Supporting Information

Three Distinct Reactions of 3,4-Dihydroisoquinolines with Azlactones: Novel Synthesis of Imidazoloisoquinolin-3-ones, Benzo[a]quinolizin-4-ones and Benzo[d]azocin-4-ones

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General procedures

Melting points were determined on Electrothermal melting point apparatus (Electrothermal 9100) and reported without correction. ^1H -Nuclear magnetic resonance (^1H NMR) spectra were recorded on a Bruker DPX-300 (300 MHz) or Bruker AV-400 (400 MHz) or a Bruker AV-500 (500 MHz) using deuteriochloroform and methanol d_4 as solvents with tetramethylsilane as an internal standard. ^{13}C -Nuclear magnetic resonance (^{13}C NMR) spectra were recorded on a Bruker DPX 300 (75 MHz) or Bruker AV-400 (100 MHz) and a Bruker AV-500 (125 MHz) using deuteriochloroform with tetramethylsilane as an internal standard. Infrared spectra (IR) were obtained on Perkin Elmer System 2000FT-IR and JASCO A-302 spectrometers. Mass spectra were determined using a Finnigan INCOS 50 and MAT 90 instruments. Elemental analyses were carried out by using a Perkin Elmer Elemental Analyzer 2400 CHN. Column chromatography was carried out using Fluka aluminum oxide (type 507 C neutral; 100-125 mesh) and Merck silica gel (70-230 mesh ASTM). Thin layer chromatography (TLC) and preparative thin layer chromatography (PTLC) were carried out on silica gel (E.Merck PF 254). All reagents were purified and dried according to the standard procedures. Solvents were removed by using Eyela Aspirator A-2S and Büchi Rotavapor R110. All products were evacuated by a Christ Freeze Dryer Unit Alpha 1/6, to remove the last traces of solvents.

Preparation of imidazoloisoquinolines (1a-1h)

A solution of azlactones **4a-4d** (1 mmol) and 3,4-dihydroisoquinolines **5a-5c** (1.2 mmol) in acetonitrile (10 mL) was heated at reflux for 3-48 h. The solvent was removed under reduced pressure to afford the crude product which was purified by recrystallization or preparative thin-layer chromatography.

1-Benzoyl-2-benzylidene-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (1a)

1 a

Purified by recrystallization (ethyl acetate-hexane); a white solid; m.p. = 170-171 °C; IR (nujol): 1713, 1668, 1651 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3): δ 2.88 (dt, $J = 16.2, 5.4$ Hz, 1H, H-6 α), 3.19 (ddd, $J = 16.2, 7.9, 7.9$ Hz, 1H, H-6 β), 3.60 (ddd, $J = 13.7, 7.9, 5.4$ Hz, 1H, H-5 α), 4.26-4.39 (m, 1H, H-5 β), 6.56 (s, 1H, H-10b), 6.74 (s, 1H, H-2a), 6.92-6.97 (m, 2H, ArH), 7.02-7.10 (m, 5H, ArH), 7.17-7.23 (m, 2H, ArH), 7.27-7.36 (m, 3H, ArH), 7.41 (dd, $J = 7.3, 7.3$ Hz, 1H, ArH), 7.90 (d, $J = 7.3$ Hz, 1H, ArH); ^{13}C NMR (100 MHz, CDCl_3): δ 26.7, 38.7, 71.8, 119.2, 126.3, 127.2, 127.6, 127.9, 128.1, 128.2, 128.5, 128.7, 128.8, 130.8, 133.2, 133.6, 134.3, 135.1, 165.3, 170.0; MS: m/z (% relative intensity) 380 (M^+ , 36), 275 (7), 249 (84), 131 (3), 105 (100), 77 (69), 51 (15); HRFABMS Molecular ion calcd for $\text{C}_{25}\text{H}_{21}\text{N}_2\text{O}_2$: 381.1603, found: 381.1610; Anal. Calcd for $\text{C}_{25}\text{H}_{20}\text{N}_2\text{O}_2$ (380.44): C, 78.93; H, 5.30; N, 7.36. Found: C, 78.66; H, 5.37; N, 7.26.

1-Benzoyl-2-benzylidene-8-methoxy-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (1b)

1 b

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); a white solid; m.p. (CH₂Cl₂-hexane) = 154-155 °C; IR (nujol): 1699, 1682, 1660, 1623, 1599, 1579, 1494, 1259 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.82 (dt, *J* = 16.4, 4.8 Hz, 1H, H-6 α), 3.10-3.24 (m, 1H, H-6 β), 3.54 (ddd, *J* = 13.1, 7.9, 4.8 Hz, 1H, H-5 α), 3.82 (s, 3H, OCH₃), 4.38 (ddd, *J* = 13.1, 7.9, 4.8 Hz, 1H, H-5 β), 6.54 (s, 1H, H-10b), 6.68-6.74 (m, 2H, H-2a and ArH), 6.88-6.98 (m, 3H, ArH), 7.00-7.10 (m, 5H, ArH), 7.15-7.23 (m, 1H, ArH), 7.23-7.30 (m, 2H, ArH), 7.85 (d, *J* = 8.6 Hz, 1H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 27.1, 38.6, 55.3, 71.7, 113.2, 113.5, 119.1, 127.3, 127.6, 127.7, 127.9, 128.10, 128.13, 128.2, 128.6, 130.8, 133.3, 133.7, 135.8, 159.7, 165.4, 170.0; MS: *m/z* (% relative intensity) 410 (M⁺, 42), 305 (11), 249 (45), 161 (46), 160 (78), 105 (100), 77 (83); HRFABMS Molecular ion calcd for C₂₆H₂₃N₂O₃: 411.1709, found: 411.1710; Anal. Calcd for C₂₆H₂₂N₂O₃ (410.46): C, 76.08; H, 5.40; N, 6.82. Found: C, 75.80; H, 5.78; N, 6.95.

1-Benzoyl-2-(3,4-dimethoxybenzylidene)-1,5,6,10b-tetrahydro-2H-imidazo[2,1-*a*]isoquinolin-3-one (1c)

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); a yellow oil; IR (nujol): 1705, 1656, 1515 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.85 (dt, *J* = 16.5, 5.1 Hz, 1H, H-6 α), 3.19 (ddd, *J* = 16.5, 8.4, 8.0 Hz, 1H, H-6 β), 3.57 (ddd, *J* = 13.4, 8.4, 5.1 Hz, 1H, H-5 α), 3.77, 3.82 (2s, 6H, OCH₃), 4.11-4.43 (m, 1H, H-5 β), 6.45-6.62 (m, 4H, ArH and H-10b), 6.69 (s, 1H, H-2a), 7.07-7.39 (m, 8H, ArH), 7.89-7.96 (m, 1H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 26.7, 38.7, 55.5, 55.8, 71.7, 110.5, 110.8, 119.5, 122.0, 126.4, 126.9, 127.4, 127.6, 128.8, 128.9, 130.8, 133.4, 134.5, 135.2, 148.2, 148.9, 165.5, 170.1; MS: *m/z* (% relative intensity) 440 (M⁺, 35), 335 (17), 310 (21), 309 (100),

105 (75), 77 (63); HRFABMS Molecular ion calcd for $C_{27}H_{25}N_2O_4$: 441.1814, found: 441.1816.

1-Benzoyl-2-benzylidene-8,9-dimethoxy-10b-phenyl-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (1d)

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); a white needle; m.p. (CH_2Cl_2 -hexane) = 201-202 °C; IR (nujol): 1708, 1650, 1520 cm^{-1} ; 1H NMR (400 MHz, $CDCl_3$): δ 2.54-2.63 (m, 1H, H-6 α), 3.06-3.19 (m, 2H, H-5 α and H-6 β), 3.93, 4.05 (2s, 6H, OCH_3), 4.29-4.38 (m, 1H, H-5 β), 6.62 (s, 1H, H-2a), 6.68 (s, 1H, ArH), 6.77 (br d, J = 7.2 Hz, 2H, ArH), 6.95-7.28 (m, 13H, ArH), 8.03 (s, 1H, ArH); ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.9, 36.3, 55.9, 56.0, 82.7, 111.2, 111.8, 116.3, 127.0, 127.4, 127.5, 127.6, 128.2, 128.9, 129.0, 130.6, 130.9, 133.8, 134.4, 138.3, 147.6, 149.3, 164.7, 168.3; MS: m/z (% relative intensity) 516 (M^+ , 17), 439 (2), 411 (2), 268 (19), 267 (91), 266 (100), 236 (14), 105 (10), 77 (30); HRFABMS Molecular ion calcd for $C_{33}H_{29}N_2O_4$: 517.2127, found: 517.2140; Anal.Calcd for $C_{33}H_{28}N_2O_4$ (516.59): C, 76.73; H, 5.46; N, 5.42. Found: C, 77.02; H, 5.44; N, 5.57.

1-Acetyl-2-benzylidene-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (1e)

Purified by preparative thin-layer chromatography (60% ethyl acetate-hexane); a pale orange oil; IR (nujol): 1695, 1668 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3): δ 1.92 (s, 3H, CH_3), 2.82 (dt, $J = 16.3, 4.7$ Hz, 1H, H-6 α), 2.88-3.22 (m, 1H, H-6 β), 3.51 (ddd, $J = 13.6, 9.2, 4.7$ Hz, 1H, H-5 α), 4.29-4.41 (m, 1H, H-5 β), 6.62 (s, 1H, H-10b), 7.00 (s, 1H, H-2a), 7.15 (d, $J = 7.0$ Hz, 1H, ArH), 7.24-7.41 (m, 7H, ArH), 7.60 (d, $J = 7.1$ Hz, 1H, ArH); ^{13}C NMR (75 MHz, CDCl_3): δ 22.7, 26.8, 38.5, 70.6, 118.6, 126.2, 127.1, 128.6, 128.70, 128.73, 128.90, 128.94, 134.0, 134.7, 164.8, 171.9; MS: m/z (% relative intensity) 318 (M^+ , 84), 276 (47), 275 (81), 187 (17), 133 (35), 132 (100), 117 (47); HRFABMS Molecular ion calcd for $\text{C}_{20}\text{H}_{19}\text{N}_2\text{O}_2$: 319.1447, found: 319.1449.

1-Acetyl-2-benzylidene-8-methoxy-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (1f)

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); a bright yellow crystal; m.p. (CH_2Cl_2 -hexane) = 165-166' $^\circ\text{C}$; IR (nujol): 1704, 1699, 1673, 1661, 1611, 1503 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3): δ 1.91 (s, 3H, CH_3), 2.72-2.84 (m, 1H, H-6 α), 3.15 (ddd, $J = 16.5, 10.1, 6.7$ Hz, 1H, H-6 β), 3.47 (ddd, $J = 13.2, 10.1, 5.1$ Hz, 1H, H-5 α), 3.81 (s, 3H, OCH_3), 4.34-4.46 (m, 1H, H-5 β), 6.60 (s, 1H, H-10b), 6.67 (d, $J = 2.3$ Hz, 1H, ArH), 6.88 (dd, $J = 8.6, 2.3$ Hz, 1H, ArH), 7.01 (s, 1H, H-2a), 7.27-7.41 (m, 5H, ArH), 7.56 (d, $J = 8.6$ Hz, 1H, ArH); ^{13}C NMR (75 MHz, CDCl_3): δ 22.8, 27.2, 38.4, 55.3, 70.5, 113.3, 113.4, 118.6, 127.0, 127.9, 128.7, 128.9, 134.1, 135.5, 159.5, 164.9, 171.8; MS: m/z (% relative intensity) 348 (M^+ , 63), 318 (14), 305 (48), 275(15), 162 (29), 161 (94), 160 (100); HRFABMS Molecular ion calcd for $\text{C}_{21}\text{H}_{21}\text{N}_2\text{O}_3$: 349.1552, found: 349.1553; Anal.Calcd for $\text{C}_{21}\text{H}_{20}\text{N}_2\text{O}_3$ (348.40): C, 72.40; H, 5.79; N, 8.04. Found: C, 72.56; H, 5.92; N, 8.15.

1-Acetyl-2-(3,4-dimethoxybenzylidene)-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (1g)

Purified by preparative thin-layer chromatography (30% ethyl acetate-hexane); a yellow crystal; m.p. (CH₂Cl₂-hexane) = 155-156 °C; IR (nujol): 1713, 1660, 1599, 1514 cm⁻¹; ¹H NMR (400 MHz, CDCl₃): δ 1.98 (s, 3H, CH₃), 2.80 (ddd, *J* = 16.4, 4.9, 3.4 Hz, 1H, H-6α), 3.16 (ddd, *J* = 16.4, 10.3, 6.6 Hz, 1H, H-6β), 3.48 (ddd, *J* = 13.3, 10.3, 4.9 Hz, 1H, H-5α), 3.83 (s, 3H, OCH₃), 3.90 (s, 3H, OCH₃), 4.36-4.45 (m, 1H, H-5β), 6.65 (s, 1H, H-10b), 6.85 (d, *J* = 8.3 Hz, 1H, ArH), 6.94 (s, 1H, H-2a), 6.95 (d, *J* = 1.8 Hz, 1H, ArH), 6.98 (dd, *J* = 8.3, 1.8 Hz, 1H, ArH), 7.13-7.17 (m, 1H, ArH), 7.25-7.29 (m, 2H, ArH), 7.58-7.64 (m, 1H, ArH); ¹³C NMR (100 MHz, CDCl₃): δ 22.7, 26.8, 38.5, 55.7, 55.8, 70.5, 110.4, 111.2, 119.2, 122.8, 126.3, 126.5, 126.9, 128.6, 129.0, 134.2, 134.9, 148.9, 149.6, 165.1, 172.2; MS: *m/z* (% relative intensity) 378 (M⁺, 33), 335 (18), 248 (15), 247 (100), 178 (18), 177 (77), 162 (19); HRFABMS Molecular ion calcd for C₂₂H₂₃N₂O₄: 379.1658, found: 379.1658; Anal. Calcd for C₂₂H₂₂N₂O₄ (378.42): C, 69.83; H, 5.86; N, 7.40. Found: C, 69.68; H, 5.81; N, 7.42.

1-Acetyl-2-benzylidene-8,9-dimethoxy-10b-phenyl-1,5,6,10b-tetra-hydro-2H-imidazo[2,1-a]isoquinolin-3-one (1h)

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); a yellow needle; m.p. (CH₂Cl₂-hexane) = 173 °C (decompose); IR (nujol): 1711, 1674, 1515, 1450, 1421 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 1.71 (s, 3H, CH₃), 2.56 (ddd, *J* = 16.2, 6.0, 2.7 Hz, 1H, H-6 α), 2.94 (ddd, *J* = 13.0, 9.8, 6.0 Hz, 1H, H-5 α), 3.01-3.15 (m, 1H, H-6 β), 3.90, 3.94 (2s, 6H, OCH₃), 4.26 (ddd, *J* = 13.0, 7.2, 2.7 Hz, 1H, H-5 β), 6.63 (s, 1H, ArH), 6.94 (s, 1H, H-2a), 7.17-7.34 (m, 10H, ArH), 7.74 (s, 1H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 24.2, 26.1, 35.9, 55.8, 55.9, 82.6, 111.1, 111.6, 115.9, 126.7, 128.1, 128.2, 128.4, 128.5, 128.8, 128.9, 129.0, 134.7, 139.4, 147.7, 149.2, 163.8, 169.6; MS: *m/z* (% relative intensity) 454 (M⁺, 2), 348 (26), 347 (13), 333 (25), 332 (100), 305 (22), 290 (39), 289 (21), 262 (15), 161 (43), 160 (59), 118 (68), 117 (42), 91 (97); HRFABMS Molecular ion calcd for C₂₈H₂₇N₂O₄: 455.1971, found: 455.1967.

Preparation of imidazoloisoquinolines (8a-8c)

A solution of azlactone **9** (1 mmol) and 3,4-dihydroisoquinolines **5d-5f** (1.2 mmol) in acetonitrile (10 mL) was heated at reflux for 1 h. The solvent was evaporated to dryness *in vacuo*. The crude product was purified by preparative thin-layer chromatography on silica gel.

1-Benzoyl-8,9-dimethoxy-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (8a)

Purified by preparative thin-layer chromatography (5% methanol-CH₂Cl₂); a white solid; m.p. (CH₂Cl₂-hexane) = 203-204 °C; IR (nujol): 1694, 1636, 1513 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.64-2.74 (m, 1H, H-6 α), 3.09 (ddd, *J* = 16.4, 10.9, 6.1 Hz, 1H, H-6 β), 3.32 (ddd, *J* = 14.5, 10.9, 5.0 Hz, 1H, H-5 α), 3.80, 3.88 (2s, 6H, OCH₃), 4.06 (d, *J* = 15.7

Hz, 1H, H-2 α), 4.15 (d, J = 15.7 Hz, 1H, H-2 β), 4.30-4.40 (m, 1H, H-5 β), 6.62 (s, 1H, ArH), 6.87 (s, 1H, H-10b), 7.15 (s, 1H, ArH), 7.43-7.57 (m, 3H, ArH), 7.57-7.64 (m, 2H, ArH); ^{13}C NMR (75 MHz, CDCl_3): δ 26.7, 38.0, 51.9, 55.8, 55.9, 70.3, 109.0, 111.1, 126.2, 127.1, 127.5, 128.7, 131.4, 134.5, 148.1, 149.0, 167.3, 172.0; MS: m/z (% relative intensity) 352 (M^+ , 29), 309 (35), 275 (36), 247 (94), 191 (16), 190 (39), 105 (100), 77 (58); HRFABMS Molecular ion calcd for $\text{C}_{20}\text{H}_{21}\text{N}_2\text{O}_4$: 353.1501, found: 353.1503.

1-Benzoyl-8-methoxy-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (8b)

Purified by preparative thin-layer chromatography (2% methanol- CH_2Cl_2); a colorless oil; IR (nujol): 1714, 1651, 1646, 1500 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3): δ 2.80 (dt, J = 16.3, 4.9 Hz, 1H, H-6 α), 3.04-3.18 (m, 1H, H-6 β), 3.38 (ddd, J = 13.5, 9.0, 4.9 Hz, 1H, H-5 α), 3.80 (s, 3H, OCH_3), 4.01-4.30 (m, 3H, H-5 β and H-2), 6.69 (d, J = 2.5 Hz, 1H, ArH), 6.80 (dd, J = 8.6, 2.5 Hz, 1H, ArH), 6.84 (br s, 1H, H-10b), 7.42-7.56 (m, 4H, ArH), 7.58-7.65 (m, 2H, ArH); ^{13}C NMR (75 MHz, CDCl_3): δ 27.3, 37.8, 51.9, 55.3, 70.1, 113.0, 113.6, 127.2, 127.4, 127.6, 128.6, 131.4, 134.4, 135.5, 159.5, 167.3, 171.7; MS: m/z (% relative intensity) 322 (M^+ , 100), 280 (23), 279 (43), 245 (55), 217 (40), 160 (11), 105 (12), 77 (11); HRFABMS Molecular ion calcd for $\text{C}_{19}\text{H}_{19}\text{N}_2\text{O}_3$: 323.1396, found: 323.1396.

1-Benzoyl-8,9,10-trimethoxy-1,5,6,10b-tetrahydro-2H-imidazo[2,1-a]isoquinolin-3-one (8c)

Purified by preparative thin-layer chromatography (60% ethyl acetate-hexane); a colorless oil; IR (nujol): 1714, 1661, 1652, 1600, 1575, 1494, 1456, 1118 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3): δ 2.56 (br d, $J = 16.0$ Hz, 1H, H-6 α), 2.97-3.12 (m, 1H, H-6 β), 3.20 (ddd, $J = 11.8, 11.8, 4.3$ Hz, 1H, H-5 α), 3.75, 3.76, 3.78 (3s, 9H, OCH_3), 3.92 (s, 2H, H-2), 4.08-4.18 (m, 1H, H-5 β), 6.37 (s, 1H, ArH), 7.02 (s, 1H, H-10b), 7.33-7.47 (m, 3H, ArH), 7.54-7.61 (m, 2H, ArH); ^{13}C NMR (75 MHz, CDCl_3): δ 27.0, 38.4, 52.1, 55.9, 60.6, 61.1, 67.8, 107.3, 119.9, 128.4, 128.5, 131.2, 131.4, 134.6, 140.8, 151.9, 153.7, 170.0, 171.7; MS: m/z (% relative intensity) 383 ($\text{M}^+ + 1$, 2), 352 (23), 351 (100), 105 (60), 77 (33); HRFABMS Molecular ion calcd for $\text{C}_{21}\text{H}_{23}\text{N}_2\text{O}_5$: 383.1607, found: 383.1604.

Preparation of benzo[a]quinolizine-4-one (2a-2h)

A solution of azlactones **4a, 4e-4f** (1 mmol) and 6,7-dimethoxy-3,4-dihydroisoquinolines **6a-6c** (1.5 mmol) in acetonitrile (10 mL) was heated at reflux for 2 h. The solvent was evaporated to dryness *in vacuo*. The crude product was purified by preparative thin-layer chromatography on silica gel.

6,7-Dihydro-9,10-dimethoxy-2-phenylbenzo[a]quinolizine-4-one (2a)

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); *cis*-**2a**: a bright yellow solid; m.p. (ethyl acetate-hexane) = 156-158 °C; IR (nujol): 3396, 1683, 1654, 1604, 1581, 1509 cm⁻¹; ¹H NMR (400 MHz, CDCl₃): δ 2.79 (dt, *J* = 15.7, 4.0 Hz, 1H, H-7α), 2.92 (ddd, *J* = 15.7, 10.2, 4.9 Hz, 1H, H-7β), 3.49 (ddd, *J* = 12.9, 10.2, 4.0 Hz, 1H, H-6α), 3.83, 3.85 (2s, 6H, OCH₃), 4.36-4.44 (m, 2H, H-6β and H-2), 5.06 (dd, *J* = 7.6, 5.5 Hz, 1H, H-3), 6.02 (d, *J* = 7.2 Hz, 1H, H-1), 6.61 (s, 1H, ArH), 6.84 (d, *J* = 5.5 Hz, 1H, NH), 7.00-7.05 (m, 2H, ArH), 7.08 (s, 1H, ArH), 7.14-7.19 (m, 3H, ArH), 7.30-7.36 (m, 2H, ArH), 7.39-7.44 (m, 1H, ArH), 7.59-7.63 (m, 2H, ArH); ¹³C NMR (100 MHz, CDCl₃): δ 28.6, 39.5, 39.7, 54.3, 55.9, 56.0, 103.1, 106.7, 110.7, 121.2, 127.0, 127.1, 127.6, 128.5, 128.6, 131.6, 134.2, 135.2, 136.3, 148.3, 149.8, 166.9, 167.4; MS: *m/z* (% relative intensity) 454 (M⁺, 5), 349 (26), 334 (24), 333 (100), 332 (33), 105 (2), 77 (3); HRFABMS Molecular ion calcd for C₂₈H₂₇N₂O₄: 455.1971, found: 455.1970; Anal. Calcd for C₂₈H₂₆N₂O₄ (454.52): C, 73.99; H, 5.77; N, 6.16. Found: C, 73.67; H, 5.92; N, 6.16.

trans-**2a**

trans-**2a**: a white solid; m.p. (ethyl acetate-hexane) = 143-144 °C; IR (nujol): 3292, 1669, 1634, 1549, 1514 cm⁻¹; ¹H NMR (400 MHz, CDCl₃): δ 2.79 (dt, *J* = 15.7, 4.2 Hz, 1H, H-7α), 2.94 (ddd, *J* = 15.7, 10.4, 4.7 Hz, 1H, H-7β), 3.45 (ddd, *J* = 12.7, 10.4, 4.2 Hz, 1H, H-6α), 3.87, 3.91 (2s, 6H, OCH₃), 4.04 (dd, *J* = 14.3, 2.8 Hz, 1H, H-2), 4.53 (ddd, *J* = 12.7, 4.7, 4.2 Hz, 1H, H-6β), 5.16 (dd, *J* = 14.3, 8.8 Hz, 1H, H-3), 5.76 (d, *J* = 2.8 Hz, 1H, H-1), 6.65 (s, 1H, ArH), 6.69-6.78 (m, 1H, NH), 7.04 (s, 1H, ArH), 7.23-7.43 (m, 8H, ArH), 7.59-7.64 (m, 2H, ArH); ¹³C NMR (100 MHz, CDCl₃): 28.7, 39.6, 44.3, 54.7, 55.9, 56.0, 104.7, 106.5, 110.7, 121.1, 127.0, 127.4, 128.2, 128.3, 128.7, 131.3, 134.1, 134.6, 140.6, 148.2, 149.6, 167.8, 168.4; MS: *m/z* (% relative intensity) 455 (M⁺+1, 0.3), 349 (6), 334 (26), 333 (100), 332 (42), 105 (2), 77 (3); HRFABMS Molecular ion calcd

for $C_{28}H_{27}N_2O_4$: 455.1971, found: 455.1978; Anal.Calcd for $C_{28}H_{26}N_2O_4$ (454.52): C, 73.99; H, 5.77; N, 6.16. Found: C, 74.23; H, 5.94; N, 6.29.

6,7-Dihydro-9,10-dimethoxy-1-methyl-2-phenylbenzo[*a*]quinolizine-4-one (2b)

cis-**2b**

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); *cis*-**2b**: a white needles; m.p. (ethyl acetate-hexane) = 184-185 °C; IR (nujol): 3381, 1665, 1652, 1608, 1578, 1514 cm^{-1} ; 1H NMR (400 MHz, $CDCl_3$): δ 2.04 (s, 3H, CH_3), 2.85-2.93 (m, 1H, H-7 α), 3.01 (ddd, J = 13.8, 12.3, 4.7 Hz, 1H, H-7 β), 3.13 (ddd, J = 12.3, 12.3, 2.7 Hz, 1H, H-6 α), 3.93, 3.94 (2s, 6H, OCH_3), 4.25 (d, J = 7.1 Hz, 1H, H-2), 4.60 (ddd, J = 12.3, 4.7, 2.7 Hz, 1H, H-6 β), 5.11 (dd, J = 7.1, 5.5 Hz, 1H, H-3), 6.79 (s, 1H, ArH), 6.94 (d, J = 5.5 Hz, 1H, NH), 7.04 (s, 1H, ArH), 7.09-7.14 (m, 2H, ArH), 7.22-7.26 (m, 3H, ArH), 7.39-7.44 (m, 2H, ArH), 7.47-7.52 (m, 1H, ArH), 7.70-7.75 (m, 2H, ArH), ^{13}C NMR (100 MHz, $CDCl_3$): δ 19.3, 28.6, 40.7, 45.9, 53.8, 56.0, 56.2, 110.1, 112.3, 116.7, 123.3, 127.1, 127.7, 128.5, 128.6, 128.9, 129.9, 130.3, 131.6, 134.1, 134.9, 146.9, 148.9, 165.6, 167.5; MS: m/z (% relative intensity) 468 (M^+ , 5), 453 (4), 391 (9), 348 (32), 347 (100), 332 (32), 105 (3), 77 (4); HRFABMS Molecular ion calcd for $C_{29}H_{29}N_2O_4$: 469.2127, found: 469.2131; Anal.Calcd for $C_{29}H_{28}N_2O_4$ (468.54): C, 74.34; H, 6.02; N, 5.98. Found: C, 74.68; H, 6.05; N, 6.14.

trans-**2b**

6,7-Dihydro-9,10-dimethoxy-1,2-diphenylbenzo[*a*]quinolizine-4-one (2c)

$cis-2c$

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); *cis*-**2c**: a white solid; m.p. (ethyl acetate-hexane) = 260-261 °C; IR (nujol): 3314, 1665, 1635, 1580, 1517 cm⁻¹; ¹H NMR (400 MHz, CDCl₃): δ 2.95 (dt, *J* = 16.0, 3.4 Hz, 1H, H-7α), 3.12 (ddd, *J* = 16.0, 11.2, 4.7 Hz, 1H, H-7β), 3.22 (s, 3H, OCH₃), 3.41 (ddd, *J* = 12.5, 11.2, 3.4 Hz, 1H, H-6α), 3.89 (s, 3H, OCH₃), 4.52 (ddd, *J* = 12.5, 4.7, 3.4 Hz, 1H, H-6β), 4.78 (d, *J* = 6.9 Hz, 1H, H-2), 5.37 (dd, *J* = 6.9, 5.6 Hz, 1H, H-3), 6.37 (s, 1H, ArH), 6.69 (s, 1H, ArH), 6.99 (d, *J* = 5.6 Hz, 1H, NH), 7.11-7.26 (m, 10H, ArH), 7.40-7.47 (m, 2H, ArH), 7.49-7.54 (m, 1H, ArH), 7.74-7.79 (m, 2H, ArH); ¹³C NMR (100 MHz, CDCl₃): δ 28.6, 40.7, 46.7, 54.5, 55.1, 55.8, 109.6, 113.2, 121.0, 122.7, 127.0, 127.1, 127.5, 128.6, 128.8, 129.4, 130.3, 131.6, 131.7, 134.0, 134.4, 139.6, 146.6, 148.8, 166.2, 167.5; MS:

m/z (% relative intensity) 530 (M^+ , 8), 453 (6), 435 (10), 410 (31), 409 (100), 394 (29), 105 (2), 77 (2); HRFABMS Molecular ion calcd for $C_{34}H_{31}N_2O_4$: 531.2284, found: 531.2291; Anal.Calcd for $C_{34}H_{30}N_2O_4$ (530.61): C, 76.96; H, 5.70; N, 5.28. Found: C, 77.24; H, 5.68; N, 4.99.

trans-**2c**

trans-**2c**: a white solid; m.p. (ethyl acetate-hexane) = 243-244 °C; IR (nujol): 3317, 1657, 1607, 1512 cm^{-1} ; 1H NMR (400 MHz, $CDCl_3$): δ 2.88 (dt, J = 15.2, 4.0 Hz, 1H, H-7 α), 3.01 (ddd, J = 15.2, 11.3, 4.4 Hz, 1H, H-7 β), 3.16 (s, 3H, OCH_3), 3.45 (ddd, J = 12.7, 11.3, 4.4 Hz, 1H, H-6 α), 3.88 (s, 3H, OCH_3), 4.31 (ddd, J = 12.7, 4.4, 4.0 Hz, 1H, H-6 β), 4.42 (d, J = 3.4 Hz, 1H, H-2), 5.16 (dd, J = 7.8, 3.4 Hz, 1H, H-3), 6.34 (s, 1H, ArH), 6.68 (s, 1H, ArH), 6.77 (d, J = 7.8 Hz, 1H, NH), 7.01-7.41 (m, 10H, ArH), 7.42-7.48 (m, 2H, ArH), 7.50-7.56 (m, 1H, ArH), 7.78-7.83 (m, 2H, ArH); ^{13}C NMR (100 MHz, $CDCl_3$): δ 28.8, 40.7, 50.6, 55.2, 55.9, 56.1, 109.7, 113.3, 117.8, 122.2, 127.0, 127.1, 127.4, 128.1, 128.6, 128.7, 128.9, 129.9, 130.0, 131.9, 134.1, 136.3, 140.1, 146.5, 148.9, 165.6, 167.5; MS: m/z (% relative intensity) 530 (M^+ , 2), 435 (5), 410 (29), 409 (100), 395 (13), 394 (43), 105 (2), 77 (2); HRFABMS Molecular ion calcd for $C_{34}H_{31}N_2O_4$: 531.2284, found: 531.2280; Anal.Calcd for $C_{34}H_{30}N_2O_4$: C, 76.96; H, 5.70; N, 5.28. Found: C, 77.12; H, 5.65; N, 4.91.

6,7-Dihydro-9,10-dimethoxy-2-(3,4-methylenedioxyphenyl)benzo[*a*]quinolizine-4-one (2d)

cis-**2d**

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); *cis*-**2d**: a bright yellow solid; m.p. (ethyl acetate-hexane) = 203-204 °C; IR (nujol): 3359, 1667, 1635, 1531, 1515 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.87 (dt, *J* = 15.7, 4.3 Hz, 1H, H-7α), 3.00 (ddd, *J* = 15.7, 10.0, 4.8 Hz, 1H, H-7β), 3.58 (ddd, *J* = 12.7, 10.0, 4.3 Hz, 1H, H-6α), 3.93, 3.94 (2s, 6H, OCH₃), 4.41 (dd, *J* = 7.4, 7.3 Hz, 1H, H-2), 4.48 (ddd, *J* = 12.7, 4.8, 4.3 Hz, 1H, H-6β), 5.09 (dd, *J* = 7.4, 5.5 Hz, 1H, H-3), 5.91 (s, 2H, OCH₂O), 6.07 (d, *J* = 7.3 Hz, 1H, H-1), 6.55-6.64 (m, 2H, ArH), 6.68 (d, *J* = 6.8 Hz, 1H, ArH), 6.69 (s, 1H, ArH), 6.98 (d, *J* = 5.5 Hz, 1H, NH), 7.16 (s, 1H, ArH), 7.38-7.48 (m, 2H, ArH), 7.48-7.56 (m, 1H, ArH), 7.69-7.78 (m, 2H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 28.6, 39.4, 39.5, 54.4, 55.9, 56.0, 101.0, 103.2, 106.8, 108.3, 108.4, 110.8, 121.1, 122.1, 127.0, 127.2, 128.5, 129.9, 131.6, 134.2, 135.1, 147.0, 147.9, 148.3, 149.8, 166.9, 167.4; MS: *m/z* (% relative intensity) 498 (M⁺, 24), 393 (100), 378 (45), 377 (95), 362 (24), 105 (2), 77 (8); HRFABMS Molecular ion calcd for C₂₉H₂₇N₂O₆: 499.1869, found: 499.1872; Anal. Calcd for C₂₉H₂₆N₂O₆ (498.53): C, 69.87; H, 5.26; N, 5.62. Found: C, 69.47; H, 5.10; N, 5.52.

trans-**2d**

trans-**2d**: a white solid; m.p. (ethyl acetate-hexane) = 203-204 °C ; IR (nujol): 3306, 1688, 1647, 1542, 1515 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.79 (dt, *J* = 15.6, 4.2 Hz,

1H, H-7 α), 2.94 (ddd, $J = 15.6, 10.1, 4.8$ Hz, 1H, H-7 β), 3.47 (ddd, $J = 12.7, 10.1, 4.2$ Hz, 1H, H-6 α), 3.87-4.00 (m, 7H, OCH₃ and H-2), 4.50 (ddd, $J = 12.7, 4.8, 4.2$ Hz, 1H, H-6 β), 5.08 (dd, $J = 14.1, 8.8$ Hz, 1H, H-3), 5.72 (d, $J = 2.8$ Hz, 1H, H-1), 5.94 (s, 2H, OCH₂O), 6.65 (d, $J = 8.8$ Hz, 1H, NH), 6.66 (s, 1H, ArH), 6.76 (d, $J = 8.0$ Hz, 1H, ArH), 6.84 (dd, $J = 8.0, 1.6$ Hz, 1H, ArH), 6.93 (d, $J = 1.6$ Hz, 1H, ArH), 7.05 (s, 1H, ArH), 7.32-7.40 (m, 2H, ArH), 7.40-7.49 (m, H, ArH), 7.62-7.70 (m, 2H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 28.7, 39.6, 44.1, 54.9, 55.9, 56.1, 101.0, 104.7, 106.6, 108.2, 108.4, 110.8, 121.1, 121.5, 127.1, 127.5, 128.4, 131.4, 134.3, 134.4, 134.7, 146.9, 147.9, 148.2, 149.7, 167.8, 168.3; MS: m/z (% relative intensity) 498 (M⁺, 23), 393 (80), 378 (40), 377 (100), 362 (28), 105 (3), 77 (10); HRFABMS Molecular ion calcd for C₂₉H₂₇N₂O₆: 499.1869, found: 499.1867; Anal. Calcd for C₂₉H₂₆N₂O₆ (498.53): C, 69.87; H, 5.26; N, 5.62. Found: C, 69.57; H, 5.24; N, 5.54.

6,7-Dihydro-9,10-dimethoxy-1-methyl-2-(3,4-methylenedioxyphenyl)benzo[*a*]-quinolizine-4-one (2e)

cis-2e

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); *cis*-**2e**: a yellow solid; m.p. (ethyl acetate-hexane) = 192-193 °C; IR (nujol): 3382, 1647, 1608, 1577, 1513 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.05 (s, 3H, CH₃), 2.88-2.93 (m, 1H, H-7 α), 3.00 (ddd, $J = 13.6, 12.0, 4.4$ Hz, 1H, H-7 β), 3.14 (ddd, $J = 12.3, 12.0, 3.3$ Hz, 1H, H-6 α), 3.94, 3.95 (2s, 6H, OCH₃), 4.20 (d, $J = 7.6$ Hz, 1H, H-2), 4.58-4.67 (m, 1H, H-6 β), 5.07 (dd, $J = 7.6, 5.2$ Hz, 1H, H-3), 5.92 (s, 2H, OCH₂O), 6.57-6.65 (m, 2H, ArH), 6.69 (d, $J = 7.7$ Hz, 1H, ArH), 6.80 (s, 1H, ArH), 7.00 (d, $J = 5.2$ Hz, 1H, NH), 7.05 (s, 1H, ArH), 7.40-7.55 (m, 3H, ArH), 7.74-7.80 (m, 2H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 19.2, 28.6, 40.6, 45.7, 53.9, 56.0, 56.2, 101.0, 108.3, 108.6, 110.2, 112.4, 116.8, 122.6,

123.2, 127.1, 128.5, 129.9, 130.2, 131.6, 134.2, 147.0, 147.1, 147.9, 149.0, 165.6, 167.5;
 MS: m/z (% relative intensity) 512 (M^+ , 5), 407 (3), 393 (7), 392 (31), 391 (100), 377
 (12), 376 (33), 105 (4), 77 (17); HRFABMS Molecular ion calcd for $C_{30}H_{29}N_2O_6$:
 513.2026, found: 513.2032; Anal. Calcd for $C_{30}H_{28}N_2O_6$ (512.55): C, 70.30; H, 5.51; N,
 5.47. Found: C, 70.53; H, 5.56; N, 5.32.

trans-2e

trans-2e: a white solid; m.p. (ethyl acetate-hexane) = 158-159 °C; IR (nujol): 3295, 1674, 1631, 1548, 1515 cm^{-1} ; 1H NMR (300 MHz, $CDCl_3$): δ 1.83 (s, 3H, CH_3), 2.77 (t, J = 5.8 Hz, 2H, H-7 α and H-7 β), 3.51-3.62 (m, 1H, H-6 α), 3.85-4.01 (m, 8H, OCH_3 , H-2 and H-6 β), 5.08 (dd, J = 9.7, 8.7 Hz, 1H, H-3), 5.93 (d, J = 2.9 Hz, 1H, $OCHHO$), 5.94 (d, J = 2.9 Hz, 1H, $OCHHO$), 6.72-6.90 (m, 5H, ArH and NH), 6.98 (s, 1H, ArH), 7.30-7.39 (m, 2H, ArH), 7.41-7.49 (m, 1H, ArH), 7.61-7.68 (m, 2H, ArH); ^{13}C NMR (75 MHz, $CDCl_3$): δ 19.7, 28.6, 41.0, 49.6, 54.9, 56.0, 56.3, 101.0, 108.2, 108.8, 110.1, 112.6, 115.0, 122.3, 123.3, 127.1, 128.3, 130.3, 130.6, 131.4, 131.8, 134.0, 146.8, 146.9, 147.9, 148.9, 167.0, 167.6; MS: m/z (% relative intensity) 512 (M^+ , 0.6), 393 (16), 378 (27), 377 (100), 376 (35), 362 (33); HRFABMS Molecular ion calcd for $C_{30}H_{29}N_2O_6$: 513.2026, found: 513.2027; Anal. Calcd for $C_{30}H_{28}N_2O_6$ (512.55): C, 70.30; H, 5.51; N, 5.47. Found: C, 70.28; H, 5.56; N, 5.56.

6,7-Dihydro-9,10-dimethoxy-1-phenyl-2-(3,4-methylenedioxyphenyl)benzo[*a*]-quinolizine-4-one (2f)

cis-**2f**

Purified by preparative thin-layer chromatography (50% ethyl acetate-hexane); *cis*-**2f**: a white solid; m.p. (ethyl acetate-hexane) = 256-257 °C; IR (nujol): 3293, 1667, 1634, 1516 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.91-3.01 (m, 1H, H-7 α), 3.11 (ddd, *J* = 13.4, 12.0, 4.3 Hz, 1H, H-7 β), 3.23 (s, 3H, OCH₃), 3.42 (ddd, *J* = 12.3, 12.0, 3.7 Hz, 1H, H-6 α), 3.90 (s, 3H, OCH₃), 4.53 (ddd, *J* = 12.3, 4.3, 3.7 Hz, H-6 β), 4.72 (d, *J* = 6.7 Hz, 1H, H-2), 5.33 (dd, *J* = 6.7, 5.2 Hz, 1H, H-3), 5.877 (s, 1H, OCHHO), 5.882 (s, 1H, OCHHO), 6.37 (s, 1H, ArH), 6.55-6.72 (m, 4H, ArH), 7.05 (d, *J* = 5.2 Hz, 1H, NH), 7.12-7.28 (m, 5H, ArH), 7.41-7.58 (m, 3H, ArH), 7.76-7.84 (m, 2H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 28.6, 40.6, 46.4, 54.6, 55.1, 55.8, 100.9, 108.3, 108.6, 109.6, 113.3, 121.2, 122.5, 122.6, 127.1, 127.2, 128.0, 128.6, 129.5, 130.2, 131.5, 131.7, 134.1, 139.5, 146.6, 147.0, 147.9, 148.9, 166.2, 167.5; MS: *m/z* (% relative intensity) 574 (M⁺, 8), 454 (31), 453 (100), 438 (20), 377 (7); HRFABMS Molecular ion calcd for C₃₅H₃₁N₂O₆: 575.2182, found: 575.2181; Anal. Calcd for C₃₅H₃₀N₂O₆ (574.62): C, 73.16; H, 5.26; N, 4.88. Found: C, 73.36; H, 5.44; N, 4.94.

trans-**2f**

trans-**2f**: a amorphous solid; IR (nujol): $\nu_{\max}$ 3337, 1668, 1651, 1512 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 2.83-2.95 (m, 1H, H-7 α), 2.95-3.09 (m, 1H, H-7 β), 3.17 (s, 3H, OCH₃), 3.44 (m, 1H, H-6 α), 3.89 (s, 3H, OCH₃), 4.29-4.39 (m, 2H, H-2 and H-6 β), 5.09 (dd, *J* =

7.7, 3.0 Hz, 1H, H-3), 5.90 (s, 1H, OCHHO), 5.91 (s, 1H, OCHHO), 6.33 (s, 1H, ArH), 6.69 (s, 1H, ArH), 6.72 (d, $J = 8.4$ Hz, 1H, ArH), 6.84 (d, $J = 7.7$ Hz, 1H, NH), 6.86-6.91 (m, 2H, ArH), 7.02-7.10 (m, 2H, ArH), 7.10-7.24 (m, 3H, ArH), 7.42-7.59 (m, 3H, ArH), 7.80-7.86 (m, 2H, ArH); ^{13}C NMR (75 MHz, CDCl_3): 28.7, 40.6, 50.3, 55.1, 55.9, 56.3, 101.0, 108.3, 108.6, 109.7, 113.3, 117.9, 121.4, 122.1, 127.1, 128.6, 128.7, 129.9, 130.0, 131.7, 131.8, 134.0, 140.0, 146.5, 146.9, 148.0, 148.9, 165.5, 167.5; MS: m/z (% relative intensity) 574 (M^+ , 8), 454 (37), 453 (100), 438 (25), 377 (13); HRFABMS Molecular ion calcd for $\text{C}_{35}\text{H}_{31}\text{N}_2\text{O}_6$: 575.2182, found: 575.2181.

6,7-Dihydro-9,10-dimethoxy-2-(3,4-methylenedioxyphenyl)benzo[*a*]quinolizine-4-one (2g)

Purified by preparative thin-layer chromatography (70% ethyl acetate-hexane); *cis*-**2g**: a bright green solid; m.p. (ethyl acetate-hexane) = 210-211 °C; IR (nujol): 3395, 1681, 1662, 1607, 1513 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3): δ 2.02 (s, 3H, CH_3), 2.84 (dt, $J = 15.7, 4.2$ Hz, 1H, H-7 α), 2.96 (ddd, $J = 15.7, 10.1, 4.9$ Hz, 1H, H-7 β), 3.53 (ddd, $J = 12.8, 10.1, 4.2$ Hz, 1H, H-6 α), 3.89, 3.92 (2s, 6H, OCH_3), 4.23 (t, $J = 7.3$ Hz, 1H, H-2), 4.43 (ddd, $J = 12.8, 4.9, 4.2$ Hz, 1H, H-6 β), 4.89 (dd, $J = 7.3, 5.9$ Hz, 1H, H-3), 5.91 (d, $J = 5.2$ Hz, 1H, OCHHO), 5.92 (d, $J = 5.2$ Hz, 1H, OCHHO), 5.99 (d, $J = 7.3$ Hz, 1H, H-1), 6.29 (d, $J = 5.9$ Hz, 1H, NH), 6.53-6.57 (m, 2H, ArH), 6.67 (s, 1H, ArH), 6.71 (d, $J = 8.4$ Hz, 1H, ArH), 7.10 (s, 1H, ArH); ^{13}C NMR (100 MHz, CDCl_3): δ 23.2, 28.5, 39.3, 39.5, 54.0, 55.9, 56.0, 101.0, 103.2, 106.6, 108.2, 108.4, 110.7, 121.1, 121.8, 127.1, 130.0, 134.9, 147.0, 147.8, 148.2, 149.7, 166.8, 170.1; MS: m/z (% relative intensity) 436 (M^+ , 26), 393 (25), 378 (28), 377 (100), 362 (30); HRFABMS Molecular ion calcd for

C₂₄H₂₅N₂O₆: 437.1713, found: 437.1708; Anal. Calcd for C₂₄H₂₄N₂O₆ (436.46): C, 66.04; H, 5.54; N, 6.42. Found: C, 65.76; H, 5.72; N, 6.45.

trans-2g

trans-2g: a pale yellow amorphous solid; IR (nujol): 1661, 1651, 1513 cm⁻¹; ¹H NMR (300 MHz, CDCl₃): δ 1.93 (s, 3H, CH₃), 2.76 (dt, *J* = 15.5, 4.6 Hz, 1H, H-7α), 2.90 (ddd, *J* = 15.5, 10.2, 4.8 Hz, 1H, H-7β), 3.38-3.50 (m, 1H, H-6α), 3.79 (dd, *J* = 14.0, 2.1 Hz, 1H, H-2), 3.86, 3.90 (2s, 6H, OCH₃), 4.42 (ddd, *J* = 12.6, 4.8, 4.6 Hz, 1H, H-6β), 4.86 (dd, *J* = 14.0, 9.0 Hz, 1H, H-3), 5.63 (d, *J* = 2.1 Hz, 1H, H-1), 5.95 (s, 2H, OCH₂O), 6.18 (d, *J* = 9.0 Hz, 1H, NH), 6.63 (s, 1H, ArH), 6.77 (s, 2H, ArH), 6.85 (s, 1H, ArH), 7.00 (s, 1H, ArH); ¹³C NMR (75 MHz, CDCl₃): δ 23.0, 28.6, 39.5, 43.7, 54.5, 55.9, 56.0, 101.0, 104.6, 106.6, 108.2, 108.3, 110.7, 121.0, 121.4, 127.5, 134.3, 134.5, 146.8, 147.8, 148.2, 149.7, 168.1, 170.5; MS: *m/z* (% relative intensity) 435 (M⁺-1, 4), 394 (11), 393 (37), 392 (44), 378 (44), 377 (100), 376 (56), 363 (18), 362 (53); HRFABMS Molecular ion Calcd for C₂₄H₂₅N₂O₆: 437.1713, found: 437.1709.

6,7-Dihydro-9,10-dimethoxy-1-methyl-2-(3,4-methylenedioxyphenyl)benzo[*a*]-quinolizine-4-one (2h)

cis-2h

Purified by preparative thin-layer chromatography (70% ethyl acetate-hexane); *cis*-**2h**: a colorless oil; IR (nujol): 3317, 1661, 1651, 1645, 1512 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3): δ 1.99 (s, 3H, CH_3), 2.05 (s, 3H, $\text{CH}_3\text{C}=\text{O}$), 2.81-2.90 (m, 1H, H-7 α), 2.97 (ddd, $J = 13.5, 12.3, 4.5$ Hz, 1H, H-7 β), 3.10 (ddd, $J = 12.3, 12.3, 3.5$ Hz, 1H, H-6 α), 3.92, 3.94 (2s, 6H, OCH_3), 4.01 (d, $J = 6.9$ Hz, 1H, H-2), 4.53-4.63 (m, 1H, H-6 β), 4.88 (dd, $J = 6.9, 5.5$ Hz, 1H, H-3), 5.93 (s, 2H, OCH_2O), 6.31 (d, $J = 5.5$ Hz, 1H, NH), 6.55-6.60 (m, 2H, ArH), 6.72 (d, $J = 8.3$ Hz, 1H, ArH), 6.78 (s, 1H, ArH), 7.00 (s, 1H, ArH); ^{13}C NMR (75 MHz, CDCl_3): δ 19.1, 23.2, 28.6, 40.6, 45.7, 53.6, 56.0, 56.2, 101.0, 108.3, 108.7, 110.1, 112.3, 116.9, 122.3, 123.2, 128.7, 129.9, 130.1, 147.0, 147.1, 147.9, 149.0, 165.6, 170.3; MS: m/z (% relative intensity) 450 (M^+ , 9), 407 (4), 392 (31), 391 (100), 376 (35); HRFABMS Molecular ion Calcd for $\text{C}_{25}\text{H}_{27}\text{N}_2\text{O}_6$: 451.1869, found: 451.1874.

trans-**2h**

trans-**2h**: a white solid; m.p. (ethyl acetate-hexane) = 209-210 $^{\circ}\text{C}$; IR (nujol): 3309, 1677, 1652, 1552, 1512 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3): δ 1.80 (s, 3H, CH_3), 1.94 (s, 3H, $\text{CH}_3\text{C}=\text{O}$), 2.77 (br t, $J = 5.8$ Hz, 2H, H-7 α and H-7 β), 3.49-3.59 (m, 1H, H-6 α), 3.70 (d, $J = 9.6$ Hz, 1H, H-2), 3.87-3.97 (m, 7H, OCH_3 and H-6 β), 4.89 (dd, $J = 9.6, 8.7$ Hz, 1H, H-3), 5.96 (s, 2H, OCH_2O), 6.15 (d, $J = 8.7$ Hz, 1H, NH), 6.70-6.82 (m, 4H, ArH), 6.95 (s, 1H, ArH); ^{13}C NMR (75 MHz, CDCl_3): δ 19.7, 23.1, 28.6, 40.9, 49.5, 54.4, 56.0, 56.2, 101.0, 108.2, 108.8, 110.1, 112.6, 114.7, 122.3, 123.2, 130.3, 130.5, 131.7, 146.8, 147.8, 148.9, 166.8, 170.2; MS: m/z (% relative intensity) 451 ($\text{M}^+ + 1$, 1), 392 (29), 391 (100), 376 (63); HRFABMS Molecular ion Calcd for $\text{C}_{25}\text{H}_{27}\text{N}_2\text{O}_6$: 451.1869, found: 451.1868.

Preparation of benzo[d]azocin-4-ones (3a-3b)

A solution of azlactone **9** (1 mmol) and 6,7-dimethoxy-3,4-dihydroisoquinolines **6a** (1.2 mmol) in acetonitrile (10 mL) was heated at reflux for 2 h. On cooling, the crude product was filtered and further purified by recrystallization.

N-(8,9-Dimethoxy-6-methyl-4-oxo-1,2,3,4-tetrahydrobenzo[d]azocin-5-yl)benzamide (**3a**)

Purified by recrystallization (ethyl acetate-hexane); a white solid; m.p. = 210-211 °C, IR (nujol): 3355, 3242, 1666, 1631, 1518, 1253, 1153, 706 cm⁻¹; ¹H NMR (300 MHz, CDCl₃+CD₃OD): δ 2.04 (s, 3H, CH₃), 2.67-2.80 (m, 1H, H-1α), 3.10-3.30 (m, 2H, H-1β and H-2α), 3.79, 3.82 (2s, 6H, OCH₃), 3.97-4.10 (m, 1H, H-2β), 6.61 (s, 1H, ArH), 6.67 (s, 1H, ArH), 7.36-7.45 (m, 2H, ArH), 7.45-7.53 (m, 1H, ArH), 7.88 (br d, *J* = 7.2 Hz, 2H, ArH); ¹³C NMR (75 MHz, CDCl₃+CD₃OD): δ 19.5, 32.0, 41.5, 55.7, 55.8, 111.0, 112.1, 126.4, 127.4, 127.8, 128.4, 132.0, 132.1, 132.6, 132.9, 147.4, 148.4, 166.8, 171.3; MS: *m/z* (% relative intensity) 366 (M⁺, 89), 337 (94), 206 (100), 105 (30), 77 (26); HRFABMS Molecular ion Calcd for C₂₁H₂₃N₂O₄: 367.1658, found: 367.1663.

N-(6-Benzyl-8,9-dimethoxy-4-oxo-1,2,3,4-tetrahydrobenzo[d]azocin-5-yl)benzamide (**3b**)

Purified by recrystallization (ethyl acetate-hexane); a white solid; m.p. = 200-201 °C; IR (nujol): 3207, 1652, 1645, 1512, 1253, 1142 cm^{-1} ; ^1H NMR (300 MHz, $\text{CDCl}_3+\text{CD}_3\text{OD}$): δ 2.38-2.51 (m, 1H, H-1 α), 2.55-2.69 (m, 1H, H-1 β), 3.11-3.24 (m, 1H, H-2 α), 3.54 (br d, J = 14.2 Hz, 1H, PhCHH), 3.76, 3.79 (2s, 6H, OCH_3), 3.99-4.14 (m, 2H, H-2 β and PhCHH), 6.46 (s, 1H, ArH), 6.69 (s, 1H, ArH), 6.94-7.02 (m, 2H, ArH), 7.06-7.17 (m, 3H, ArH), 7.36-7.46 (m, 2H, ArH), 7.46-7.55 (m, 1H, ArH), 7.83-7.91 (m, 2H, ArH); ^{13}C NMR (75 MHz, $\text{CDCl}_3+\text{CD}_3\text{OD}$): δ 31.9, 39.7, 41.4, 55.6, 55.8, 111.6, 112.2, 126.4, 126.5, 127.4, 128.4, 128.5, 128.8, 129.1, 130.2, 132.1, 132.7, 135.5, 137.1, 147.1, 148.3, 166.9, 171.2; MS: m/z (% relative intensity) 442 (M^+ , 12), 351 (100), 292 (31), 105 (7), 77 (12); HRFABMS Molecular ion Calcd for $\text{C}_{27}\text{H}_{27}\text{N}_2\text{O}_4$: 443.1971, found: 443.1974.

***N*-(8,9-Dimethoxy-4-oxo-6-phenyl-1,2,3,4-tetrahydrobenzo[*d*]azocin-5-yl)-benzamide (3c)**

Purified by recrystallization (CH_2Cl_2 -hexane); a white solid; m.p. = 213-214 °C; IR (KBr): ν_{max} 3331, 1652, 1510, 1475, 1260, 1120, 704 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3): δ 2.83-2.97 (m, 1H, H-1 α), 3.32-3.53 (m, 2H, H-1 β and H-2 α), 3.72, 3.87 (2s, 6H, OCH_3), 4.00-4.14 (m, 1H, H-2 β), 5.99-6.06 (m, 1H, NH-), 6.61 (s, 1H, ArH), 6.69 (s, 1H, ArH), 7.28-7.44 (m, 7H, ArH), 7.46-7.52 (m, 1H, ArH), 7.67 (d, J = 7.4 Hz, 2H, ArH), 8.39 (s, 1H, NH-); ^{13}C NMR (75 MHz, CDCl_3): δ 32.4, 41.7, 55.86, 55.89, 112.0, 113.0, 127.2, 128.1, 128.2, 128.3, 128.6, 129.0, 129.2, 129.3, 131.2, 132.1, 132.8, 138.3, 147.6, 148.8, 164.6, 169.4; MS: m/z (% relative intensity) 428 (M^+ , 100), 399 (50), 279 (54), 268 (93), 105 (60), 77 (31); HRTOFMS Molecular ion Calcd for $\text{C}_{26}\text{H}_{24}\text{N}_2\text{O}_4$: 429.1809, found: 429.1809; Anal. Calcd for $\text{C}_{26}\text{H}_{24}\text{N}_2\text{O}_4$ (428.48): C, 72.88; H, 5.65; N, 6.54. Found: C, 72.48; H, 5.83; N, 6.33.

¹H NMR (400 MHz, CDCl₃)

¹³C NMR (100 MHz, CDCl₃)

¹H NMR (300 MHz, CDCl₃)

¹³C NMR (75 MHz, CDCl₃)

¹³C NMR (100 MHz, CDCl₃)

^1H NMR (300 MHz, CDCl_3)

¹³C NMR (75 MHz, CDCl₃)

¹H NMR (400 MHz, CDCl₃)

¹³C NMR (100 MHz, CDCl₃)

¹H NMR (400 MHz, CDCl₃)

¹³C NMR (100 MHz, CDCl₃)

¹H NMR (400 MHz, CDCl₃)

¹³C NMR (100 MHz, CDCl₃)

¹H NMR (400 MHz, CDCl₃)

¹³C NMR (100 MHz, CDCl₃)

¹H NMR (300 MHz, CDCl₃)

¹³C NMR (75 MHz, CDCl₃)

¹H NMR (300 MHz, CDCl₃)

¹³C NMR (75 MHz, CDCl₃)

¹H NMR (300 MHz, CDCl₃)

¹³C NMR (75 MHz, CDCl₃)

¹H NMR (300 MHz, CDCl₃+CD₃OD)

¹³C NMR (75 MHz, CDCl₃+CD₃OD)

¹H NMR (300 MHz, CDCl₃+CD₃OD)

¹³C NMR (75 MHz, CDCl₃+CD₃OD)

¹³C NMR (75 MHz, CDCl₃)