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J. Nat. Prod., **1993**, 56 (3), 416-417• DOI:
10.1021/np50093a015 • Publication Date (Web): 01 July 2004

Journal of Natural Products
Vol. 56, No. 3, pp. 416-417, March 1993

COUMARINS FROM *BROSIMUM GAUDICHAUDII*

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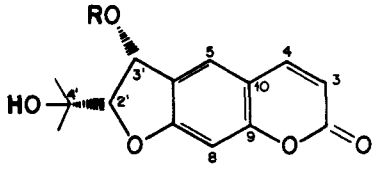
ABSTRACT.—The new coumarin, (+)-(2′*S*,3′*R*)-3-hydroxymarmesin [**1**], was isolated from the aqueous fraction of the EtOH extract of the root bark of *Brosimum gaudichaudii* (Moraceae).

Brosimum gaudichaudii Trécul. (Moraceae) is a shrub or small tree that grows in cerrado lands of Brazil. The plant is known as "mamica de cadela" or "algodão." The root bark has been used in popular medicine as a tea for the treatment of vitiligo (1). Previous work with nonpolar extracts or fractions has reported the presence of two furocoumarins, psoralen and bergapten, both from the roots (1) and the latter from the fruits (2). In subsequent work, psoralen was claimed to have inhibitory activity in the evolution of ancylostomes (3,4).

We have reinvestigated the EtOH extract from the roots of *B. gaudichaudii* in a search for more polar substances. We report here the isolation and identification, from the H_2O-soluble fraction of this extract, of (+)-(2′*S*,3′*R*)-3-hydroxymarmesin [**1**], as well as trace amounts of bergapten, psoralen, and umbelliferone. The structure of **1**, including absolute stereochemistry, was determined by comparison of the spectroscopic data with those reported in the literature for the same compound obtained from hydrolysis of a glycoside (5).



1 R=H
2 R=Ac

2D nmr data (homo and heteronuclear COSY) were also in agreement with the proposed structure. Acetylation of **1** with Ac_2O/pyridine led to substance **2**, whose nmr data also agree with the proposed structure. This is the first report of **1** occurring as a natural product as well as of its ^{13}C-nmr chemical shifts. Dihydrofurocoumarins of closely related structures are claimed to be potent coronary vasodilatators (5).

EXPERIMENTAL

GENERAL EXPERIMENTAL PROCEDURES.—The mp was obtained using a Fisher-Johns apparatus and is uncorrected. The ir spectrum was recorded with a Nicolet FT-IR spectrophotometer, and uv spectra were recorded on a Hitachi U-3210 spectrophotometer. The optical rotation was obtained on a Polamat A, Karl Zeiss polarimeter with MeOH. ^1H-nmr spectra at 200 MHz and ^{13}C-nmr spectra at 50 MHz, as well as homonuclear and heteronuclear COSY spectra, were recorded on a Bruker AC 200 spectrometer. The low resolution eims was recorded on a Hewlett Packard 5970 spectrometer.

EXTRACTION OF PLANT MATERIAL.—Roots of *B. gaudichaudii* were collected in Araraquara, and a voucher specimen is on deposit at our Institute. The dried and powdered root bark was exhaustively extracted in a Soxhlet extractor successively with hexane and EtOH. The EtOH was evaporated, and the residue was treated with MeOH. The MeOH-soluble part was evaporated to dryness and redissolved with H_2O. The H_2O-soluble part was submitted to cc (Amberlite XAD-2, H_2O/EtOH gradient). The more polar fractions (eluted with EtOH 5% and 10%) afforded mainly **1** with traces of impurities. Fractions eluted with EtOH 15%, 20%, and 25% afforded mixtures of **1**, umbelliferone, psoralen, and bergapten (identified by mp and tlc compari-

son with reference samples). Fractions eluted with 30% to 100% EtOH furnished only trace amounts of psoralen and bergapten. Compound **1** was purified by Si gel flash chromatography [1% HOAc in toluene-Et_2O (1:1)]. Compound **1** (5 mg) was treated with Ac_2O-pyridine (1:1) (2 ml, room temperature, 24 h). Usual workup furnished 5 mg of **2**.

(+)-(2'S,3'R)-3-Hydroxymarmesin [**1**].—White powder: mp 173–175° [lit. (5) 176°]; violet fluorescence under uv; ir (KBr) ν max 3383, 1707, 1627, 1570, 1125 cm^{-1}; uv λ max (MeOH, $c = 7.63 \times 10^{-5}$) nm (log ϵ) 327 (3.87), 300 sh (2.53), 258 (1.97), 246 (2.09), 223 (3.78); ^{13}C nmr (DMSO-d_6) δ 162.8 (C-7), 160.4 (C-2), 156.2 (C-9), 144.8 (C-4), 128.5 (C-6), 125.7 (C-5), 112.8 (C-10), 111.9 (C-3), 97.8 (C-8), 91.9 (C-2'), 71.0 (C-3'), 70.1 (C-4'), 26.9 and 26.5 (*gem*-dimethyl groups); ^1H nmr (DMSO-d_6) δ 8.00 (H-4, d, $J = 9.5$), 7.65 (H-5, s), 6.91 (H-8, s), 6.25 (H-3, d, $J = 9.5$), 6.06 (OH-3', d, $J = 6.0$), 5.26 (H-3', dd, $J = 6.0$), 4.86 (OH-4', s), 4.32 (H-2', d, $J = 6.0$), 1.35 and 1.31 (s, *gem*-dimethyl groups); $[\alpha]^{25}$ ($c = 0.0078$) 578 nm (+34), 546 nm (+39); low resolution eims *m/z* (rel. int.) $[M - 2 \times H_2O]^+$ 226 (100%) ($C_{14}H_{10}O_3$), $[M - 2 \times H_2O - CO]^+$ 198 (48%) ($C_{13}H_{10}O_2$), $[M - 2 \times H_2O - CO - Me]^+$ 183 (12%) ($C_{12}H_7O_2$), 155 (9%), 115 (7%), 75 (6%), 44 (12%).

Acetate of **1**.—^{13}C nmr ($CDCl_3$) δ 170.3 (OCOMe), 163.9 (C-7), 160.6 (C-2), 158.1 (C-9), 143.9 (C-4), 127.4 (C-5), 124.4 (C-6), 114.3 (C-10), 114.2 (C-3), 96.9 (C-8), 91.8 (C-2'), 73.2 (C-3'), 71.9 (C-4'), 27.5 and 27.3 (*gem*-dimethyl groups), 21.8 ($OCOCH_3$); ^1H nmr ($CDCl_3$) δ 7.59 (H-4, d, $J = 9.6$), 7.54 (H-5, s), 6.84 (H-8, s), 6.28 (H-3', d, $J = 6.2$), 6.24 (H-3, d, $J = 9.6$), 4.48 (H-2', d, $J = 6.2$), 2.09 ($OCOCH_3$, s), 1.46 and 1.44 (s, *gem*-dimethyl groups).

ACKNOWLEDGMENTS

We thank CNPq for a grant to W.V. and FAPESP for a grant to J.H.Y.V.

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Received 17 June 1992