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A New Tetrahydrofuran of *Cinnamomum Burmannii*

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ABSTRACT

*A new tetrahydrofuran, burmafuranic acid (**1**) was isolated from the mushroom supreme by Cinnamomum burmannii (Nees & T. Nees) Blume (Lauraceae). The structure of the new tetrahydrofuran was elucidated by chemical and physical evidence.*

Keywords

Cinnamomum burmannii, *Lauraceae*, Tetrahydrofuran.

Introduction

Cinnamomum burmannii (Nees & T. Nees) Blume (*Lauraceae*) is a source of Indonesia cinnamon, and is widely used as a spice in Indonesia [1]. The chemical constituents of the roots of this plant have not yet been reported. Recently, we reported a new amide, a novel homosesquiterpenoid, along with five known amides from the stems of *C. burmannii* [2,3]. Previously, we isolated 20 compounds, including one apocarotenoid, one triterpenoid, one coumarin, two steroids, and four benzenoids from the leaves of this plant [4,5]. In the course of screening for biologically and chemically novel agents from Formosan plants in the family Lauraceae [6-83], *C. burmannii* was chosen for further phytochemical investigation. In this paper, we report the isolation and structural elucidation of this new tetrahydrofuran.

Burmafuranic acid (**1**), obtained as a white powder, established by the molecular formula $C_{14}H_{18}O_7$ by HR-EIMS at *m/z* $[M + Na]^+$ 321.0947 (calcd for $C_{14}H_{18}O_7Na$, 321.0950). Two IR bands at ν_{max} 3400 and 1650 cm^{-1} one signal appearing at δ 178.0 in the ^{13}C NMR spectrum suggested that hydroxyl groups and a carbonyl group might be present. The ^1H NMR spectrum revealed an AX pattern at δ 6.54 (1H, d, J = 1.8) and 6.49 (1H, d, J = 1.8) for H-2′ and H-6′, three methine protons at δ 3.12 (1H, m), 3.42 (1H, td, J = 9.6, 4.2) and 4.61 (1H, d, J = 6.6) for H-4, H-3 and H-5, two methylene protons at δ 4.21 (1H, dd, J = 9.6, 4.2)/4.34 (1H, m) and 3.65 (1H, m)/4.51 (1H, dd, J = 9.6, 6.6) for H-2 and H-6 and two methyl protons at δ 3.87 (3H, s, OCH_3) and 3.89 (3H, s, OCH_3). ^{13}C NMR and DEPT experiments on **1** showed 14 resonance lines consisting of two methyls, two methylenes, five methines and five quaternary carbons (including one carbonyl signal at δ 178.0). The mass, UV, IR and ^1H NMR data suggested that **1** is a type of phenolic tetrahydrofuran lignan and that the position of methoxyl and hydroxyl groups should be located on the skeleton. The sequential correlations of the NOESY spectrum were successfully established as shown in Figure 1. Thus, the structure of this compound was named to be burmafuranic acid (**1**), which was further confirmed by HMBC experiments (Table 1).

Table 1: NMR data of **1** in $CDCl_3$ (δ in ppm, *J* in Hz, 600 MHz for ^1H NMR, and 150 MHz for ^{13}C NMR).

Position	δ_C	δ_H	*mult., J (Hz)*	*HMBC ($^1H \rightarrow {}^{13}C$)*
2	70.2	4.21 4.34	dd, 9.6, 4.2 m	C-3 C-3
3	46.0	3.42	td, 9.6, 4.2	C-3, C-4, C-7
4	48.2	3.12	m	C-3, C-5, C-6
5	86.0	4.61	d, 6.6	C-4, C-1′
6	70.1	3.65 4.51	m dd, 9.6, 6.6	C-4 C-4

7	178.0	–	–	–
1′	135.2	–	–	–
2′	105.6	6.54	d, 1.8	C-1′, C-3′
3′	135.4	–	–	–
4′	149.5	–	–	–
5′	152.7	–	–	–
6′	101.7	6.49	d, 1.8	C-1′, C-5′
4′-OCH_3 5′-OCH_3	56.0 61.0	3.87 3.89	s s	C-3′, C-4′, C-5′ C-4′, C-5′, C-6′

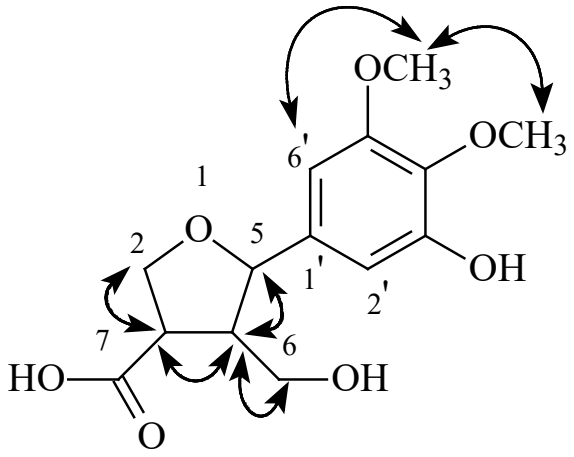

Figure 1: NOESY correlations of **1**.

Experimental

General

UV spectra were obtained in CH_3CN, IR spectra were measured on a Hitachi 260-30 spectrophotometer. ^1H NMR (600 MHz), ^{13}C NMR (150 MHz), HETCOR, HMBC, COSY, NOESY, and DEPT spectra were obtained on a Varian (Unity Plus) NMR spectrometer. Low-resolution ESI-MS spectra were obtained on an API 3000 (Applied Biosystems) and high-resolution ESI-MS spectra on a Bruker Daltonics APEX II 30e spectrometer. Silica gel 60 (Merck, 70~230 mesh, 230~400 mesh) was used for column chromatography. Precoated Silica gel plates (Merck, Kieselgel 60 F-254), 0.20 mm and 0.50 mm, were used for analytical TLC and preparative TLC, respectively, visualized with 50% H_2SO_4.

Plant Material

The stems of *C. burmannii* (Nees & T. Nees) Blume were collected from Nantou County, Taiwan, in June 2020. Plant material was identified by Dr. Su-Ling Liu (Experimental Forest College of Bioresources and Agriculture, National Taiwan University). A voucher specimen was deposited at the Department of Medical Technology, School of Medical and Health Sciences, Fooyin University, Kaohsiung, Taiwan.

Extraction and Isolation

The stems (2.12 kg) of *C. burmannii* were extracted repeatedly with MeOH (3 L x 3) at room temperature for 24-48 hrs. The MeOH extract was dried and evaporated to leave a viscous residue (37.6 g). The residue was placed on a silica gel column (1.5 kg, 70−230 mesh) and eluted with CH_2Cl_2 gradually enriched with MeOH to afford 10 fractions. Part of fraction 2 (11.6 g) was subjected to silica gel chromatography (343 g, 70−230 mesh), by eluting with *n*-hexane-acetone (100:1), enriched gradually with acetone, to furnish four fractions (2-1−2-4). Fraction 2-2 (4.5 g) was further purified on a silica gel column using *n*-hexane/acetone mixtures to obtain burmafuranic acid (**1**) (4 mg).

Burmafuranic acid (1)

White powder. $[\alpha]^{25}_D$ +35.4 (*c* 0.45, $CHCl_3$). UV λ_{max} (MeCN, log ε): 210 (4.11), 235 (4.16), 274 (4.04) nm. IR (ν_{max}, cm^{-1}): 3400 (OH), 1650 (C=O), 1500. ESI-MS *m/z* 321 $[M+Na]^+$; HR-ESI-MS *m/z* 321.0947 $[M+Na]^+$ (calcd for $C_{14}H_{18}O_7Na$, 321.0950). ^1H and ^{13}C NMR data, see Table 1.

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