New Palladium-Catalyzed Reaction Pathway to Erythrina Skeleton

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4b	v	v	v	v	¹ H and ¹³ C NMR
5b	v	v	v	v	¹ H and ¹³ C NMR
6b	v	v	v	v	¹ H and ¹³ C NMR
7b	v	v	v	v	¹ H and ¹³ C NMR
8b	v	v	v	v	¹ H and ¹³ C NMR
9b	v	v	v	v	

a. General Experimental Methods

All reactions were performed in oven-dried glassware with magnetic stirring. Commercial grade reagents were used without further purification. TLC analysis was performed using glass plate precoated with silica gel 60F₂₅₄. Flash column chromatography was performed with 230-400 mesh silica gel. ¹H NMR spectra were obtained on 400 MHz spectrometers. NMR spectra were recorded in parts per million (δ) relative to the peak for tetramethylsilane (δ =0.00) as an internal standard.

b. Spectral data and spectra

Spectral data for **3b**: IR (KBr): 1690, 1458, 1324, and 759 cm⁻¹; ¹H-NMR (400 MHz, CDCl₃) δ 7.45 (d, 1H, J = 7.6 Hz), 7.28-7.18 (m, 3H), 5.70 (s, 1H), 4.88 (d, 1H, J = 15 Hz), 4.34 (d, 1H, J = 15 Hz), 2.9-2.87 (m, 1H), 2.67-2.58 (m, 1H), 2.21-2.18 (m, 2H), 1.83-1.64 (m, 3H), and 1.52-1.44 (m, 1H); ¹³C-NMR (100 MHz, CDCl₃) δ 177.5, 167.0, 141.5, 141.4, 128.1, 126.7, 123.6, 122.3, 119.3, 77.0, 47.9, 40.5, 28.2, 27.5, and 21.0; mass spectrum (EI) m/z 225 (M^+ , 100); EI-HRMS : calcd for C₁₅H₁₅NO 225.1154, found 225.1157.

Spectral data for **4b**: IR (KBr) : 1695, 1476, 1271, and 1037 cm⁻¹; ¹H-NMR (400 MHz, CDCl₃) δ 6.94 (s, 1H), 6.67 (s, 1H), 5.97-5.96 (m, 2H), 5.73 (s, 1H), 4.80 (d, 1H, J =

14.4 Hz), 4.27 (d, 1H, $J = 14.4$ Hz), 2.93-2.90 (m, 1H), 2.61-2.58 (m, 1H), 2.23-2.17 (m, 1H), 1.80-1.65 (m, 4H), and 1.50 (m, 1H); ^{13}C -NMR (100 MHz, CDCl_3) δ 177.5, 167.3, 147.8, 146.7, 134.5, 134.3, 119.4, 104.1, 103.3, 101.4, 76.7, 47.9, 40.6, 28.2, 27.4, and 21.1; mass spectrum (EI) m/z 269 (M^+ , 100); EI-HRMS : calcd for $\text{C}_{16}\text{H}_{15}\text{NO}_3$ 269.1052, found 269.1056.

Spectral data for **5b**: IR (KBr): 1733, 1683, 1506, 1488, 1364, 1228, and 1037cm^{-1} ; ^1H -NMR (400 MHz, CDCl_3) δ : 7.26 (s, 1H), 7.02 (s, 1H), 5.95 (s, 1H), 5.92 (m, 2H), 3.96 (q, 1H, $J = 6.4$ Hz), 3.47 (q, 1H, $J = 6.4$ Hz), 2.95-2.92 (m, 3H), 2.81 (m, 1H), 2.42-2.39 (m, 1H), 2.17 (m, 1H), 1.68 (m, 2H), and 1.56-1.42 (m, 2H).; ^{13}C -NMR (100 MHz, CDCl_3) δ 179.7, 164.0, 146.2, 145.5, 130.9, 128.1, 121.3, 109.5, 106.1, 101.0, 66.7, 41.4, 36.6, 29.5, 28.6, 27.9, and 21.2; mass spectrum (EI) m/z 283 (M^+ , 100); EI-HRMS : calcd for $\text{C}_{17}\text{H}_{17}\text{NO}_3$ 283.1208, found 283.1205.

Spectral data for **6b**: IR (KBr): 1685, 1502, and 1207cm^{-1} ; ^1H -NMR (400 MHz, CDCl_3) δ 6.97 (s, 1H), 6.75 (s, 1H), 5.73 (s, 1H), 4.85 (d, 1H, $J = 14.4$ Hz), 4.32 (d, 1H, $J = 14.4$ Hz), 3.90 (s, 3H), 3.86 (s, 3H), 2.95-2.93 (m, 1H), 2.61 (m, 1H), 2.24-2.21 (m, 2H), 1.82-1.72 (m, 3H), and 1.53 (m, 1H); ^{13}C -NMR (100 MHz, CDCl_3) δ 177.6, 167.3, 149.6, 148.0, 133.4, 133.3, 119.3, 106.5, 106.3, 77.2, 56.4, 56.0, 48.0, 40.7, 28.4, 27.5, and 21.4; mass spectrum (EI) m/z 285 (M^+ , 100); EI-HRMS : calcd for $\text{C}_{17}\text{H}_{19}\text{NO}_3$

285.1365, found 285.1361.

Spectral data for **7b**: IR (KBr): 1653, 1513, 1257, and 1223 cm^{-1} ; ^1H -NMR (500 MHz, CDCl_3) δ 7.02 (s, 1H), 6.66 (s, 1H), 5.86 (s, 1H), 4.04 (q, 1H, $J = 6.5$ Hz), 3.83 (s, 3H), 3.81 (s, 3H), 3.38 (q, 1H, $J = 6.5$ Hz), 2.96-2.77 (m, 4H), 2.39-2.36 (m, 1H), 2.19-2.17 (m, 2H), 1.72-1.68 (m, 1H), and 1.51-1.37 (m, 2H). ^{13}C -NMR (125 MHz, CDCl_3) δ 169.9, 164.4, 147.9, 146.4, 129.8, 127.0, 121.0, 112.3, 109.8, 66.2, 56.2, 55.7, 41.5, 36.1, 29.4, 28.2, 28.0, and 21.2; mass spectrum (EI) m/z 299 (M^+ , 100); EI-HRMS: calcd for $\text{C}_{18}\text{H}_{21}\text{NO}_3$ 299.1521, found 299.1521.

Spectral data for **8b**: IR : 1668 cm^{-1} , 1496 cm^{-1} , 1257 cm^{-1} , and 1039 cm^{-1} ; ^1H -NMR (400 MHz, CDCl_3) δ 7.43 (d, 1H, $J = 8.4$ Hz), 6.75-6.73 (m, 2H), 5.90 (s, 1H), 4.04 (q, 1H $J = 6.6$ Hz), 3.79 (s, 3H), 3.49 (q, 1H, $J = 6.6$ Hz), 3.01-2.85 (m, 4H), 2.41-2.38 (m, 1H), 2.18 (m, 1H), 1.69 (m, 2H), and 1.56-1.48 (m, 2H); ^{13}C -NMR (100 MHz, CDCl_3) δ 170.0, 164.5, 158.2, 136.0, 130.1, 126.3, 120.8, 114.6, 111.1, 66.4, 55.2, 41.5, 36.3, 29.4, 28.9, 28.0, and 21.1; mass spectrum (EI) m/z 269 (M^+ , 100); EI-HRMS : calcd for $\text{C}_{17}\text{H}_{19}\text{NO}_2$ 269.1416, found 269.1415.

Spectral data for **9b**: IR (KBr) : 1734, 1616, 1558, 1362, 1216 and 744 cm^{-1} ; ^1H -NMR (400 MHz, CDCl_3) δ : 7.00 (s, 1H), 6.70 (s, 1H), 5.96 (s, 1H), 4.10 (m, 1H), 4.04 (m, 4H), 3.85 (s, 3H), 3.75 (s, 3H), 3.57 (m, 1H), 2.98 (m, 1H), 2.42-2.30(m, 4H), 1.95-

1.87(m, 1H), and 1.28-1.24(m, 2H); ^{13}C -NMR (100 MHz, CDCl_3) δ : 172.2, 163.6, 159.4, 148.1, 146.6, 128.7, 126.5, 115.0, 112.0, 108.4, 95.4, 69.5, 64.5, 60.7, 55.9, 55.8, 37.3, 33.4, 27.0, and 26.9; mass spectrum (EI) m/z 357 (M^+ , 100); EI-HRMS : calcd for $\text{C}_{20}\text{H}_{23}\text{NO}_5$ 357.1576, found 357.1581.