DIHYDROXYGIRINIMBINE, A NEW CARBAZOLE ALKALOID FROM MURRAYA EUCHRESTIFOLIA

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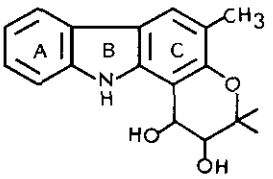
Abstract — *Dihydroxygirinimbine* (1) was the first isolated from the root bark of Murraya euchrestifolia Hayata, and the structure was established by spectroscopic analysis and the transformation of girinimbine (3).

In continuation of our studies on the chemical constituents of Murraya euchrestifolia Hayata (Rutaceae) collected in Taiwan,[1-6] we isolated a new carbazole alkaloid, named dihydroxygirinimbine, and the structure was assigned as formula 1, corresponding to dihydroxy derivative of girinimbine (3)[7] which had been isolated from Murraya koenigii Spreng. as the first member of the group of carbazole alkaloids with C_{18}-skeleton.

Dihydroxygirinimbine (1) was obtained as colorless needles, mp 189-190°C, $[\alpha]_D$ -4.0° (methanol) from the benzene fraction of silica gel column chromatography of the plant extract (0.0004% yield from dried root bark).[8] The molecular formula $C_{18}H_{19}NO_3$ was confirmed by high resolution mass spectrum (Calcd. for $C_{18}H_{19}NO_3$ 297.1364; Found 297.1365). The IR spectrum showed a broad absorption band in the range 3100-3600 cm^{-1} including a sharp band at 3450 cm^{-1}. The UV absorption bands at λ_{max} 215, 238, 254, 259, 303, and 332 nm were similar to those of the usual 3-methylcarbazole alkaloids.[9] The ^{1}H-NMR spectrum (100MHz, in $CDCl_3$+ acetone-d_6) of this alkaloid showed the signals assignable to two oxygen-linked tertiary methyls (δ 1.24 and 1.52, each 3H, s) and an aryl methyl (δ 2.28, 3H, d, J=1 Hz) coupled with H-4 (δ 7.72, 1H, br s). The appearance of an isolated four-spin system in aromatic proton region (δ 7.06, 1H, dt, J=2 & 8 Hz; 7.24, 1H, dt, J=2 &

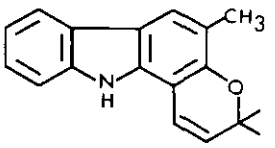
8 Hz; 7.50, 1H, dq, J=2 & 8 Hz; 7.96, 1H, br d, J=8 Hz) indicated the lack of substituents in ring A of carbazole nucleus. Furthermore, the observation of a pair of doublets (J=8 Hz) at δ 3.79 and 4.92 (each 1H) which shifted to δ 5.18 and 6.22 in diacetate, mp 159-161°C, respectively was suggestive of the presence of trans 1,2-diol moiety in the molecule.

On the basis of these spectral data, the structure of this alkaloid was proposed as formula 1.



(1); trans-diol

(2); cis-diol



(3)

In agreement with this proposition, dihydroxylation of girinimbine (3)[7] was carried out. Treatment of 3 with m-chloroperbenzoic acid in benzene for 15 min, followed by column chromatography over silica gel gave two isomeric dihydroxy derivatives.[10] Between them, the product having lower Rf value (0.17) in TLC [silica gel, $CHCl_3$-acetone (5:1)] was found to be identical with natural dihydroxygirinimbine (1) by comparison of ^{1}H-NMR, IR and mass spectra, and TLC. Another product having upper Rf value (0.36) assigned to the cis isomer (2)[11] was also afforded by the reaction of 3 with OsO_4 as major product.

From these results, dihydroxygirinimbine isolated from Murraya euchrestifolia in this time, should be represented by the formula 1.[12]

REFERENCES AND NOTES

1. T.-S. Wu, T. Ohta, H. Furukawa, and C.-S. Kuoh, Heterocycles, 20, 1267 (1983).
2. A. T. McPhail, T.-S. Wu, T. Ohta, H. Furukawa, Tetrahedron Lett., 24, 5377 (1983).
3. H. Furukawa and T.-S. Wu, Chem. Pharm. Bull., 31, 4202 (1983).
4. H. Furukawa, T. Ohta, T.-S. Wu, and C.-S. Kuoh, Chem. Pharm. Bull. (1985) in press.

5. H. Furukawa, M. Yogo, C. Ito, T.-S Wu, and C.-S. Kuoh, Chem. Pharm. Bull. (1985) in press.

6. H. Furukawa, T.-S. Wu, Y. Kawakami, T. Sato, and K. Kagei, The Abstracts of The 105th Annual Meeting of Pharmaceutical Society of Japan, Kanazawa, April, 1985.

7. D. D. Chakraborty, B. K. Barman, and P. K. Bose, Science and Cult. (India), 30, 445 (1964).

8. The detail of the isolation procedure will be described in ref. 4, in which the alkaloid is named as compound A, tentatively.

9. R. Basu, J. Indian Chem. Soc., 44, 580 (1967).

10. Isolation and characterization of the epoxy derivative of 3 were unsuccessful owing to the lability of the oxirane ring.

11. Cis-diol (2): δ 1.28 (3H, s), 1.52 (3H, s), 2.28 (3H, d, J=1 Hz), 3.78 (1H, br s), 4.12 (1H, br s), 4.20 (1H, br s), 5.13 (1H, br s), 7.06 (1H, dt, J=1.5 & 8 Hz), 7.28 (1H, dt, J=1.5 & 8 Hz), 7.46 (1H, dd, J=1.5 & 8 Hz), 7.66 (1H, s), 7.88 (1H, dd, J=1.5 & 8 Hz), and 9.56 (1H, br s). In addition of D_2O, the signals at δ 4.12, 4.20, and 9.56 disappeared, and the signals at δ 3.78 and 5.13 were observed as a pair of sharp doublets (J=4.5 Hz).

12. Determination of the absolute stereostructure of dihydroxygirinimbine (1) remains.

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