GRANDIRUBRINE, A NEW TROPOLOISOQUINOLINE ALKALOID

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Grandirubrine, a new alkaloid from Abuta grandifolia (Martius) Sandwith (Menispermaceae), has been assigned the tropoloisoquinoline structure I.

Recent studies from our laboratory have led to the isolation of a number of new alkaloids from plants of the tropical American genus Abuta (Menispermaceae).[1-5] We now wish to report the isolation and structure determination of the new tropoloisoquinoline alkaloid grandirubrine (I) from Abuta grandifolia.[6a,b]

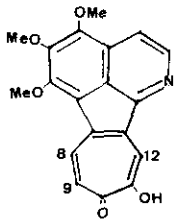
The tertiary base fraction from A. grandifolia was crystallized directly from chloroform-ethanol to give, in low yield, reddish-brown needles of grandirubrine (I), mp 201-203°. The mass spectrum of I indicates the composition $C_{19}H_{15}NO_5$, as evidenced by a molecular ion peak at m/e 337.0949. The nmr spectrum of I ($CDCl_3$) showed three methoxyls at δ 4.06, 4.16 and 4.20 (3 H each), an aromatic AB quartet at 7.42 and 8.33 (1 H each, J = 10 Hz), an aromatic AB quartet at δ 7.80 and 8.73 (1 H each, J = 5 Hz), and an aromatic singlet (1 H) at δ 8.41. The ir spectrum of I (KBr) revealed a conjugated carbonyl at 6.3 μ; its uv spectrum (95% EtOH) showed maxima (log ε) at 232 (4.96), 254 (4.79), 296 (4.58), 363 (4.72), 384 (4.41), 400 (4.19), 480 nm (3.90) and shoulders at 274 (4.66), 312 (4.46) and 343 nm (4.51).

Reaction of grandirubrine with excess diazomethane in methanol afforded a mixture of two isomeric monomethyl ethers, A and B. The minor ether (A) proved to be identical (tlc, uv, nmr, ms) with imerubrine (II).[1,5] The major ether (B), mp 183-185°, was assigned the isoimerubrine structure III. It showed the following spectral data: uv (95% EtOH) 230 sh, 253, 364, 410, and 490 nm; nmr ($CDCl_3$) δ 4.08, 4.13, 4.29, 4.31 (s, 3 H each), 7.52 (1 H, d, J = 11.5 Hz), 7.79 (1 H, d, J = 5 Hz), 8.02 (1 H, s), 8.38 (1 H, d, J = 11.5 Hz), and 8.85 (1 H, d, J = 5 Hz); mass spectrum (rel intensity) 351 (M^+, 100%), 336 (32), 323 (29), 322 (22), 321 (12), 320 (15) and 308 (69).

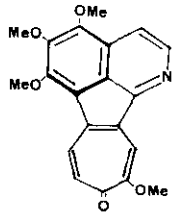
The structure of imerubrine (II) has been determined unambiguously by X-ray crystallography;[5] grandirubrine must therefore be a monodesmethylimerubrine. The only monodesmethylimerubrines which would give a mixture of both imerubrine and an isoimerubrine on methylation are the two tropolone tautomers I and IV. We have assigned structure I to grandirubrine since its spectral properties are closer to those of isoimerubrine (III) than to those of imerubrine (II). Thus, the

C-8 and C-9 protons of isoimerubrine form the AB quartet (J = 11.5 Hz) at δ 8.38 and 7.52, respectively, while the C-12 proton appears as the δ 8.02 singlet. The corresponding values for the protons at C-8, C-9 and C-12 in grandirubrine are δ 8.33, 7.42 and 8.41, showing that O-methylation has caused an appreciable shift of only the neighboring C-12 proton. In imerubrine, the protons at C-8 and C-9 are in quite a different environment with respect to the tropone carbonyl; they form an AB quartet (J = 9.4 Hz) at δ 8.06 and 6.87, respectively.

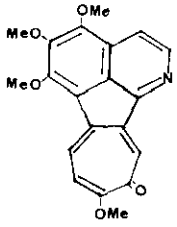
Grandirubrine (I) is thus the second example of a tropoloisoquinoline alkaloid, as well as the first alkaloid of this type to contain a free tropolone system.



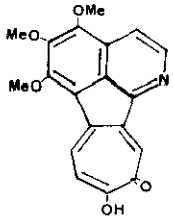
I



III



II



IV

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6(a) B. A. Krukoff and R. C. Barneby, Mem. N. Y. Bot. Gard. 1971, 22(2), 30.

6(b) A sample identified formerly as Abuta grandifolia (see A. I. DaRocha, K. Bessho and M. P. Cava, Quimica, 1967, 3) did not contain grandirubrine. However, reconfirmation of the identity of this plant specimen was not possible since no voucher samples were deposited in any herbarium.

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