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SESQUITERPENE LACTONES, CHROMANS, AND OTHER CONSTITUENTS OF *OPHRYOSPORUS PIQUERIOIDES*

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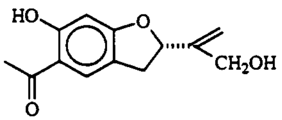
ABSTRACT.—The aerial parts of *Ophryosporus piquerioides* (Compositae) yielded two new stereoisomeric 3,4-dihydroxy-2,2-dimethyl-6,7-dimethoxychromans **6** and **7** in addition to three known eudesmanolides, 1β,5α-dihydroxy-10(14)eudesmene, a known benzofuran, scopoletin, and syringaresinol.

The literature contains reports on the chemistry of five out of nearly forty *Ophryosporus* species (Compositae, Eupatorieae) (1–4), but so far no general picture has emerged. Prenylated acetophenones, including chromenes and tremetone derivatives, as well as labdanes, are common, and in one instance sesquiterpene lactones have been isolated (4). We now report isolation from *Ophryosporus piquerioides* (DC.) Benth ex Baker, a taxon found in the selvas of Peru, Bolivia, and northwestern Argentina, of **1** (1), **2** (5), the eudesmanolides **3–5** (6,7), scopoletin, and the lignan syringaresinol. New are the isomeric 2,2-dimethyl-3,4-dihydroxychromanes **6** and **7**, oxidation products of the corresponding chromene (precocene II) which has been found in *Ophryophorus heptanthus* (3) and *Ophryophorus floribundus* (4).

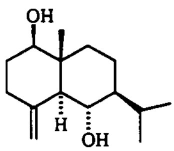
Assignment of stereochemistry to the isomeric diols was facilitated by comparison with the corresponding diols **8** and **9** isolated earlier from *Helianthella quinquenervis* (8). The ^{1}H-nmr spectrum of cis diol **7** exhibited mutually coupled signals at δ 4.75 and 3.67 ($J_{3,4}=4$ Hz), like cis diol **9** whose structure was secured by synthesis (8). The corresponding signals of trans diol **6** occurred at δ 4.51 and 3.59 ($J_{3,4}=8.5$ Hz) in conformity with the chemical shifts and coupling constant of H-3 and H-4 in **8**.

EXPERIMENTAL

GENERAL EXPERIMENTAL PROCEDURES.—For separation of mixtures, Waters hplc equip-



1



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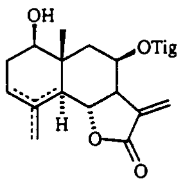
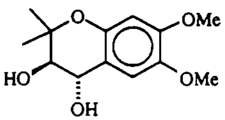
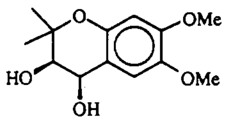


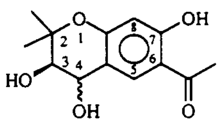
3 $\Delta^{3,4}$
4 $\Delta^{4,5}$
5 $\Delta^{4,15}$



6



7



8 4α-OH
9 4β-OH

ment (M45 pump, U6K injector with 2 ml loop and R-401 differential refractometer) and also a Konik KNC-500A liquid chromatograph (RI detector and Rheodyne injector with 3 ml loop) were used. Columns employed were a Phenomenex Maxsil 10C8 (10 × 500 mm) and a Phenomenex Ultremex 5C18 (10 × 250 mm). Rt's were measured from the solvent peak. Nmr spectra were obtained by means of Varian 300 and 500 MHz spectrometers and ms with a Finnigan GC/MS system Model 4510 at 70 eV. Known compounds were identified by ms and ^{1}H-nmr spectra.

PLANT MATERIAL.—Aerial parts of *O. piquerioides* were collected at the flowering stage on May 18, 1989 at Sierras de Medina, Tucumán Province, Argentina. A voucher specimen (C. Catalán No. 101) is on deposit in the herbarium of the Instituto Miguel Lillo, Tucumán, Argentina.

EXTRACTION AND ISOLATION.—Air-dried flowers and leaves (619 g) were extracted with $CHCl_3$ (2 × 5 liters) at room temperature for 3 days to give after evaporation 49.6 g (8.2%) of crude extract which was suspended in EtOH (566 ml) at 55° and diluted with H_2O (426 ml). The mixture was extracted successively with *n*-hexane (3 × 300 ml) and $CHCl_3$ (3 × 900 ml). The $CHCl_3$ extract on evaporation at reduced pressure furnished a residue (7.4 g) which was chromatographed over Si gel (200 g) using $CHCl_3$ with increasing amounts of EtOAc (0–100%), 58 fractions being collected which were monitored by tlc.

Fractions 15–26 (480 mg) were combined and subjected to cc on Si gel [$CHCl_3$-EtOAc (19:1)], 20 fractions being collected. Fractions 6–20 of the rechromatogram (296 mg) were combined; a 100-mg portion was processed by hplc [MeOH-H_2O (2:1), 2 ml/min] to give 0.9 mg of **1** (Rt 13 min), mixtures or unidentified material (Rt 14, 20.3, 22.5 min), 0.6 mg of **2** (Rt 25.1 min), 2.7 mg of **5** (Rt 16.3 min), 0.5 mg of **4** (Rt 21.1 min), and 1.5 mg of **3** (Rt 23.1 min). Fractions 27–52 from the original column were combined (1.41 g) and subjected to flash chromatography [Si gel, $CHCl_3$-EtOAc (3:1), 22 fractions]. Fractions 4–9 (884 mg) were combined, and a portion (100 mg) was processed by hplc [MeOH-H_2O (3:2), 1.6 ml/min] to give 29.2 mg of a mixture which showed four spots on tlc. Final purification by tlc on Si gel 60 HF [$CHCl_3$-EtOAc-MeOH (170:30:3)] gave 6.3 mg of **6** [Rt 0.13 min, $CHCl_3$-EtOAc (3:1)], 8.1 mg of **7** [Rt 0.21 min, $CHCl_3$-EtOAc (3:1)], 0.8 mg of syringaresinol [Rt 0.26 min, $CHCl_3$-EtOAc (3:1)], and 0.6 mg of scopoletin [Rt 0.42 min, $CHCl_3$-EtOAc (3:1)].

trans-*3,4-Dihydroxy-2,2-dimethyl-6,7-dimethoxychroman* [**6**].—Obtained only in the form of a gum: ir (film) 3401, 3009, 2966, 1612, 1503, 1448, 1409, 1379, 1364, 1327, 1266, 1220, 1188, 1170, 1144, 1122, 1005, 913, 852, 834, 793, 766, 665 cm^{-1}; ^{1}H-nmr (300 MHz, $CDCl_3$) δ 6.92 (s, H-8), 6.37 (s, H-5), 4.51 (brd, J = 8.5 Hz, H-4), 3.59 (d, J = 8.5 Hz, H-3), 3.85 and 3.82 (both s, 3H, -OMe's), 1.47 and 1.22 (s and brs, both 3H, Me's). The substance, kept in $CHCl_3$, had decomposed by the time an attempt at measuring the ms was made.

cis-*3,4-Dihydroxy-2,2-dimethyl-6,7-dimethoxychroman* [**7**].—Obtained only in the form of a gum: ir (film) 3403, 1619, 1510, 1451, 1413, 1384, 1369, 1335, 1265, 1244, 1201, 1148, 1128, 1106, 1012, 1040, 1012, 974, 940, 859, 833, 821, 790, 757, 665 cm^{-1}; ^{1}H-nmr ($CDCl_3$) δ 6.99 (s, H-8), 6.38 (s, H-5), 4.75 (br, H-4), 3.67 (br, H-3), 3.84 and 3.82 (both s, 3H, -OMe's), 1.46 and 1.27 (both s, 3H, Me's), 2.60 and 2.00 (both br, -OH's). On addition of D_2O the H-3 and H-4 signals sharpened to d's (J = 4) and the -OH signals disappeared. The substance, kept in $CDCl_3$, had decomposed by the time an attempt at measuring the ms was made.

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