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SHORT COMMUNICATION

MEIOCARPIN: A NOVEL LIGNAN FROM THE STEM BARK OF *MEIOCARPIDIUM LEPIDOTUM* (ANNONACEAE)

Silvere Ngouela[1], Guy Feuya[1], Jean C. Tchouankeu[1], Gaston Achoundong[2], Raymond B.T. Zambou[1], Etienne Tsamo[1*] and Joseph D. Connolly[3]

[1]Department of Organic Chemistry, Faculty of Science, University of Yaoundé I, P.O. Box 812, Yaoundé, Cameroon
[2]National Herbarium, P.O. Box 1601, Yaoundé, Cameroon
[3]Department of Chemistry, The University, Glasgow G 12 8QQ, Scotland, U.K.

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ABSTRACT. A new lignan, meiocarpin, and the known compounds, sitosterol and polycarpol, have been isolated from the stem bark of *Meiocarpidium lepidotum*, Annonaceae. The structure of the new compound was elucidated on the basis of its spectroscopic data.

KEY WORDS: *Meiocarpidium lepidotum*, Annonaceae, lignan

INTRODUCTION

The genus *Meiocarpidium* Engler and Diels [1] belongs to the Annonaceae (sub-family Annonoiideae, tribe Unoneae and sub-tribe Xylopideae). It is endemic to equatorial Africa and is found in the humid primary dense forests of South Cameroon, Equatorial Guinea, Gabon and the Congo [2, 3]. *Meiocarpidium lepidotum* is a small tree or shrub with silver leaves. The wood is used locally to make various utensils [4]. Previous studies on the stem, root bark, bark and leaves resulted in the isolation of the triterpenoid polycarpol (lanosta-7,9(11),24-triene-3,15-diol) [5] and two aminoethylphenanthrene alkaloids [6]. In this paper, we describe the isolation of a new lignan derivative, meiocarpin (**1**), from the stem bark of *M. lepidotum*. The structure of the new compound is based on ^{1}H and ^{13}C NMR studies.

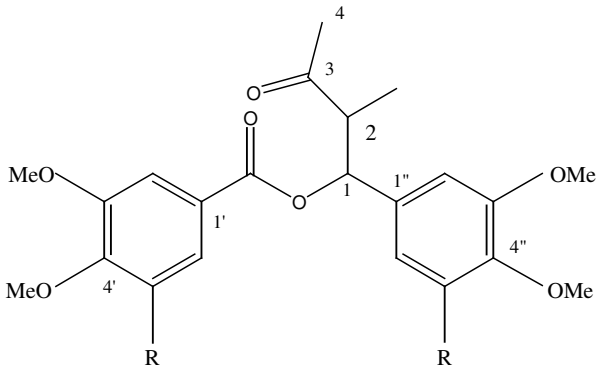
RESULTS AND DISCUSSION

Chromatographic separation of the AcOEt extract of the stem bark of *M. lepidotum* resulted in the isolation of compound **1** as a white amorphous powder. The EIMS exhibited a molecular ion peak at *m/z* 462 which, in conjunction with the ^{13}C NMR and DEPT spectra, suggested the molecular formula $C_{24}H_{30}O_9$. The IR spectrum of **1** indicated the presence of an ester (1740 cm^{-1}), a ketone (1710 cm^{-1}) and aromatic rings (1650, 1610 and 1600 cm^{-1}). The ^{1}H NMR spectrum of **1** (Table 1) showed a three proton singlet of a methyl ketone (δ 2.27) and singlets assignable to six methoxy groups. Two pairs of equivalent aromatic protons at δ 6.65 (2H, s) and 7.26 (2H, s) indicated the presence of two symmetrically substituted aromatic rings. The HMBC correlations of the aromatic protons (see Table 1) and the ^{13}C chemical shifts of the methoxy carbons revealed the 3,4,5-trimethoxyphenyl nature of the aromatic rings. In the ^{1}H NMR spectrum a secondary methyl group [δ 1.02 (d, J = 7.0 Hz)] was coupled to a methine proton [δ 3.23 (dd, J = 7.0, 10.0 Hz, H-2)] which was also coupled to another methine [δ 5.93

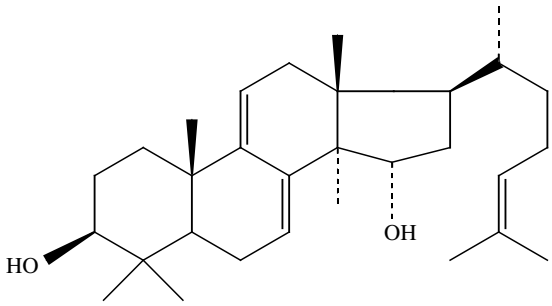
*Corresponding author. E-mail: tsamo@cm.refer.org

(d, J = 10.0 Hz, H-1)], consistent with the sequence –OCH-CH-CH_3. Signals at δ 209.9 and 165.3 in the ^{13}C NMR spectrum confirmed the presence of ketone and ester carbonyl groups, respectively. The assembly of the part structures to give **1** was facilitated by correlations in the HMBC spectrum (see Table 1). Thus the methyl of the methyl ketone showed correlations to the ketonic carbonyl group and to C-2. The secondary methyl group had correlations with C-1, C-2 and C-3, consistent with a 2-methyl-3-oxobutyl moiety. Correlations of the aromatic protons H-2″ and H-6″ to C-1 revealed the attachment of one of the aromatic rings. The other aromatic ring formed part of the ester as shown by correlations of the aromatic protons H-2′ and H-6′ to the ester carbonyl carbon which also had a correlation from H-1. These data lead unambiguously to structure **1**, [1-(3,4,5-trimethoxyphenyl)]-2-methyl-3-oxo-1-butyl 3,4,5-trimethoxybenzoate, which we named meiocarpin. There are two chiral centres in **1** but the relative configuration could not be assigned from NMR evidence because of the freely rotating nature of the molecule. Unfortunately the sample was lost before the optical rotation could be measured. Meiocarpin is a cleaved lignan closely related to compound **2** from *Ocotea foetens* [7]. Both are probably derived from a 7,7′-epoxylignan precursor by oxidative cleavage. A similar oxidation has been postulated to explain the structure of a lignan from *Magnolia stellata* [8].

In addition to **1**, sitosterol and polycarpol (**3**) were also isolated [5].



(**1**) R = OMe
(**2**) R = H



(**3**)

Table 1. ^{1}H and ^{13}C NMR chemical shift assignments for meiocarpin (**1**).

N°	^{13}C	^{1}H (m), J (Hz)	HMBC correlations
1	79.0 (CH)	5.93 (d, 10.0)	C-2, C-3, C-1″, C-2″, RCOO, Me-2
2	52.9 (CH)	3.23 (dq, 7.0; 10.0)	C-3, Me-2
3	209.9 (CO)	-	
4	28.9 (CH_3)	2.27 (s)	C-2, C-3
1′	125.2 (C)	-	
2′,6′	107.5 (CH)	7.26 (s)	C-1', C-3′, C-4′, RCOO
3′,5′	153.4 (C)	-	
4′	143.0 (C)	-	
1″	134.0 (C)	-	
2″,6″	104.7 (CH)	6.65 (s)	C-1, C-3″, C-4″
3″,5″	153.8 (C)	-	
4”	138.5 (C)	-	
Me-2	14.1 (CH_3)	1.02 (d, 7.0)	C-1, C-2, C-3
RCOO	165.3	-	
3′,5′-OMe	56.7	3.82 (s)	C-3′,5′
4′-OMe	61.3	3.82 (s)	C-4′
3″,5″-OMe	56.6	3.80 (s)	C-3″,5″
4″-OMe	61.2	3.76 (s)	C-4″

EXPERIMENTAL

General. Melting points were determined on a Buchi melting point apparatus B-545. IR spectra were recorded on a Perkin-Elmer B4FT-IR spectrometer with KBr pellets. NMR spectra were run in $CDCl_3$ on a Bruker spectrometer equipped with a 5 mm ^{1}H and ^{13}C probe operating at 400.1 and 100.6 MHz, respectively. The chemical shifts (δ) are reported in ppm with the solvent signal, (δ_H 7.25 and δ_C 77.0 for $CDCl_3$) as reference, while coupling constants (J) are given in Hertz.

Plant material. The stem bark of *M. lepidotum* was collected in January 1999 at Edea, Littoral Province of Cameroon, by Dr Achoundong of the National Herbarium Yaoundé, Cameroon, who authenticated the voucher specimen (N° 26084).

Extraction, isolation and characterization. The air-dried powdered seeds of *M. lepidotum* (1 kg) were extracted with EtOAc (3 L x 3) at room temperature. After removal of solvent under reduced pressure, the crude extract (43 g) was subjected to flash chromatography on silica gel 60 using hexane and increasing amounts of EtOAc and finally pure EtOAc to furnish four fractions A, B, C and D. Fractions A and B were successively subjected to column chromatography over silica gel (70-230 mesh), eluting with a gradient of hexane-EtOAc of increasing polarity to afford sitosterol (60 mg) and meiocarpin (**1**) (15 mg), respectively. Chromatography of the fraction C with the same eluents led to two main series E and F. Fraction F was subjected to repeated column chromatography on silica gel (70-230 mesh) with chloroform-methanol as eluent to yield polycarpol (**3**) (25 mg).

Meiocarpin (**1**). Amorphous powder, ^{13}C and ^{1}H NMR data: see Table 1; EIMS: *m/z*: 462 $[M]^+$ (10), 317 (5), 267 (6), 257 (6), 250 (10), 237 (8), 220 (13), 209 (18), 197 (79), 179 (22), 167 (100), 149 (36).

Polycarpol (lanosta-7,9(11),24-triene-3,15-diol) (**3**). White powder, m.p. 173 °C, ^{13}C NMR spectral data were in agreement with those reported [5].

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