

STRUCTURE ELUCIDATION OF TWO NEW
TETRAHYDROPROTOBERBERINE ALKALOIDS,
CORYTENCHINE AND CORYTENCHIRINE[†]

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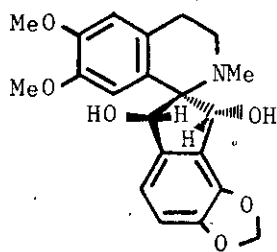
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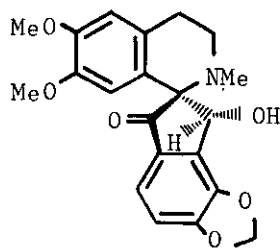
The structures of two tetrahydroprotoberberines,
corytenchine and corytenchirine, from Corydalis ochotensis Turcz were assigned to 3 and 12, respectively.

Previously we reported the isolation of two new spirobenzylisoquinoline alkaloids, yenusomine (1) and yenusomidine (2), from Corydalis ochotensis Turcz (Papaveraceae) collected in Taiwan's Central Mountains.¹ Thereafter, the fraction of phenolic alkaloids was studied and we wish to describe the isolation of two new tetrahydroprotoberberine alkaloids, corytenchine and corytenchirine.

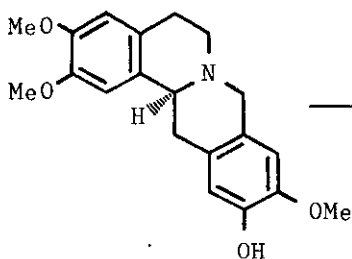
The fraction of phenolic alkaloids was treated with hydrobromic acid and then recrystallised from methanol to afford the hydrobromide of base C, m.p. 245 - 246^o (sinters at 234^o), $[\alpha]_D^{20} - 240^{\circ}$ (c = 1.0 in methanol), which was converted into the free base, named as corytenchine, m.p. 257 - 258^o (from methanol), $[\alpha]_D^{30} - 268^{\circ}$ (c =



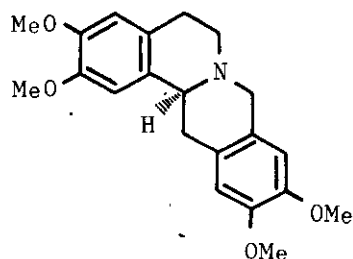
(1)



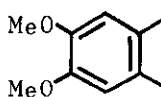
(2)



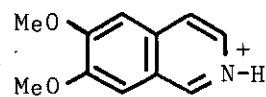
(3)



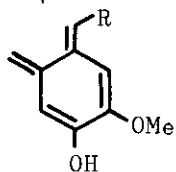
(8)



(4)

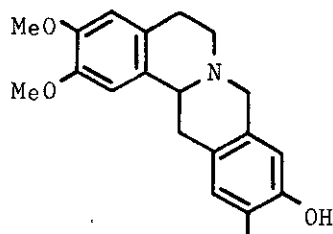


(5)

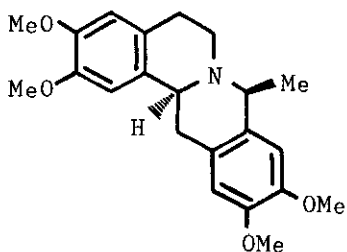


(6) R=H

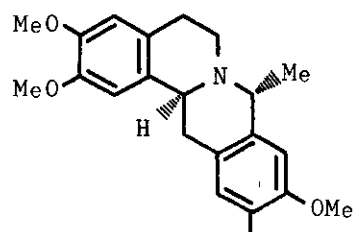
(7) R=Me



(9)



(10)



(11) R=Me OR

(12) R=H

0.89 in chloroform). The i.r. [$\nu_{\max}^{\text{CHCl}_3}$ 3530 (OH) and 2830 - 2600 cm^{-1} (trans-quinolizidine)] and u.v. [$\lambda_{\max}^{\text{EtOH}}$ (log ϵ) 287 nm (3.58)] showed the phenolic tetrahydroprotoberberine structure. The n.m.r. spectrum (in CDCl_3) showed three methoxyl groups at 3.87 (6H) and 3.90 (3H) together with four aromatic protons at 6.57 (1H), 6.64 (1H), 6.74 ppm. (2H) as each singlet. The mass spectrum of this alkaloid has its molecular ion peak at m/e 341 and fragment ions at m/e 192 (4), 190 (5), 150 (6). The fragment pattern indicates that one hydroxyl group exists on the ring D.² Methylation of this base with diazomethane gave (-)-xylopinine (8), which was identical with an authentic sample,³ proving the 2,3,10,11-oxysubstituted tetrahydroprotoberberine structure. Therefore corytenchine was compared with the synthetic 11-hydroxy-2,3,10-trimethoxy-(3, racemate)^{4a} and 10-hydroxy-2,3,11-trimethoxytetrahydroprotoberberine (9).^{4b} The i.r. (in chloroform) and n.m.r. spectra of natural product were superimposable on those of 3. The latter compound (9) showed the aromatic protons at 6.79 (1H) and 6.62 (3H).

The base, which was regenerated from the mother liquor of the hydrobromide of phenolic alkaloids, was repeatedly recrystallised from methanol to give the base D as colourless prisms, m.p. 246 - 247°, [α]_D²⁴ - 299° (c = 1.0 in chloroform), $\lambda_{\max}^{95\% \text{ EtOH}}$ (log ϵ) 287 nm (3.82). The n.m.r. spectra of this compound showed three protons at 1.45 as doublet (J 6.5 Hz), twelve protons at 3.87 as singlet, six protons at 3.91 as singlet and eight aromatic protons at 6.56 (2H), 6.62 (2H) and 6.73 ppm (4H) as each singlet. The mass spect-

rum showed ion peaks at m/e 355, 341, 340, 192 (4), 190 (5), 164 (7) and 150 (6). The base D is thus considered as a molecular compound of corytenchine (3) and an alkaloid, which is named as corytenchirine and has an extra methyl group. The chemical shifts of C - 13 methyl group of 13-methyltetrahydroprotoberberines are known^{5,6} but the n.m.r. spectra of 8-methyltetrahydroprotoberberines had not been reported. According to the known procedure,⁷ we could obtain α - and β -coralydines (10) in addition to the other stereoisomeric compound (11). α - and β -Coralydines (10), m.p. 148° and m.p. 95 - 96°, respectively, showed the C - 8 methyl group at 1.53 ppm as doublet ($J = 6.5$ Hz), weak Bohlmann bands at 2900 - 2700 cm^{-1} and a molecular ion peak at m/e 369, while the latter compound (11) showed the C-methyl group at 1.40 ppm as doublet ($J = 6.5$ Hz), no Bohlmann bands absorption and m/e 369 (M^+).⁸ This fact indicates that both α - and β -coralydines have cis related hydrogens at C - 8 and 13a positions, on the other hand the hydrogens at C - 8 and 13a positions in case of 11 are trans.

Methylation of the base D with diazomethane afforded a product, the n.m.r. spectrum of which showed the methyl group at 1.40 as doublet ($J = 6.5$ Hz) and was identical with that of an equimolecular mixture of xylopinine (8) and compound (11). Furthermore, the hydrobromides of O-methylated products were crystallised from methanol to give two different crystals, m.p. 204 - 206° and m.p. 197 - 203°. The former compound was converted into the free base, m.p. 186 - 187°, the n.m.r. spectrum of which was identical with (-)-xylopinine (8).

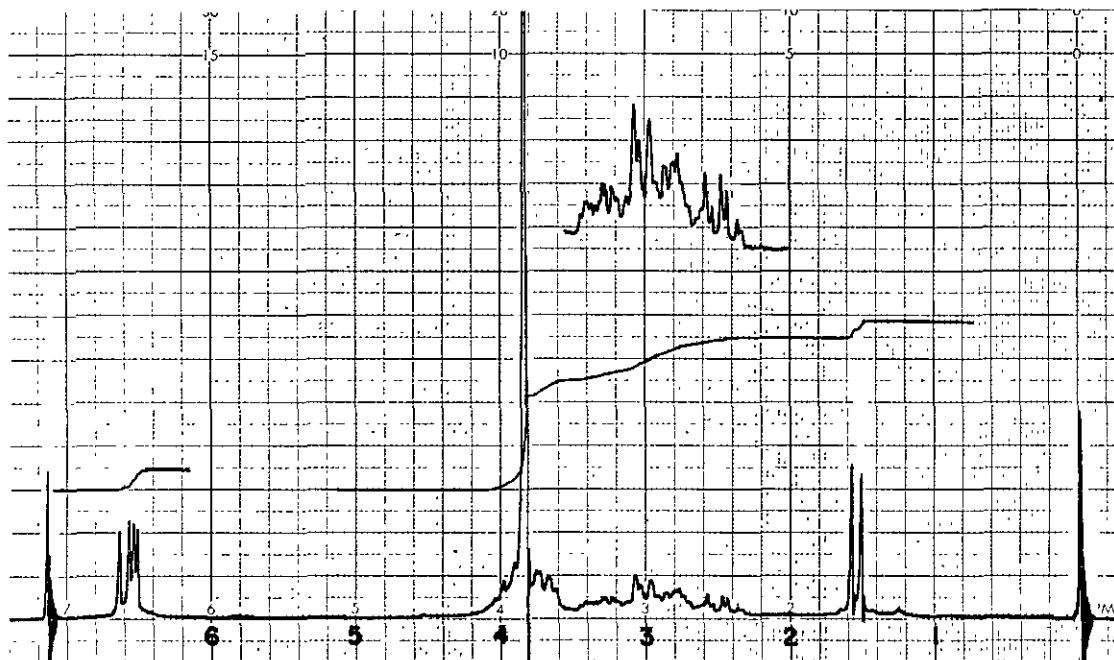


Figure 1. N.m.r. spectrum of $(-)$ -coralydine (10).

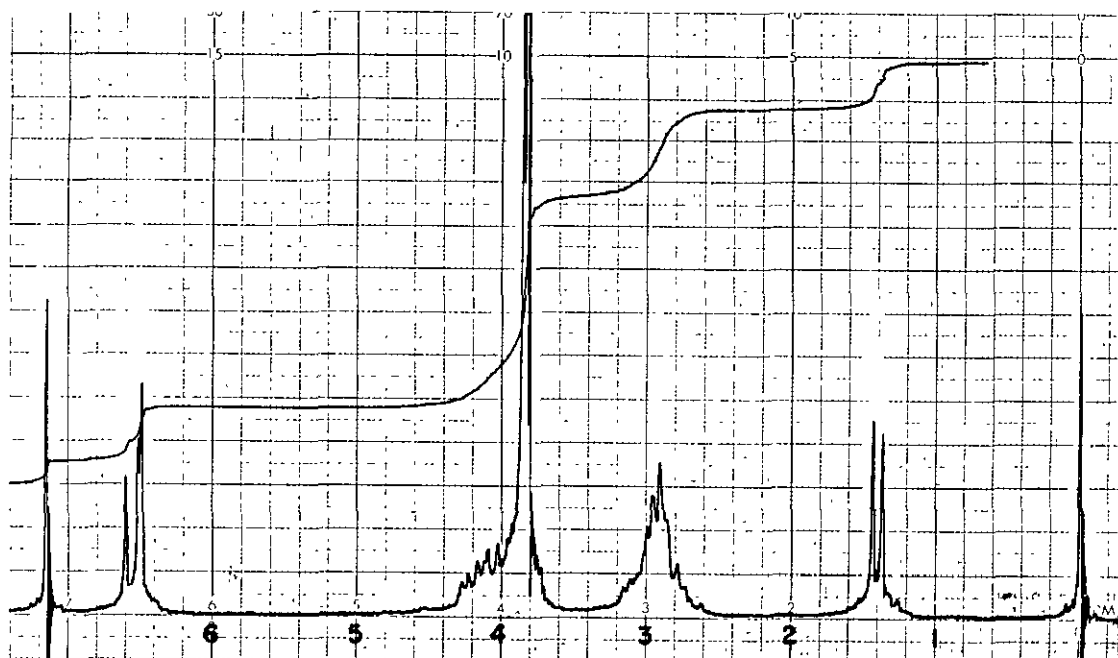


Figure 2. N.m.r. spectrum of $(-)$ -O-methylcorytenchirine (11).

The base, m.p. 163 - 165° (sinters at 157°), regenerated from the latter one, was identified as (-)-O-methylcorytenchirine (11) from the comparison of the n.m.r. spectra. On the basis of the similarity of aromatic protons in the n.m.r. spectrum of base D with that of corytenchine, the structure of corytenchirine was tentatively assigned to 12. The chiral center at C - 13a position of both alkaloids, corytenchine (3) and corytenchirine (12), are assigned to S-configuration because of their levo rotation.³

The structural confirmation of corytenchirine (12) by a total synthesis are in progress.

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8 α - and β -Coralydine would be related to dimorphism, which was suggested by the private communication from Dr. Y. Kondo, Pharmaceutical Institute, Tohoku University. The n.m.r. spectra of coralydine (10) and O-methylcorytenchirine (11) are shown in Figure 1 and 2, respectively.

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