Supporting Information
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Palladium-Catalyzed Regioselective Coupling of Secondary Propargyl Carbonates and Ethyl 2-(pyridin-2-yl)acetate Derivatives: Facile Access to C-3 Benzylated Indolizines

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**General Information:** All reactions were performed under N₂ unless otherwise stated. The solvents were dried before use by standard procedures. ¹H NMR and ¹³C NMR spectra were recorded in CDCl₃ on a 400 MHz or 500 MHz instrument. All ¹H NMR spectra are measured relative to the signals for residual CHCl₃ (7.26 ppm) and all ¹³C NMR spectral data are reported relative to CDCl₃ (77.16 ppm). HRMS data were recorded on a micrOTOF instrument using ESI technique. All column chromatography was performed using silica gel (200-300 microns). Unless otherwise noted, commercially available chemicals were used as received. Propargylic carbonates were synthesized according to literature procedures.

General procedure for synthesis of indolizines from propargyl carbonates and ethyl 2-(pyridin-2-yl)acetate derivatives: Ethyl 2-(pyridin-2-yl)acetate derivatives (I, 0.4 mmol), propargyl carbonates (2, 0.2 mmol), Pd₂(dba)₃ (0.01 mmol), DBFphos (0.02 mmol), K₂CO₃ (0.4 mmol) were mixed under N₂ atmosphere in 2 mL DMF. The reaction tube was heated in an oil bath at 120 °C for 16 hours. After completion of the reaction, the reaction mixture was extracted with EtOAc (15 mL × 3), and the solvent was removed under reduced pressure. The remaining crude product was then purified through column chromatography using silica gel (ethyl acetate/petroleum ether = 1/5) to afford 3a-3r.

**Ethyl 3-benzyl-2-phenylindolizine-1-carboxylate (3a)**

![Chemical Structure](image)

(Eluent: ethyl acetate/petroleum ether = 1/5, v/v); 65% yield (brown oil, 46 mg); ¹H NMR (500 MHz, Chloroform-d) δ 8.24 (dd, ⁹J = 9.2, 1.3 Hz, 1H), 7.53 (d, ⁹J = 7.0 Hz, 1H), 7.32 – 7.23 (m, 5H), 7.15 (t, ⁹J = 7.3 Hz, 2H), 7.10 (t, ⁹J = 7.2 Hz, 1H), 6.99 – 6.93 (m, 3H), 6.54 (td, ⁹J = 6.8, 1.3 Hz, 1H), 4.11 (q, ⁹J = 7.1 Hz, 2H), 4.08 (s, 2H), 1.06 (t, ⁹J = 7.1 Hz, 3H). ¹³C NMR (125 MHz, Chloroform-d) δ 165.2, 137.5, 136.2,
135.4, 131.5, 130.5, 128.9, 127.8, 127.7, 127.1, 126.7, 123.4, 122.2, 121.4, 120.2, 112.6, 102.0, 59.3, 30.2, 14.3. HR-ESI-MS (m/z): calcd. for C$_{24}$H$_{21}$NO$_2$ [M + H]$^+$ 356.1645, found 356.1642.

**Ethyl 3-benzyl-2-(4-chlorophenyl)indolizine-1-carboxylate (3b)**

![Chemical Structure](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 51% yield (brown oil, 40 mg); $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.27 – 8.21 (m, 1H), 7.50 (dt, $J = 7.0$, 1.1 Hz, 1H), 7.28 (s, 5H), 7.12 (d, $J = 8.4$ Hz, 2H), 6.99 (ddd, $J = 9.2$, 6.7, 1.1 Hz, 1H), 6.87 (d, $J = 8.2$ Hz, 2H), 6.57 (td, $J = 6.8$, 1.3 Hz, 1H), 4.11 (q, $J = 7.1$ Hz, 2H), 4.04 (s, 2H), 1.05 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, Chloroform-d) $\delta$ 165.1, 143.4, 136.2, 136.0, 135.2, 132.5, 131.6, 130.6, 130.4, 129.1, 128.5, 127.7, 127.2, 125.5, 123.2, 122.3, 120.8, 120.3, 112.8, 59.3, 29.6, 14.3. HR-ESI-MS (m/z): calcd. for C$_{24}$H$_{20}$ClNO$_2$ [M + H]$^+$ 390.1255, found 390.1257.

**Ethyl 3-benzyl-2-(4-(trifluoromethyl)phenyl)indolizine-1-carboxylate (3c)**

![Chemical Structure](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 34% yield (brown oil, 29 mg); $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.26 (d, $J = 9.1$ Hz, 1H), 7.49 (dt, $J = 7.0$, 1.1 Hz, 1H), 7.43 (d, $J = 8.1$ Hz, 2H), 7.28 (d, $J = 1.1$ Hz, 5H), 7.06 (d, $J = 8.0$ Hz, 2H), 7.01 (ddd, $J = 9.1$, 6.7, 1.1 Hz, 1H), 6.60 (td, $J = 6.8$, 1.3 Hz, 1H), 4.15 (d, $J = 2.0$ Hz, 2H), 4.11 (t, $J = 7.1$ Hz, 2H), 1.06 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, Chloroform-d) $\delta$ 165.1, 141.8, 136.3, 135.1, 131.9, 131.1, 130.4, 129.1, 128.1, 127.8, 127.3, 127.0, 125.9 (q, $J = 3.1$ Hz), 123.1, 122.4, 120.4, 113.0, 102.3, 59.4, 30.1, 14.3. HR-ESI-MS (m/z): calcd. for C$_{25}$H$_{20}$F$_3$NO$_2$ [M+H]$^+$ 424.1519, found 424.1520.
Ethyl 3-benzyl-2-(naphthalen-1-yl)indolizine-1-carboxylate (3d)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 58% yield (brown oil, 47 mg); $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.28 (dd, $J = 9.1$, 1.2 Hz, 1H), 7.97 (dd, $J = 7.9$, 1.9 Hz, 1H), 7.80 (d, $J = 9.5$ Hz, 1H), 7.64 (d, $J = 8.1$ Hz, 1H), 7.47 – 7.41 (m, 2H), 7.39 (d, $J = 7.0$ Hz, 1H), 7.30 (dd, $J = 7.8$, 1.7 Hz, 2H), 7.23 – 7.14 (m, 4H), 6.98 (ddd, $J = 9.2$, 6.6, 1.1 Hz, 1H), 6.67 (dd, $J = 7.1$, 1.3 Hz, 1H), 6.48 (td, $J = 6.8$, 1.3 Hz, 1H), 4.47 (s, 2H), 4.15 (q, $J = 7.1$ Hz, 2H), 1.08 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, Chloroform-d) $\delta$ 165.2, 136.5, 135.2, 133.9, 132.6, 131.9, 131.8, 130.3, 129.0, 127.6, 127.5, 127.1, 126.4, 125.9, 125.8, 124.4, 123.5, 123.1, 122.2, 120.6, 120.3, 112.7, 102.1, 59.4, 27.3, 14.3. HR-ESI-MS (m/z): calcd. for $\text{C}_{28}\text{H}_{23}\text{NO}_2$ [M+H]$^+$ 406.1802, found 406.1808.

Ethyl 3-(4-fluorobenzyl)-2-phenylindolizine-1-carboxylate (3e)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 47% yield (green oil, 35 mg); $^1$H NMR (500 MHz, Chloroform-d) $\delta$ 8.23 (d, $J = 9.1$ Hz, 1H), 7.56 – 7.53 (m, 1H), 7.20 – 6.99 (m, 5H), 5.86 (td, $J = 6.8$, 1.4 Hz, 1H), 4.13 (q, $J = 7.1$ Hz, 2H), 4.07 (s, 2H), 1.09 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (125 MHz, Chloroform-d) $\delta$ 165.1, 162.2 (d, $J = 243.8$ Hz), 161.3, 143.5, 137.3, 136.2, 132.0 (d, $J = 7.5$ Hz), 131.2 (d, $J = 3.8$ Hz), 130.4, 129.1, 129.0, 128.5, 127.7, 126.8, 123.4, 122.3, 121.5, 120.3, 114.6 (d, $J = 21.3$ Hz), 112.8, 102.0, 59.3, 30.1, 14.4. HR-ESI-MS (m/z): calcd. for $\text{C}_{24}\text{H}_{20}\text{NO}_2\text{F}$ [M+H]$^+$ 374.1551, found 374.1544.
Ethyl 3-(3-fluorobenzyl)-2-phenylindolizine-1-carboxylate (3f)

(Eluent: ethyl acetate/petroleum ether = 1/5, v/v); 60% yield (brown oil, 45 mg); \(^1\)H NMR (500 MHz, Chloroform-d) \(\delta\) 8.24 (d, \(J = 9.1\) Hz, 1H), 7.55 (d, \(J = 6.9\) Hz, 1H), 7.31 – 7.21 (m, 2H), 7.17 (d, \(J = 7.8\) Hz, 2H), 7.10 (dd, \(J = 24.1, 7.5\) Hz, 2H), 7.05 – 6.97 (m, 2H), 6.94 (d, \(J = 7.7\) Hz, 2H), 6.57 (td, \(J = 6.9, 1.5\) Hz, 1H), 4.13 (q, \(J = 7.1\) Hz, 2H), 4.09 (s, 2H), 1.08 (t, \(J = 7.2\) Hz, 3H). \(^13\)C NMR (125 MHz, Chloroform-d) \(\delta\) 165.0, 162.2 (d, \(J = 243.8\) Hz), 143.5, 137.7 (d, \(J = 8.8\) Hz), 137.2, 136.3, 130.4, 130.1, 129.1, 129.0, 128.5, 127.8, 127.2, 126.8, 126.2 (d, \(J = 2.5\) Hz), 123.5, 122.5, 122.3, 121.5, 120.3, 117.6 (d, \(J = 21.3\) Hz), 114.1, 113.9, 112.8, 101.9, 59.4, 30.1, 27.0, 14.3. HR-ESI-MS (m/z): calcd. for C\(_{24}\)H\(_{20}\)NO\(_2\)F [M + H]\(^+\) 374.1551, found 374.1543.

Ethyl 3-(2-fluorobenzyl)-2-phenylindolizine-1-carboxylate (3g)

(Eluent: ethyl acetate/petroleum ether = 1/5, v/v); 62% yield (yellow oil, 46 mg); \(^1\)H NMR (400 MHz, Chloroform-d) \(\delta\) 8.24 (dt, \(J = 9.1, 1.3\) Hz, 1H), 7.54 (dt, \(J = 7.1, 1.2\) Hz, 1H), 7.23 (ddd, \(J = 8.8, 6.4, 4.3\) Hz, 2H), 7.17 – 7.12 (m, 2H), 7.11 – 7.01 (m, 3H), 6.99 – 6.93 (m, 3H), 6.53 (td, \(J = 6.8, 1.3\) Hz, 1H), 4.16 – 4.03 (m, 4H), 1.04 (t, \(J = 7.1\) Hz, 3H). \(^13\)C NMR (100 MHz, Chloroform-d) \(\delta\) 164.9, 160.8 (d, \(J = 244\) Hz), 137.1, 136.3, 132.1 (d, \(J = 3.0\) Hz), 130.4, 129.2 (d, \(J = 9.0\) Hz), 128.9, 127.8, 127.7,
126.8, 124.5, 123.6, 123.5, 123.4, 122.2, 121.9, 120.3, 120.2, 115.2 (d, J = 22 Hz),
112.7, 59.3, 30.3, 14.2. HR-ESI-MS (m/z): calcd. for C_{24}H_{20}NO_{2}F [M + H]^+ 374.1551,
found 374.1541.

**Ethyl 3-(4-bromobenzyl)-2-phenylindolizine-1-carboxylate (3h)**

![Chemical structure of 3h](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 39% yield (brown oil, 34 mg); ¹H NMR (500 MHz, Chloroform-d) δ 8.23 (d, J = 9.0 Hz, 1H), 7.56 (d, J = 6.9 Hz, 1H),
7.42 (d, J = 8.4 Hz, 2H), 7.19 – 7.16 (m, 4H), 7.15 – 7.10 (m, 1H), 7.00 (ddd, J = 8.8,
6.8, 1.2 Hz, 1H), 6.96 – 6.90 (m, 2H), 6.58 (td, J = 6.9, 1.4 Hz, 1H), 4.15 (q, J = 7.0
Hz, 2H), 4.07 (s, 2H), 1.12 (t, J = 7.1 Hz, 3H). ¹³C NMR (125 MHz, Chloroform-d) δ
165.0, 137.2, 136.2, 134.4, 132.2, 130.9, 130.4, 130.2, 129.5, 129.0, 128.5, 127.8,
127.7, 126.9, 123.5, 122.4, 121.4, 121.3, 120.3, 112.8, 101.8, 59.4, 30.1, 14.4.;
HR-ESI-MS (m/z): calcd. for C_{24}H_{20}BrNO_{2} [M + H]^+ 434.0750, found 434.0749.

**2-Methyl-3-(o-tolyl)indolizine-1-carbonitrile (3i)**

![Chemical structure of 3i](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 49% yield (brown oil, 38 mg); ¹H NMR (500 MHz, Chloroform-d) δ 8.25 – 8.21 (m, 1H), 7.55 (d, J = 7.0 Hz, 1H), 7.28
– 7.23 (m, 4H), 7.19 – 7.15 (m, 2H), 7.14 – 7.10 (m, 1H), 7.00 (ddd, J = 9.2, 6.8, 1.2
Hz, 1H), 6.93 (d, J = 6.7 Hz, 2H), 6.57 (td, J = 6.8, 1.4 Hz, 1H), 4.14 (q, J = 7.2 Hz,
2H), 4.07 (s, 2H), 1.11 (t, J = 7.1 Hz, 3H). ¹³C NMR (125 MHz, Chloroform-d) δ
165.0, 143.5, 137.2, 136.2, 133.9, 133.1, 131.8, 130.6, 130.2, 129.1, 129.0, 128.5, 127.9, 127.7, 126.8, 123.5, 122.4, 121.5, 120.3, 112.8, 59.4, 30.1, 14.4. HR-ESI-MS (m/z): calcd. for C_{24}H_{20}ClNO_{2} [M + H]^+ 390.1255, found 390.1257.

**Ethyl 3-(naphthalen-2-yl)-2-phenylindolizine-1-carboxylate (3j)**

![Image of 3j](image1)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 81% yield (brown oil, 66 mg); ^1^H NMR (500 MHz, Chloroform-d) δ 8.31 (dd, J = 9.1, 1.2 Hz, 1H), 7.79 – 7.73 (m, 3H), 7.61 – 7.57 (m, 2H), 7.40 – 7.33 (m, 3H), 7.25 (ddd, J = 8.2, 6.7, 1.3 Hz, 1H), 7.10 (dd, J = 8.2, 6.4 Hz, 2H), 7.06 – 6.98 (m, 2H), 6.93 – 6.89 (m, 2H), 6.57 (td, J = 6.8, 1.4 Hz, 1H), 4.05 – 3.92 (m, 2H), 3.86 – 3.71 (m, 2H), 0.46 (t, J = 7.1 Hz, 3H). ^13^C NMR (125 MHz, Chloroform-d) δ 165.1, 137.2, 136.4, 133.8, 133.4, 129.1, 128.9, 128.8, 128.5, 128.0, 127.9, 127.7, 127.4, 126.6, 126.5, 125.8, 125.6, 125.1, 123.6, 122.3, 120.0, 112.6, 58.9, 30.3, 13.4. HR-ESI-MS (m/z): calcd. for C_{28}H_{23}NO_{2} [M + H]^+ 406.1802, found 406.1810.

**Ethyl 2-fluoro-3-(4-methoxybenzyl)indolizine-1-carboxylate (3k)**

![Image of 3k](image2)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 63% yield (brown oil, 51 mg); ^1^H NMR (500 MHz, Chloroform-d) δ 8.25 – 8.19 (m, 1H), 7.56 (d, J = 6.9 Hz, 1H), 7.28 – 7.22 (m, 2H), 7.01 – 6.94 (m, 3H), 6.84 (d, J = 8.6 Hz, 2H), 6.70 (d, J = 8.7 Hz, 2H), 6.56 (td, J = 6.8, 1.4 Hz, 1H), 4.13 (q, J = 7.2 Hz, 2H), 4.00 (s, 2H), 3.66 (s, 3H), 1.09
(t, J = 7.1 Hz, 3H). $^{13}$C NMR (125 MHz, Chloroform-d) δ 165.1, 162.2 (d, $J = 243.8$ Hz), 158.5, 136.2, 132.0 (d, $J = 8.8$ Hz), 131.2 (d, $J = 3.8$ Hz), 130.2, 129.1, 128.7, 123.5, 122.3, 121.9, 120.2, 114.6 (d, $J = 21.3$ Hz), 114.4, 112.7, 101.9, 59.3, 55.3, 29.2, 14.4. HR-ESI-MS (m/z): calcd. for C$_{25}$H$_{22}$FNO$_3$ [M+H]$^+$ 404.1656, found 404.1662.

**Ethyl 2-(4-chlorophenyl)-3-(4-methoxybenzyl)indolizine-1-carboxylate (3l)**

![Ethyl 2-(4-chlorophenyl)-3-(4-methoxybenzyl)indolizine-1-carboxylate (3l)](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 54% yield (yellow oil, 45 mg); $^1$H NMR (400 MHz, Chloroform-d) δ 8.22 (dt, $J = 9.1$, 1.2 Hz, 1H), 7.56 (dt, $J = 7.0$, 1.1 Hz, 1H), 7.28 – 7.20 (m, 4H), 6.98 (ddd, $J = 9.2$, 6.7, 1.1 Hz, 1H), 6.86 – 6.80 (m, 2H), 6.72 – 6.67 (m, 2H), 6.56 (td, $J = 6.8$, 1.3 Hz, 1H), 4.13 (q, $J = 7.1$ Hz, 2H), 3.99 (s, 2H), 3.66 (s, 3H), 1.11 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, Chloroform-d) δ 165.0, 158.4, 136.2, 133.9, 133.1, 131.8, 131.4, 129.9, 129.1, 128.9, 128.6, 127.8, 123.5, 122.4, 121.8, 120.2, 114.4, 113.2, 112.7, 101.8, 59.4, 55.3, 29.2, 14.4. HR-ESI-MS (m/z): calcd. for C$_{25}$H$_{22}$ClNO$_3$ [M+H]$^+$ 420.1361, found 420.1371.

**3-benzyl-2-phenylindolizine-1-carbonitrile (3m)**

![3-benzyl-2-phenylindolizine-1-carbonitrile (3m)](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 67% yield (yellow solid, mp 154 –156 °C, 41 mg); $^1$H NMR (400 MHz, Chloroform-d) δ 7.73 (d, $J = 9.0$ Hz, 1H), 7.68 (d, $J = 7.0$ Hz, 1H), 7.60 – 7.55 (m, 2H), 7.50 – 7.44 (m, 2H), 7.43 – 7.37 (m, 1H), 7.35 – 7.26 (m, 3H), 7.12 – 7.07 (m, 3H), 6.70 (td, $J = 6.9$, 1.3 Hz, 1H), 4.38 (s, 2H).
$^{13}$C NMR (100 MHz, Chloroform-d) $\delta$ 138.2, 136.7, 132.6, 131.3, 129.4, 129.2, 128.9, 128.1, 127.7, 127.1, 123.9, 122.3, 120.2, 117.9, 117.2, 113.2, 81.5, 30.3. HR-ESI-MS (m/z): calcd. for C$_{22}$H$_{16}$N$_{2}$ [M+H]$^+$ 309.1386, found 309.1379.

**Methyl 3-benzyl-2-phenyldizine-1-carboxylate (3n)**

![Methyl 3-benzyl-2-phenyldizine-1-carboxylate](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 67% yield (brown oil, 46 mg); $^1$H NMR (500 MHz, Chloroform-d) $\delta$ 8.21 (d, $J = 9.1$ Hz, 1H), 7.53 (d, $J = 7.0$ Hz, 1H), 7.32 – 7.27 (m, 4H), 7.26 – 7.23 (m, 1H), 7.17 – 7.13 (m, 2H), 7.12 – 7.07 (m, 1H), 6.98 – 6.92 (m, 3H), 6.53 (td, $J = 6.8, 1.3$ Hz, 1H), 4.08 (s, 2H), 3.64 (s, 3H). $^{13}$C NMR (125 MHz, Chloroform-d) $\delta$ 165.6, 143.4, 137.4, 136.2, 135.2, 130.4, 128.9, 128.6, 127.8, 127.7, 127.1, 126.7, 123.5, 122.3, 121.5, 120.3, 112.7, 101.7, 50.6, 30.2. HR-ESI-MS (m/z): calcd. for C$_{23}$H$_{19}$NO$_{2}$ [M+H]$^+$ 342.1489, found 342.1482.

**Isopropyl 3-benzyl-2-phenyldizine-1-carboxylate (3o)**

![Isopropyl 3-benzyl-2-phenyldizine-1-carboxylate](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 57% yield (brown oil, 42 mg); $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.24 (dt, $J = 9.1, 1.2$ Hz, 1H), 7.53 (dd, $J = 7.0, 1.2$ Hz, 1H), 7.31 – 7.27 (m, 4H), 7.26 – 7.23 (m, 1H), 7.17 – 7.13 (m, 2H), 7.12 – 7.08 (m, 1H), 6.98 – 6.93 (m, 3H), 6.53 (td, $J = 6.8, 1.3$ Hz, 1H), 5.04 (p, $J = 6.2$ Hz, 1H), 4.08 (s, 2H), 1.06 (d, $J = 6.3$ Hz, 6H). $^{13}$C NMR (100 MHz, Chloroform-d) $\delta$ 164.7, 137.5, 136.1, 135.5, 131.5, 130.5, 129.1, 128.9, 128.6, 127.8, 127.6, 127.0, 126.7, 123.4, 122.0, 121.3, 120.2, 112.6, 102.5, 66.4, 30.2, 22.1. HR-ESI-MS (m/z): calcd. for C$_{25}$H$_{23}$NO$_{2}$ [M+H]$^+$ 370.1802, found 370.1798.
Butyl 3-benzyl-2-phenylindolizine-1-carboxylate (3p)

![Chemical Structure](image)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 48% yield (brown oil, 37 mg); $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.23 (dt, $J = 9.1, 1.2$ Hz, 1H), 7.51 (d, $J = 7.2$ Hz, 1H), 7.28 (d, $J = 4.3$ Hz, 4H), 7.24 (dd, $J = 8.2, 4.2$ Hz, 1H), 7.15 (dd, $J = 6.5, 4.8$ Hz, 2H), 7.12 – 7.08 (m, 1H), 6.97 – 6.93 (m, 3H), 6.52 (td, $J = 6.8, 1.3$ Hz, 1H), 4.05 (s, 2H), 1.26 (s, 9H). 13C NMR (100 MHz, Chloroform-d) $\delta$ 164.8, 137.6, 136.0, 135.9, 131.2, 130.4, 128.9, 127.8, 127.7, 126.9, 126.7, 123.3, 121.8, 121.0, 120.1, 112.5, 103.8, 79.4, 30.2, 28.4. HR-ESI-MS (m/z): calcd. for C$_{26}$H$_{25}$NO$_2$ [M+H]$^+$ 384.1958, found 384.1957.

Ethyl 3-benzyl-5-methyl-2-phenylindolizine-1-carboxylate (3q)

(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 41% yield (brown oil, 30 mg); $^1$H NMR (500 MHz, Chloroform-d) $\delta$ 8.24 (dd, $J = 9.1, 1.4$ Hz, 1H), 7.23 – 7.18 (m, 5H), 7.14 (dd, $J = 8.3, 6.9$ Hz, 2H), 7.07 (d, $J = 7.3$ Hz, 1H), 6.86 (dd, $J = 9.1, 6.7$ Hz, 1H), 6.77 – 6.72 (m, 2H), 6.30 (d, $J = 6.8$ Hz, 1H), 4.29 (s, 2H), 4.04 (q, $J = 7.1$ Hz, 2H), 2.52 (s, 3H), 0.95 (t, $J = 7.1$ Hz, 3H); $^{13}$C NMR (125 MHz, Chloroform-d) $\delta$ 165.2, 143.5, 141.7, 138.7, 136.2, 135.8, 133.6, 130.6, 130.2, 129.1, 128.9, 128.5, 127.6, 127.3, 126.9, 126.2, 122.7, 122.6, 118.2, 114.9, 102.6, 59.2, 32.8, 21.5, 14.1; HR-ESI-MS (m/z): calcd. for C$_{25}$H$_{23}$NO$_2$ [M+H]$^+$ 370.1802, found 370.1798.

Methyl 3-benzyl-6-methyl-2-phenylindolizine-1-carboxylate (3r)
(Eluent: ethylacetate/petroleum ether = 1/5, v/v); 51% yield (brown oil, 36 mg); \(^1\)H NMR (400 MHz, Chloroform-d) \(\delta\) 8.19 (d, \(J = 9.2\) Hz, 1H), 7.44 – 7.38 (m, 2H), 7.38 – 7.34 (m, 4H), 7.25 – 7.17 (m, 3H), 7.04 – 7.01 (m, 2H), 6.92 (dd, \(J = 9.2, 1.5\) Hz, 1H), 4.13 (s, 2H), 3.71 (s, 3H), 2.17 (s, 3H). \(^{13}\)C NMR (100 MHz, Chloroform-d) \(\delta\) 165.6, 143.5, 137.6, 135.3, 135.1, 131.2, 130.6, 130.4, 129.1, 128.9, 128.6, 128.5, 127.8, 127.7, 127.0, 126.6, 126.5, 125.5, 122.2, 121.2, 121.1, 119.7, 101.3, 50.6, 30.1, 18.6. HR-ESI-MS (m/z): calcd. for C\textsubscript{24}H\textsubscript{21}NO\textsubscript{2} [M+H]\(^+\) 356.1645, found 356.1637.
Chemical structure diagram and NMR spectrum.