product	IR (KBr; cm^{-1})	^1H NMR [$CDCl_3$/TMS; δ (ppm), *J* (Hz)]	^{13}C NMR [$CDCl_3$/TMS; δ (ppm)]
6e	2980, 2900, 2870, 1681, 1603, 1544, 1511, 1485, 1461, 1417, 1400, 1343, 1253, 1216, 1179, 1139, 1115, 1068	7.31 (1 H, d, *J* = 7.7 Hz, $Ar^{2'}$-6′H), 7.21 (4 H, m, Ph-H and $Ar^{2'}$-H), 7.15 (1 H, m, $Ar^{2'}$-H), 7.10 (1 H, m, $Ar^{2'}$-H), 7.05 (2 H, m, Ph-H), 6.72 (1 H, s, H-10), 6.52 (1 H, s, H-7), 4.86 (1 H, m, H-5), 4.51 (1 H, m, H-5), 4.05 (1 H, m, OCH_2), 3.96 (1 H, m, OCH_2), 3.86 (3 H, s, OMe), 3.27 (3 H, s, OMe), 3.12 (1 H, m, H-6), 3.05 (1 H, m, H-6), 0.85 (3 H, t, *J* = 7.2 Hz, CH_2CH_3)	161.5 (q), 148.0 (q), 147.2 (q), 135.5 (q), 135.3 (q), 134.7 (q), 131.9 (CH), 131.2 (q), 130.8 (2 × CH), 129.8 (q), 128.4 (2 × CH), 128.1 (CH), 127.8 (CH), 126.6 (CH), 125.8 (q), 125.6 (CH), 121.7 (q), 120.8 (q), 118.6 (q), 110.7 (CH), 108.6 (CH), 59.6 (CH_2), 55.9 (CH_3), 55.0 (CH_3), 42.8 (CH_2), 29.0 (CH_2), 13.4 (CH_3)
6f	2994, 2935, 2842, 1684, 1612, 1542, 1521, 1488, 1421, 1398, 1333, 1285, 1264, 1248, 1221, 1198, 1175, 1143, 1066, 1030	7.16 (2 H, d, *J* = 7.9 Hz, $Ar^{1'}$-3′ and 5′H), 7.06 (2 H, d, *J* = 8.1 Hz, $Ar^{2'}$-3′ and 5′H), 7.04 (2 H, d, *J* = 8.1 Hz, $Ar^{2'}$-2′ and 6′H), 6.79 (2 H, d, *J* = 8.4 Hz, $Ar^{1'}$-2′ and 6′H), 6.72 (1 H, s, H-10), 6.55 (1 H, s, H-7), 4.63 (2 H, t, *J* = 6.8 Hz, H-5), 4.07 (2 H, q, *J* = 6.5 Hz, OCH_2), 3.87 (3 H, s, OMe), 3.76 (3 H, s, OMe), 3.21 (3 H, s, OMe), 3.05 (2 H, t, *J* = 6.8 Hz, H-6), 0.98 (3 H, t, *J* = 6.5 Hz, CH_2CH_3)	161.8 (q), 158.4 (q), 148.1 (q), 147.2 (q), 134.3 (q), 132.2 (2 × CH), 132.0 (2 × CH), 131.7 (q), 131.3 (q), 127.3 (q), 127.2 (2 × CH), 125.9 (q), 121.3 (q),120.8 (q), 118.2 (q), 113.8 (2 × CH), 110.6 (CH), 108.6 (CH), 59.8 (CH_2), 55.9 (CH_3), 55.2 (CH_3), 55.1 (CH_3), 42.8 (CH_2), 29.1 (CH_2), 13.7 (CH_3)
6g	2987, 2932, 2903, 2866, 2830, 1675, 1547, 1519, 1487, 1460, 1437, 1416, 1398, 1289, 1249, 1216, 1198, 1178, 1140, 1114	7.30 (1 H, d, *J* = 7.9 Hz, $Ar^{2'}$-6′H), 7.09 (5 H, m, $Ar^{2'}$-3′, 4′, 5′H, $Ar^{1'}$-2′ and 6′H), 6.76 (2 H, d, *J* = 8.2 Hz, $Ar^{1'}$-3′ and 5′H), 6.72 (1 H, s, H-10), 6.59 (1 H, s, H-7), 4.84 (1 H, br m, Hz, H-5), 4.52 (1 H, br m, Hz, H-5), 4.05 (1 H, br m, OCH_2), 3.97 (1 H, br m, OCH_2), 3.88 (3 H, s, OMe), 3.73 (3 H, s, OMe), 3.33 (3 H, s, OMe), 3.07 (2 H, br m, H-6), 0.85 (3 H, br m, CH_2CH_3)	161.6 (q), 158.4 (q), 148.0 (q), 147.2 (q), 135.7 (q), 134.7 (q), 132.0 (CH), 131.8 (2 × CH), 131.2 (q), 130.0 (q), 128.4 (CH), 127.7 (CH), 127.4 (q), 125.8 (q), 125.7 (CH), 121.3 (q), 120.9 (q), 118.5 (q), 113.6 (2 × CH), 110.7 (CH), 108.6 (CH), 59.6 (CH_2), 55.9 (CH_3), 55.15 (CH_3), 55.1 (CH_3), 42.8 (CH_2), 29.0 (CH_2), 13.4 (CH_3)
6h	2939, 2840, 1694, 1594, 1547, 1513, 1497, 1442, 1396, 1340, 1238, 1213, 1181, 1136, 1067, 1020	8.07 (2 H, d, *J* = 8.4 Hz, $Ar^{2'}$-3′ and 5′H), 7.31 (2 H, d, *J* = 8.4 Hz, $Ar^{2'}$-2′ and 6′H), 6.76 (1 H, d, *J* = 8.1 Hz, $Ar^{1'}$-6′H), 6.74 (1 H, s, $Ar^{1'}$-2′H), 6.69 (1 H, d, *J* = 8.1 Hz, $Ar^{1'}$-5′H), 6.63 (1 H, s, H-10), 6.62 (1 H, s, H-7), 4.67 (2 H, t, *J* = 5.9 Hz, H-5), 4.08 (2 H, q, *J* = 7.0 Hz, OCH_2), 3.89 (3 H, s, OMe), 3.83 (3 H, s, OMe), 3.63 (3 H, s, OMe), 3.34 (3 H, s, OMe), 3.08 (2 H, t, *J* = 5.9 Hz, H-6), 0.96 (3 H, t, *J* = 7.0 Hz, CH_2CH_3)	161.3 (q), 148.8 (q), 148.4 (q), 148.1 (q), 147.3 (q), 146.3 (q), 143.5 (q), 131.5 (2 × CH), 131.5 (q), 130.6 (q), 127.0 (q), 126.0 (q), 123.4 (CH), 122.3 (2 × CH), 121.3 (q), 120.4 (q), 114.1 (CH), 111.2 (CH), 110.7 (CH), 108.6 (CH), 60.0 (CH_2), 55.9 (CH_3), 55.8 (2 × CH_3), 55.2 (CH_3), 42.9 (CH_2), 29.0 (CH_2), 13.7 (CH_3)
6i	2940, 2835, 1592, 1552, 1514, 1497, 1459, 1443, 1341, 1264, 1250, 1229, 1210, 1164, 1137, 1114, 1023	7.88 (2 H, d, *J* = 9.0 Hz, $Ar^{2'}$-3′ and 5′H), 7.37 (3 H, m Ph-H), 7.22 (2 H, m Ph-H), 7.01 (2 H, d, *J* = 9.0 Hz, $Ar^{2'}$-2′ and 6′H), 6.85 (1 H, d, *J* = 8.2 Hz, $Ar^{1'}$-6′H), 6.75 (2 H, m, $Ar^{1'}$-2′ and 5′H), 6.73 (1 H, s, H-10), 6.66 (1 H, s, H-7), 4.04 (2 H, t, *J* = 6.7 Hz, H-5), 3.89 (3 H, s, OMe), 3.88 (3 H, s, OMe), 3.67 (3 H, s, OMe), 3.40 (3 H, s, OMe), 2.98 (2 H, t, *J* = 6.7 Hz, H-6)	149.0 (q), 147.9 (q), 147.4 (q), 147.2 (q), 145.1 (q), 143.0 (q), 131.1 (q), 131.0 (2 × CH), 130.8 (2 × CH), 128.5 (2 × CH), 128.1 (q), 127.9 (CH), 126.3 (q), 124.8 (q), 123.4 (CH), 122.9 (2 × CH), 121.8 (q), 120.9 (q), 119.4 (q), 114.2 (CH), 111.4 (CH), 110.9 (CH), 108.1 (CH), 55.92 (CH_3), 55.89 (2 × CH_3), 55.3 (CH_3), 42.3 (CH_2), 29.5 (CH_2)
6j	2938, 2834, 1690, 1582, 1547, 1520, 1493, 1464, 1403, 1382, 1318, 1299, 1262, 1251, 1238, 1213, 1173, 1135, 1088, 1060, 1025	7.18 (2 H, d, *J* = 8.7 Hz, $Ar^{2'}$-3′ and 5′H), 7.07 (2 H, d, *J* = 8.7 Hz, $Ar^{2'}$-2′ and 6′H), 6.76 (1 H, d, *J* = 8.3 Hz, $Ar^{1'}$-5′H), 6.73 (1 H, s, H-10), 6.72 (1 H, dd, *J* = 2.1, 8.3 Hz, $Ar^{1'}$-6′H), 6.65 (1 H, s, H-7), 6.59 (1 H, d, *J* = 2.1 Hz, $Ar^{1'}$-2′H), 4.64 (2 H, t, *J* = 6.5 Hz, H-5), 4.07 (2 H, q, *J* = 7.1 Hz, OCH_2), 3.88 (3 H, s, OMe), 3.84 (3 H, s, OMe), 3.63 (3 H, s, OMe), 3.34 (3 H, s, OMe), 3.06 (2 H, t, *J* = 6.5 Hz, H-6), 0.98 (3 H, t, *J* = 7.1 Hz, CH_2CH_3)	161.7 (q), 148.6 (q), 148.1 (q), 147.8 (q), 147.2 (q), 134.4 (q), 132.1 (q), 132.0 (2 × CH), 131.7 (q), 131.1 (q), 127.5 (q), 127.2 (2 × CH), 126.0 (q), 123.5 (CH), 121.3 (q), 120.7 (q), 118.3 (q), 114.3 (CH), 111.0 (CH), 110.7 (CH), 108.7 (CH), 59.8 (CH_2), 55.9 (CH_3), 55.8 (CH_3), 55.75 (CH_3), 55.2 (CH_3), 42.8 (CH_2), 29.1 (CH_2), 13.7 (CH_3)

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