

## A New Dihydropipltartine and Piplartine Dimer from *Piper rugosum*

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A NEW DIHYDROPIPLARTINE AND PIPLARTINE DIMER  
FROM *PIPER RUGOSUM*ANDERSON MAXWELL\* and DAVE RAMPERSAD<sup>1</sup>

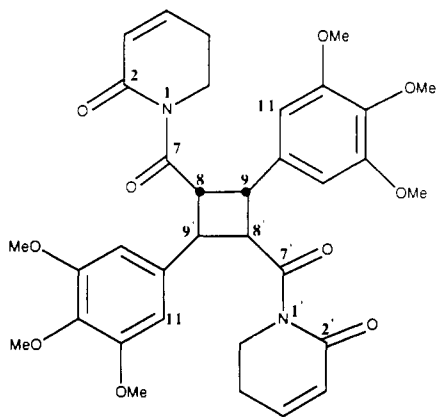
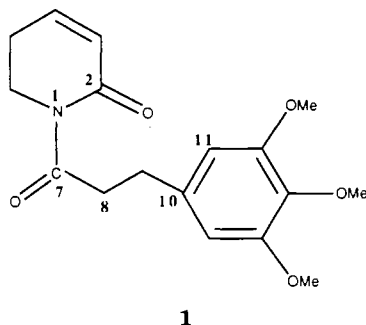
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ABSTRACT.—The Me<sub>2</sub>CO extract of the aerial parts of *Piper rugosum* yielded two piperidine alkaloids characterized as 8,9-dihydropiplartine [**1**] and piplartine dimer [**2**] by spectroscopic methods. Compound **1** has not been previously reported.

The piperidine alkaloid, piplartine, which exhibits a hypotensive effect and also causes depression of intestinal tonus in mongrel dogs (1), has been isolated on numerous occasions from a number of *Piper* species (2–6). The uncertainty concerning its structure among the early investigators was resolved by X-ray crystallographic analysis (7). This compound can give rise to two dihydro structures: loss of the pyridone double bond resulting in 3,4-dihydropiplartine or loss of the cinnamyl double bond resulting in **1**. Our continuing interest (8–11) in the chemistry of Trinidad *Piper* species led us to investigate the aerial parts of *Piper rugosum* Lam. (Piperaceae). This shrub is endemic to the regions of the West Indies (12) and can be found growing in the moist, shady, forested parts of Trinidad. It is quite rare, not known to be used in folk medicine, and never researched chemically. We report the isolation of 8,9-dihydropiplartine

[**1**] and piplartine dimer [**2**] from its aerial parts.

Vacuum liquid chromatography (vlc) of the Me<sub>2</sub>CO extract resulted in combined fractions 13–23 and 24–31. The latter gave colorless crystalline needles, whereas the former (a green mixture) was decolorized to give a yellow oil. Preparative tlc of this oil using AgNO<sub>3</sub> impregnated Si gel yielded a clear semi-solid. Low resolution eims of the less polar semi-solid gave an [M]<sup>+</sup> at *m/z* 319, which was compatible with a molecular formula of C<sub>17</sub>H<sub>21</sub>NO<sub>5</sub>. Uv absorption maxima were observed at 221 and 268 nm, while the ir spectrum exhibited carbonyl absorptions at 1705 (δ lactam) and 1690 (amide) cm<sup>-1</sup>. The <sup>1</sup>H-nmr spectrum (see Experimental) contained a two-proton aromatic singlet at δ 6.50 and singlets at δ 3.85 (3H) and δ 3.88 (6H), which indicated a 1-substituted 3,4,5-trimethoxybenzene ring. The doublet of triplets at δ 6.02 (1H, *J* = 9,



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2 Hz), the multiplet at  $\delta$  6.92 (1H), that at  $\delta$  2.40 (2H) and the triplet at  $\delta$  3.99 (2H,  $J = 6$  Hz) suggested the presence of a 2-(1H)-pyridone ring (5,6). The AA'BB' pair of multiplets centered at  $\delta$  2.95 and 3.26 pointed to the presence of a  $-\text{CH}_2-\text{CH}_2-\text{C}=\text{O}$  group linking the aromatic and pyridone moieties. Thus, the spectral data led to the formulation of structure **1**.

Indeed, the  $^1\text{H}$ -nmr spectrum of **1** was essentially identical with that of piplartine (**7**), except that the AB pair of doublets ( $J = 15.6$  Hz) at  $\delta$  7.37 and 7.73, which accounts for the trans cinnamyl doublet bond in piplartine, was absent in the spectrum of **1**, and the AA'BB' pair of multiplets appeared. This evidently indicated saturation of the C-8-C-9 bond and further corroborated the structure formulated for **1**.

The more polar compound **2** was isolated as colorless crystalline needles, mp 262–263° (Me<sub>2</sub>CO/CHCl<sub>3</sub>). The spectral data (ir,  $^1\text{H}$  nmr, and  $^{13}\text{C}$  nmr) were essentially identical with the published data (6) for piplartine dimer.

3,4-Dihydropiplartine has been isolated from *Piper bartlingianum* (13) and synthesized by catalytic hydrogenation of piplartine (5). However, this is the first report of the occurrence of the other dihydro compound **1**. The dimer **2** has previously been isolated from *Piper tuberculatum* (6) and from *Piper arborescens* (15).

## EXPERIMENTAL

GENERAL EXPERIMENTAL PROCEDURES.—Mp's were determined on a Reichert micro mp apparatus and are uncorrected. Uv spectra were recorded on a Perkin-Elmer 552A uv-vis spectrophotometer, and ir spectra were run both neat and as Nujol mulls using a Pye Unicam SP3-200 instrument.  $^1\text{H}$ - (80 MHz) and  $^{13}\text{C}$ - (20 MHz) nmr spectra were run on a Bruker WP 80 SY FT nmr spectrometer with TMS as the internal standard. Lreims were obtained at 70 eV on a Finnegan 4000 mass spectrometer. Si gel 60 PF-254 and 366 (Merck) was used for analytical (0.25 mm) and preparative (1 mm) tlc and for vlc (14).

PLANT MATERIAL.—Aerial parts of the plant *P. rugosum* were collected at the 3.5 mile post

along the Toco Road, Trinidad, in July 1988. A voucher specimen is on deposit at the National Herbarium of Trinidad and Tobago. The plant material was air dried (ca. 28°) for 1 week and oven dried (40°) for an additional week.

EXTRACTION, SEPARATION, AND ISOLATION.—The dried, ground plant material (330 g) was exhaustively extracted with Me<sub>2</sub>CO (6 liters) for 1 week. Evaporation of the Me<sub>2</sub>CO gave 11.2 g of the crude extract. This extract was subjected to vlc, eluting initially with petroleum ether alone and then with petroleum ether/Me<sub>2</sub>CO mixtures of increasing polarity. Fractions 13–23 were combined (2.30 g) and subsequently decolorized in Me<sub>2</sub>CO solution by gently heating with powdered charcoal for 20 min. After filtration and evaporation of the Me<sub>2</sub>CO, 1.5 g of a yellow viscous oil was obtained. Preparative tlc [petroleum ether-Me<sub>2</sub>CO (3:1)] of this oil gave a uv-active band which was subjected to further preparative tlc [petroleum ether-Me<sub>2</sub>CO (7:3)] using AgNO<sub>3</sub> (12%) impregnated Si gel. Compound **1** (8 mg) was obtained as a clear semi-solid: uv (MeOH)  $\lambda$  max 221 and 268 nm ( $\epsilon$  11600, 2500); ir  $\nu$  max (neat) 3010, 1705, 1690, 1590, 1510, 1464, 1420, 1390, 1362, 1342, 1310, 1240, 1215, 1180, 1130, 1000, 820, 755 cm<sup>-1</sup>; eims  $m/z$  (%) [ $\text{M}]^+$  319 (29), 255 (15), 254 (100), 219 (18) 181 (67), 179 (52), 151 (27), 149 (50), 123 (12), 111 (16), 97 (20), 85 (19), 71 (19), 69 (20), 57 (32);  $^1\text{H}$  nmr (CDCl<sub>3</sub>)  $\delta$  2.40 (m, 2H, H-5), 2.95 (m, 2H, H-9), 3.26 (m, 2H, H-8), 3.85 (s, 3H, 13-OMe), 3.88 (s, 6H, 12-, 14-OMe), 3.99 (t,  $J = 6$  Hz, 2H, H-6), 6.02 (dt,  $J = 9, 2$  Hz, 1H, H-3), 6.50 (s, 2H, H-11, -15), 6.92 (m, 1H, H-4).

Fractions 24–31 gave 66 mg of the more polar compound **2**. It was recrystallized from CHCl<sub>3</sub>/Me<sub>2</sub>CO to give colorless crystalline needles: mp 262–263° [lit. (6) 269–272°]; uv (MeOH)  $\lambda$  max 214 and 267 nm ( $\epsilon$  30700, 8400).

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## LITERATURE CITED

1. P.J. Tewari, B.R. Srivastava, K.C. Durta, and S.S. Mishra, *Labdev*, **3**, 81 (1965).
2. C.K. Atal and S.S. Banga, *Curr. Sci.*, **32**, 354 (1963).
3. A. Chatterjee and C.P. Dutta, *Tetrahedron*, **23**, 1769 (1967).
4. S.S. Mishra and P.J. Tewari, *J. Pharm. Sci.*, **53**, 1423 (1964).

5. B.S. Joshi, V.N. Kamat, and A.K. Saksena, *Tetrahedron Lett.*, **20**, 2395 (1968).
6. R.B. Filho, M.P. DeSouza, and M.E.O. Mattos, *Phytochemistry*, **20**, 345 (1981).
7. P.M. Boll, J. Hansen, O. Simonsen, and N. Thorup, *Tetrahedron*, **40**, 171 (1984).
8. A. Maxwell and D. Rampersad, *J. Nat. Prod.*, **51**, 370 (1988).
9. A. Maxwell and D. Rampersad, *J. Nat. Prod.*, **52**, 411 (1989).
10. A. Maxwell and D. Rampersad, *J. Nat. Prod.*, **52**, 614 (1989).
11. A. Maxwell and D. Rampersad, *J. Nat. Prod.*, **52**, 891 (1989).
12. D. Philcox, "Flora of Trinidad and Tobago," Ministry of Agriculture Lands and Fisheries, Trinidad and Tobago, 1977, Vol. II, Part VIII, pp. 529-530.
13. A. Kijjoo, A.M. Giesebrecht, and O.R. Gottlieb, *Planta Med.*, **44**, 188 (1982).
14. S.W. Pelletier, H.P. Chokshi, and H.K. Desai, *J. Nat. Prod.*, **49**, 892 (1986).
15. C.-Y. Duh, Y.-C. Wu, and S.-K. Wang, *J. Nat. Prod.*, **53**, 1575 (1990).

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