Supporting Information

A Concise total Synthesis of (-)-Erinapyrone B from D-(+)-Malic acid

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TABLE OF CONTENTS

INFORMATION	Page
1. Experimental Procedure for known compounds	S1-S3
2. ¹ H NMR, ¹³ C NMR Spectrum & chiral-HPLC chromatogram of compound 5	S4
3. ¹ H NMR, ¹³ C NMR Spectrum & chiral-HPLC chromatogram of compound 6	S5
4. ¹ H NMR, ¹³ C NMR Spectrum & chiral-HPLC chromatogram of compound 7	S6
5. ¹ H NMR, ¹³ C NMR Spectrum & chiral-HPLC chromatogram of compound 8	S7
6. ¹ H NMR, ¹³ C NMR Spectrum & chiral-HPLC chromatogram of compound 9	S8
7. ¹ H NMR, ¹³ C NMR Spectrum & chiral-HPLC chromatogram of compound 10	S9
8. ¹ H NMR & Mass Spectrum of compound 11	S10
9. ¹ H NMR, ¹³ C NMR Spectrum & chiral-HPLC chromatogram of (-)-Erinapyrone B	S11

Dimethyl (R)-(+)-malate (5)

SOCl₂ (23.8 mL, 328.35 mmol) was added drop wise to a solution of (R)-Malic acid (20 g, 149.23 mmol) in dry MeOH (200 mL) at 0 °C. The resulting solution was stirred at room temperature for 18 hours. The solvent was removed *in vacuo* and distillation under reduced pressure yielded 22.8 g (95%) of the *title compound* as a clear and colorless liquid: bp 130-131 °C (15 mmHg); R_f 0.6 (60% EtOAc/hexanes); [α]_D²⁵ +10.18° (c 2.2, EtOH), {lit¹, [α]_D²² +10.7 (c 2.4, EtOH)}; ¹H NMR (400 MHz, CDCl₃) δ 4.52 (dd, *J* = 6.0, 4.6 Hz, 1H), 3.82 (s, 3H), 3.73 (s, 3H), 3.36 (br, 1H), 2.95-2.74 (m, 2H); ¹³C NMR (100MHz, CDCl₃): δ 172.6, 170.9, 67.1, 52.7, 51.9, 38.3; IR (DCM film) 3479, 3005, 2958, 2853, 2101, 1732, 1440, 1368, 1274, 1175, 1109, 1046, 994, 849, 786 cm⁻¹; MS (ESI) *m/z* 185.0 [M+Na]⁺; HRMS Calculated for C₆H₁₀O₅ [M+H]⁺ 163.0606; found 163.0615.

¹ Burton, J. W.; Clark, J. S.; Derrer, S.; Stork, T. C.; Bendall, J. G.; Holmes, A. B. *J. Am. Chem. Soc.* **1997**, *119*, 7483-7498

Methyl (3R)-3,4-dihydroxybutanoate (6)

Dimethyl (*R*)-(+)-malate (5.0 g, 30.86 mmol) was dissolved in warm dry THF (180 mL) and the resulting solution was allowed cool to room temperature. Borane -methyl sulfide complex solution (2.0 M in THF, 15.4 mL, 30.86 mmol) was added and the reaction mixture was stirred for 30 min. The reaction mixture was cooled to 0 °C and sodium borohydride (58 mg, 1.543 mmol) was added in one portion, and the solution was stirred at room temperature for 1.5 hours under a nitrogen atmosphere. The reaction was quenched by the cautious addition of dry methanol (20 mL) and then stirred for 30 min. The solvent was removed under reduced pressure and the crude product was purified by column chromatography over silica gel (EtOAc) to afford 3.7 g (90%) of the *title compound* as oil; R_f 0.2 (50% EtOAc/hexanes); $[\alpha]_D^{25} +20.80^\circ$ (c 2.0, MeOH), {lit¹, $[\alpha]_D^{20} +23.3^\circ$ (c 2.2, CHCl₃)}; ¹H NMR (400 MHz, CDCl₃) δ 4.13-4.07 (m, 1H), 3.71 (s, 3H), 3.65-3.45 (m, 2H), 2.57 (dd, J = 16.4, 7.8 Hz, 1H), 2.47 (dd, J = 16.4, 5.0 Hz, 1H). ¹³CNMR (100 MHz, CDCl₃) δ 173.4, 68.6, 65.8, 52.7, 37.6; IR (DCM film) 3534, 3265, 2954, 2884, 2104, 1731, 1441, 1300, 1173, 1084, 1040, 996, 866, 741 cm⁻¹; MS (ESI) m/z 133.9 [M-H]⁺; HRMS Calculated for C₅H₁₁O₄ [M+H]⁺ 135.0657; found 135.0623.

Methyl (3R)-4-(*tert*-butyldiphenylsilyloxy)-3-hydroxybutanoate (7)

Imidazole (3.04 g, 44.77 mmol) and *tert*-butyldiphenylsilyl chloride (7.38 g, 26.86 mmol) were added to a solution of diol **6** (3.0 g, 22.38 mmol) in 30 mL of dry DMF at 0 °C. The reaction mixture was stirred at room temperature for 18 hours under a nitrogen atmosphere, and then diluted with 50 mL of diethyl ether and 50 mL of water. The organic layer was separated and washed with aqueous hydrochloric acid (1 N, 3x15 mL), saturated aqueous NaHCO₃ solution (15 mL), and brine (15 mL), dried (MgSO₄), and concentrated under reduced pressure. The crude product was purified by column chromatography over silica gel (10% EtOAc in hexanes) to afford 4.9 g (90%) of the *title compound* as a white solid: mp 65-72 °C; R_f 0.6 (30% EtOAc/hexanes); $[\alpha]_D^{25} +7.167^\circ$ (c 1.22, CHCl₃), {lit², $[\alpha]_D^{20} +7.2^\circ$ (c 1.22, CHCl₃)}; ¹H NMR (400 MHz, CDCl₃) δ 7.66 (m, 4H), 7.35 (m, 6H), 4.18 (m, 1H), 3.73 (dd, J = 10.2, 5.7 Hz, 1H), 3.66 (d, J = 10.2, 5.7 Hz, 1H), 3.66 (s, 3H), 3.60 (d, J = 3.7Hz, 1H), 3.18 (s, 3H), 2.75-2.6 (m, 2H), 1.09 (s, 9H); ¹³C NMR (100MHz, CDCl₃): δ 173.2, 135.4, 133.23, 133.21, 129.7, 127.6, 68.6, 66.9, 61.1, 34.8, 31.8, 26.8, 19.2; IR (DCM film) 3480, 3071, 3049, 2931, 2858, 1731, 1428, 1361, 1260, 1170, 1113, 1070, 1007, 940, 823, 741, 703 cm⁻¹; MS (ESI) m/z 395.18 [M+Na]⁺; HRMS Calculated for C₂₁H₂₈O₄Si [M+Na]⁺ 395.1655; found 395.1629.

² Boukouvalas, J.; Fortier, G.; Radu, Ioan-Iosif. *J. Org. Chem.* **1998**, 63, 916-917

(R)-4-(tert-butylphenylsilyloxy)-3-hydroxy-N-methoxy-N-methylbutanamide (8)

Trimethylaluminum (1M solution in toluene, 16.12 mL, 16.12 mmol) was added to a solution of N,O-dimethylhydroxylamine hydrochloride (1.11g, 16.12 mmol) in 60 mL of CH₂Cl₂ at room temperature and the mixture was stirred for 30 min under a nitrogen atmosphere. A solution of ester **7** (2.0 g, 8.06 mmol) in 10 mL of CH₂Cl₂ was added drop wise and the reaction was heated under reflux for 24 hours under a nitrogen atmosphere. After cooling to room temperature, aqueous hydrochloric acid (0.5 N, 60 mL) was added and the resulting mixture was extracted with CH₂Cl₂ (3x30 mL). The combined organic layer was washed with aqueous NaHCO₃ solution (15 mL), brine (15 mL), dried (MgSO₄), and concentrated under reduced pressure. The crude product was purified by column chromatography over silica gel (30% EtOAc in hexanes) to afford 1.67 g (75%) of the *title compound* as a white solid; R_f 0.3 (30% EtOAc/hexanes); [α]_D²⁸ +19.16° (c 1.21, CHCl₃), {lit², [α]_D²⁰ +17.0° (c 1.22, CHCl₃)}; ¹H NMR (400 MHz, CDCl₃) δ 7.68 (m, 4H), 7.35 (m, 6H), 4.19 (m, 1H), 3.74 (dd, J = 10.2, 5.5 Hz, 1H), 3.68 (dd, J = 10.2, 5.7 Hz, 1H); 3.65 (s, 3H), 3.60 (d, J = 3.7 Hz, 1H), 2.76-2.58 (m, 2H); 1.07 (s, 9H); ¹³C NMR (100MHz, CDCl₃): δ 173.2, 170.9, 135.5, 133.2, 129.7, 127.6, 68.6, 66.9, 61.1, 52.7, 51.9, 34.8, 31.8, 26.8, 19.2; IR (DCM film) 3454, 3043, 2984, 2706, 1965, 1786, 1645, 1445, 1265, 1187, 1111, 1000, 939, 822, 740, 708 cm⁻¹; MS (ESI) m/z 402 (M+H)⁺; HRMS Calculated for C₂₂H₃₁NO₄Si [M+Na]⁺ 424.1920; found 424.1913.

(-)-Erinapyrone B (2)

Protected pyranone alcohol **10** (0.3 g, 0.789 mmol) was dissolved in 5 mL of THF, cooled to 0 °C, and treated with TBAF (1M solution in THF; 1.17 mL, 1.184 mmol). The resulting reaction mixture was stirred at room temperature under a nitrogen atmosphere. After 3 hours, the reaction mixture was concentrated under *vacuum*. The crude product was purified by column chromatography over silica gel (70% EtOAc in hexanes) to afford 89 mg (80%) of the title compound **(-)-Erinapyrone B** as a colorless liquid; R_f 0.3 (100% EtOAc); [α]_D²⁷ -220.6° (c 1.36, CHCl₃), {lit³, [α]_D²⁴ -209.6° (c 0.177, CHCl₃)}; ¹H NMR (400 MHz, CDCl₃) δ 5.38 (s, 1H), 4.56 (m, 1H), 3.93 (m, 1H), 3.78 (m, 1H); 2.63 (m, 1H), 2.34 (m, 1H), 1.95 (s, 3H); ¹³C NMR (100MHz, CDCl₃): δ 192.3, 173.9, 114.0, 105.0, 79.4, 64.0, 36.7, 33.8, 31.9, 29.6, 29.4, 29.3, 29.1, 28.9, 22.6, 20.9, 14.0. IR (DCM film) 3397, 2960, 2917, 2349, 2109, 1726, 1637, 1603, 1403, 1260, 1088, 1032, 932, 802 cm⁻¹; MS (ESI) m/z 143.0 (M+H)⁺; HRMS Calculated for C₇H₁₁O₃ [M+H]⁺ 143.0708; found 143.0705.

³ Noda, Y.; Fukaya, T.; Kikuchi, M. *Heterocycles* **1996**, *43*, 271-275.