Two New Dichromenes from *Evodia lepta*

Guo-Lin Li and Da-Yuan Zhu*

State Key Laboratory of Drug Research, Shanghai Institute of Materia Medica, Chinese Academy of Sciences, Shanghai 200031, People's Republic of China

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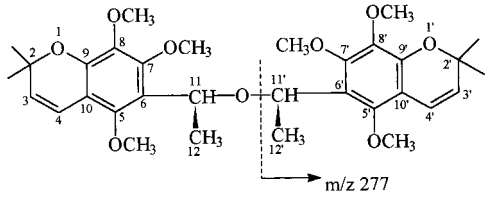
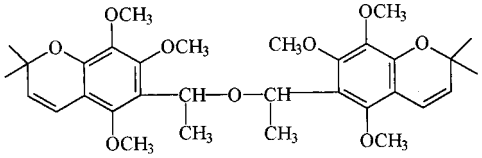
Two new dichromenes, **1** and **2**, were isolated from the aerial parts of *Evodia lepta*. Their structures were determined by spectroscopic analysis.

Evodia lepta (Spreng) Merr. (Rutaceae), a traditional Chinese herb, is widely used as a folk medicine to treat many diseases.[1] Previous papers have reported the isolation and identification of five chromenes, evodione, isoevodionol, leptol A (**3**), ethylleptol A, and leptene A,[1] from this plant.[2] Continuing with the chemical studies of *E. lepta*, we report herein the isolation and identification of two new dichromenes **1** and **2**.

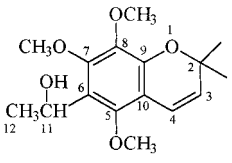


1



2 (RR or SS)

Compound **1** was isolated as a colorless oil, and HREIMS indicated $C_{32}H_{42}O_9$ to be its molecular formula (570.2842, requires 570.2829). The ^{1}H NMR spectrum was very similar to that of leptol A (**3**), except that the



3

H-11 signal in **1** appeared at δ 4.91 and in leptol A it appeared at δ 5.09. The ^{13}C NMR spectra of these two compounds were also very similar, except for some small chemical shift differences. The IR spectrum of **1** demonstrated that this compound had no hydroxyl group. The EIMS of this compound indicated 570 as its molecular weight, which is equal to that of the product of condensation of two molecules of **3** with loss of one molecule of water. The base ion peak, at *m/z* 277, is consistent with a fragment arising from cleavage of the oxygen link of a dimer. From the above evidence, we conclude that the planar structure of dichromene A is that shown. In its HMBC spectrum, H-11 is correlated with C-11′ and H-11′ is correlated with C-11, confirming the dimer structure **1**. Other correlations such as between H-4 and C-5 and C-9, H-11 and C-5 and C-7 and C-6, H-12 and C-6 demonstrate the correct placement of substituents in the aromatic ring.

Compound **2** was obtained as an orange oil, and HREIMS indicated its molecular formula to be $C_{32}H_{42}O_9$ (570.2816, requires 570.2829), the same as **1**. ^{1}H NMR and ^{13}C NMR spectra of **1** and **2** are very similar except for significant chemical shift differences in a few protons and carbons. Using the same method, the planar structure of **2** was shown to be identical to that of **1**, and hence, these compounds are diastereoisomers. Since the optical rotation of **1** is zero, it must be the meso *RS* stereoisomer, while the optically active **2** ($[\alpha]^{20}_D$ −13.7°) must be either the *RR* or *SS* enantiomer.

Experimental Section

General Experimental Procedures. ^{1}H and ^{13}C NMR and all 2D spectra were recorded in CD_3COCD_3 solution on a Bruker Am-400 spectrometer at 400 and 100 MHz, respectively, and the solvent signal was used as reference (2.05 ppm for ^{1}H NMR and 29.8 for ^{13}C NMR). Low-resolution EIMS were recorded on a MAT-95 spectrometer, and the HREIMS were obtained on a MAT-77 spectrometer. TLC was performed on silica gel F_{254}.

Plant Material. Aerial parts of *E. lepta* (Spreng) Merr. were collected from Hainan province, People's Republic of China, in July 1992. A voucher sample (no. 910042) is deposited in the herbarium of Shanghai Institute of Materia Medica, Chinese Academy of Sciences. A specimen was authenticated by Dr. Xiao-qiang Ma, Department of Phytochemistry, Shanghai Institute of Materia Medica, Chinese Academy of Sciences.

Extraction and Isolation. From the petroleum ether−EtOAc (10:1) part mentioned in a previous paper[2] we obtained compound **1** (50 mg) using petroleum ether−acetone (15:1) and compound **2** (22 mg) using petroleum ether−EtOAc (10:1) by repeated silica gel CC.

Dichromene A (1): colorless oil; $[\alpha]^{25}_D$ 0.00° (*c* 0.61, acetone); IR (film) ν_{max} cm^{-1} 2970, 2940, 1732, 1633, 1595, 1471, 1375, 1234, 1132, 1055, 980; ^{1}H NMR (CD_3COCD_3, 400 MHz) δ 6.48 (1H, d, J = 9.9 Hz, H-4), 5.68

* To whom correspondence should be addressed. Tel.: 0086-021-64311833 ext 318. Fax: 0086-021-64370269. E-mail: zjf21@server.shcnc.ac.cn.

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(1H, d, $J = 9.9$ Hz, H-3), 4.91 (1H, q, $J = 6.6$ Hz, H-11), 3.76 (3H, s, CH_3O-8), 3.66 (3H, s, CH_3O-7), 3.54 (3H, s, CH_3O-5), 1.59 (3H, d, $J = 6.6$, CH_3-12), 1.43, 1.39 (each 3H, s, 2 × CH_3-2); ^{13}C NMR (CD_3COCD_3, 100 MHz) δ 153.59 (s, C-7), 151.45 (s, C-5), 147.12 (s, C-9), 139.78 (s, C-8), 129.86 (d, C-3), 123.30(s, C-6), 118.04 (d, C-4), 112.78 (s, C-10), 76.67 (s, C-2), 67.55(d, C-11), 62.89, 61.40, 60.85 (each q, 3 × CH_3O-8, 7, 5), 27.91, 27.36 (each q, 2 × CH_3-2), 20.43 (q, C-12); HREIMS *m/z* $[M]^+$ 570.2842 ($C_{32}H_{42}O_9$ requires 570.2829); EIMS *m/z* $[M]^+$ 570 (22), 555 $[M - CH_3]^+$ (14), 277 (100).

Dichromene B (2): orange oil; $[\alpha]^{20}_D$ −13.7° (*c* 1.2, acetone); IR (film) ν_{max} cm^{-1} 2970, 2930, 1714, 1633, 1593, 1471, 1375, 1234, 1132, 1057, 980; ^1H NMR (CD_3COCD_3, 400 MHz) δ 6.54 (1H, d, $J = 9.9$ Hz, H-4), 5.71 (1H, d, $J = 9.9$ Hz, H-3), 4.91 (1H, q, $J = 6.7$ Hz, H-11), 3.81 (3H, s, CH_3O-8), 3.85 (3H, s, CH_3O-7), 3.71 (3H, s, CH_3O-5), 1.46 (3H, d, $J = 6.7$, CH_3-12), 1.45, 1.43 (each 3H, s, 2 × CH_3-2); ^{13}C NMR (CD_3COCD_3, 100 MHz) δ 153.63 (s, C-7), 151.32 (s, C-5), 147.06 (s, C-9), 139.68 (s, C-8), 129.78 (d, C-3), 123.10(s, C-6), 118.08 (d, C-4), 112.62 (s, C-10), 76.78 (s, C-2), 70.02(d, C-11), 63.23, 61.69, 60.92 (each q, 3 × CH_3O-8, 7, 5), 27.96, 27.61 (each q, 2 × CH_3-2), 22.06 (q, C-12); HREIMS *m/z* $[M]^+$ 570.2816 ($C_{32}H_{42}O_9$ requires 570.2829); EIMS *m/z* $[M]^+$ 570 (13), 555 $[M - CH_3]^+$ (11), 289 (39), 277 (100), 121 (76).

Leptol A (3). ^1H NMR (CD_3COCD_3, 400 MHz) δ 6.53 (1H, d, $J = 10.0$ Hz, H-4), 5.72 (1H, d, $J = 10.0$ Hz, H-3), 5.09 (1H, q, $J = 6.6$ Hz, H-11), 3.91, 3.81, 3.73 (each 3H, s, 3 × CH_3O-8, 7, 5), 1.51 (3H, d, $J = 6.6$, CH_3-12), 1.45 (6H, s, 2 × CH_3-2); ^{13}C NMR (CD_3COCD_3, 100 MHz) δ 152.93 (s, C-7), 150.25 (s, C-5), 146.92 (s, C-9), 139.58 (s, C-8), 130.05 (d, C-3), 124.59 (s, C-6), 117.87 (d, C-4), 112.53 (s, C-10), 76.93 (s, C-2), 63.95(d, C-11), 63.49, 61.96, 61.04 (each q, 3 × CH_3O-8, 7, 5), 27.89, 27.89 (each q, 2 × CH_3-2), 24.73(q, C-12).

References and Notes

(1) Jiangsu New Medical College. *The Dictionary of Chinese Herbs*; Shanghai Publishing House of Science and Technology: Shanghai, 1986; Vol. 1, p 68.
(2) Li, G. L.; Zeng, J. F.; Song, C. Q.; Zhu, D. Y. *Phytochemistry* **1997**, *44*, 1175−1177.

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