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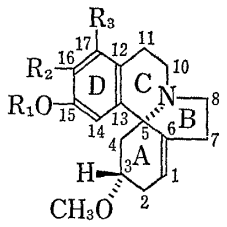
Dihydroerysovine, a New Erythrina Alkaloid

A new Erythrina alkaloid designated as dihydroerysovine was isolated from *Cocculus trilobus* DC. (Menispermaceae). From chemical and spectroscopic studies, especially INDOR and NOE techniquse, the structure (III) was assigned to this alkaloid. The utility of INDOR and NOE methodes for the determination of substituent pattern on an aromatic ring of Erythrina alkaloids was ascertained.

Keywords——dihydroerysovine; erythrina alkaloid; *Cocculus trilobus* DC.; mass spectrum; NOE; INDOR

In a previous paper,[1] we have reported the isolation and structure elucidation of two abnormal type aromatic erythrina alkaloids cocculine (I) and coccutrine (II) from *Cocculus trilobus* DC. (Menispermaceae).

The present communication describes the structure determination and stereochemistry of a new alkaloid, named dihydroerysovine.



I : $R_1=R_2=R_3=H$
II : $R_1=R_2=H$, $R_3=OCH_3$
III : $R_1=R_3=H$, $R_2=OCH_3$
IV: $R_1=CH_3$, $R_2=OCH_3$, $R_3=H$

Chart 1

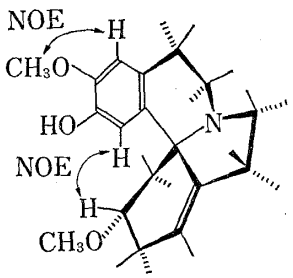


Fig. 1.

Dihydroerysovine (III): $C_{18}H_{23}O_3N$, oil, $[\alpha]_D$ +223° ($CHCl_3$), IR $\nu_{max}^{CHCl_3}$ cm^{-1}: 3500 (OH). UV λ_{max}^{EtOH} nm (log ε): 232 (3.83), 299 (3.55). NMR (C_6D_6, δ): 6.99 (1H, s., aromatic-H), 6.30 (1H, s., aromatic-H), 5.37 (1H, m., olefinic H), 5.11 (1H, br., OH), 3.89 (1H, m., CH_3O–$\underline{C}$–$\underline{H}$), 3.27 (3H, s., OCH_3), 2.98 (3H, s., OCH_3), 2.49 (1H, q., J=12, 4 Hz), 1.93 (1H, t., J=12 Hz). These data suggested the presence of two methoxyl groups, one phenolic hydroxyl group, one trisubstituted double bond and two aromatic protons situated *para* to each other. Lack of any signal due to an NH or an N-methyl group in the NMR spectrum led us to conclude that dihydroerysovine must be a tetracyclic alkaloid. The mass spectrum showed the prominent peaks at *m/e* 301 (M^+), 243 and 242. The base peak at *m/e* 243 (M^+—58), a diagnostic fragment ion peak for the aromatic Erythrina alkaloids,[2] supports the presence of substituted cyclohexene ring (ring A) in dihydroerysovine (III). O-Methyl derivative (IV), derived from III by methylation with CH_2N_2, was identified with dihydroerysotrine[3] by comparisons of IR, NMR and TLC with those of an authentic sample.

Therefore, the absolute structure of a new alkaloid III was determined except for the positions of methoxyl and hydroxyl groups on an aromatic ring.

The positions of the aromatic hydroxyl and methoxyl groups were determined to be C-15 and C-16, respectively, on the basis of the results of INDOR and NOE experiments.[4]

1) A.T. McPhail, K.D. Onan, H. Furukawa, and M. Ju-ichi, *Tetrahedron Letters*, **1976**, 485.
2) R.B. Boar and D.A. Widdowson, *J. Chem. Soc.*, (*B*), **1970**, 1591.
3) V. Prelog, B.C. McKusick, J.R. Merchant, S. Julia, and M. Wilhelm, *Helv. Chim. Acta.*, **39**, 498 (1956).
4) The INDOR and NOE analysis of this type alkaloids will be presented in elsewhere.

INDOR experiment showed a responce of the proton at δ 3.89 (H_{ax}–C(3)) by monitoring the signal of C-14 aromatic proton at δ 6.99. This observation indicates the presence of NOE effect (15.0% increment) due to spatially close relationship between the C-3β axial proton and C-14 aromatic proton (Fig. 1). Monitoring the C-17 aromatic proton at δ 6.30, obvious responce due to NOE effect (15.4% increment) of the aromatic methoxyl group signal at δ 3.27 was observed.

From the NMR spectral results mentioned above, it was clearly shown that the aromatic methoxyl group and hydroxyl group were located at C-16 and C-15, respectively.

Because of the ready determination on the position of substituent(s) on the aromatic ring, these INDOR and NOE techniques may find value as a tool for the determination of substituent pattern on an aromatic ring of Erythrina alkaloids.

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