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ISOLATION OF TWO NEW ALKALOIDS FROM DAPHNIPHYLLUM MACROPODUM MIQUEL

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In the study of alkaloids from Daphniphyllum macropodum Miquel (Japanese name, Yuzuriha), the isolation of three new alkaloids, daphniphylline, neodaphniphylline, and yuzurimine was reported (1). The structure of daphniphylline (I) was determined by the X-ray diffraction study (2) and it was found that the carbon skeleton was very novel.

We further examined alkaloidal components of the above plant and could isolate two new alkaloids, codaphniphylline (m.p. 266-267°C as hydrochloride), and neoyuzurimine (m.p. 195-198°C as picrate).

Extraction of bark and leaves of Daphniphyllum macropodum Miquel by the previously reported method (1) gave resinous substance, from which codaphniphylline and neoyuzurimine were isolated by column chromatography on alumina using benzene-diethylamine (100:0.4) as a solvent. Codaphniphylline and

daphniphylline were separated by fractional crystallization from chloroform-ether, but they showed the same Rf-value on thin layer chromatography on silica gel with a solvent system, ether-n-hexane-diethylamine (20:15:3).

Codaphniphylline hydrochloride forms colorless needles, m.p. 266-267°C (in a sealed tube), having a molecular formula $C_{30}H_{47}O_3N \cdot HCl$ (Found: C, 70.75; H, 9.41; N, 2.82 %. Calcd.: C, 71.21; H, 9.56; N, 2.77 %), UV spectrum: $\varepsilon_{210\,m\mu}^{EtOH}$ 170; IR spectrum: $\nu_{max.}^{KBr}$ 2500 (broad, $\rightarrow N^{+}H$), 1707 ($>C=O$), 1321, 1182, 1142, 1095, 1053 cm^{-1}; mass spectrum: m/e 469 (M^{+}), 454, 386, 286, 272. The NMR spectrum of codaphniphylline (100 Mc., in $CDCl_3$) is shown in FIG. 1.

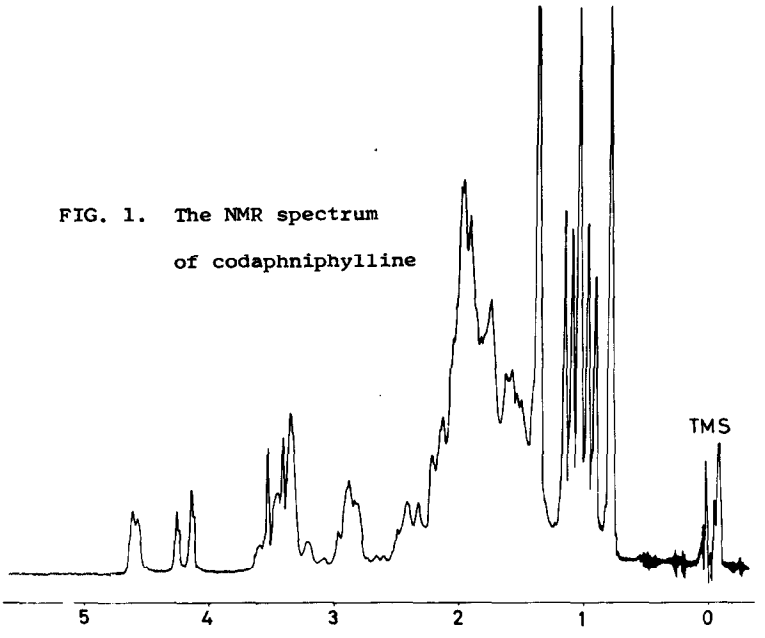
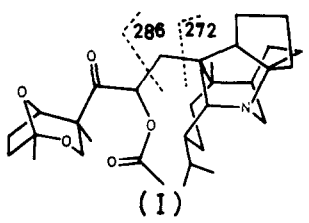
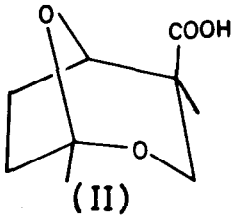


FIG. 1. The NMR spectrum of codaphniphylline

Hydrolysis of daphniphylline (I) with 0.6 N methanolic aqueous sodium hydroxide afforded desacetyl-daphniphylline, which was oxidized by sodium periodate to a ketal-acid (II), m.p.122-123°C, and an aldehyde. The aldehyde was converted by reduction with sodium borohydride and acetylation with acetic anhydride to daphnialcohol-acetate (III), m.p. 268-270°C (as hydrochloride, in a sealed tube).



(I)



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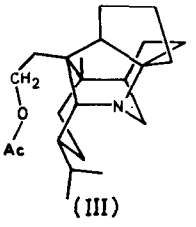

(III)

The ketal-acid has a molecular formula $C_9H_{14}O_4$ (Found: C, 58.01; H, 7.47 %. Calcd.: C, 58.05; H, 7.58 %), IR spectrum: $\nu_{max.}^{KBr}$ 1700 (-COOH), 1140 and 1068 (-C-O-C-O-C-) cm^{-1}; mass spectrum: m/e 186 (M^+).

Daphnialcohol-acetate hydrochloride has a molecular formula $C_{23}H_{37}O_2N \cdot HCl$ (Found: C, 69.70; H, 9.52; N, 3.34 %. Calcd.: C, 69.76; H, 9.42; N, 3.54 %), IR spectrum: $\nu_{max.}^{KBr}$ 2500 (broad, $\rangle N^+H$), 1741 and 1231 (-OAc) cm^{-1}; mass spectrum: m/e 359 (M^+), 344, 272.

The NMR spectra of daphnialcohol-acetate (100 Mc., in $CDCl_3$), daphniphylline (100 Mc., in $CDCl_3$), and the ketal-acid (60 Mc., in $CDCl_3$) are shown in FIG. 2. Most signals of the

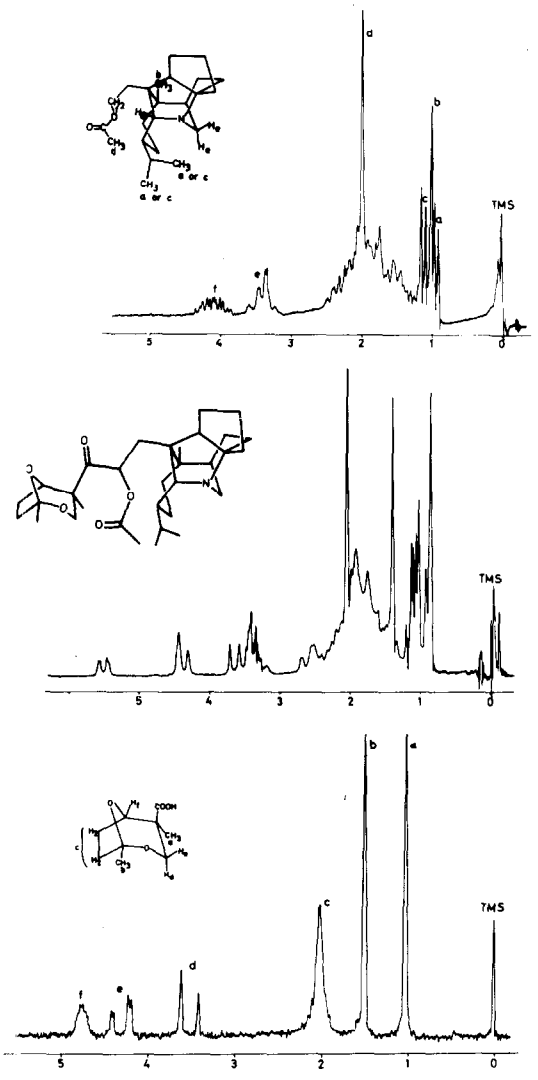

FIG. 2. The NMR spectra of daphnialcohol-acetate, daphniphylline, and the ketal-acid.

NMR spectrum of codaphniphylline correspond to those of daphniphylline, but a signal (2H, m) at 2.9 p.p.m. is observed only in the spectrum of codaphniphylline, while a signal (3H, s) at 2.05 p.p.m. and a signal (1H, q) at 5.52 p.p.m. appear only in the spectrum of daphniphylline. The mass spectrum of daphniphylline showed strong characteristic peaks at m/e 286 and 272, which are probably due to fragments shown in (I). These two peaks are also observed in the mass spectrum of codaphniphylline, suggesting that codaphniphylline has the same structure around nitrogen atom as that of daphniphylline. The difference, 58, of the molecular weight between daphniphylline and codaphniphylline is well accounted for by assuming that the acetoxyl group of the former compound is replaced by a hydrogen in the latter. This inference is consistent with the NMR (no acetoxyl group) and IR (no ester carbonyl) spectra of codaphniphylline.

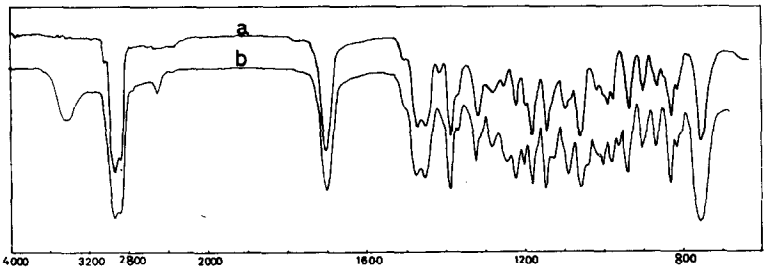

FIG. 3. The IR spectrum of codaphniphylline (a), and the IR spectrum of desacetyl-daphniphylline (b).

Furthermore, as shown in FIG. 3, the IR spectra of codaphniphylline (a) and desacetyl-daphniphylline (b) resemble each other. Therefore, codaphniphylline is presumably desacetoxy-daphniphylline. Further study is now in progress.

The molecular formula and other data of neoyuzurimine will be reported soon.

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2. N. Sakabe and Y. Hirata, Tetrahedron Letters, 1966, No. 9, 965.