

THE STRUCTURE OF DAPHNIPHYLLIDINE

Masaaki Toda, Haruki Niwa and Yoshimasa Hirata

(Chemical Institute, Nagoya University, Chikusa-ku, Nagoya, Japan)

and Shosuke Yamamura\*

(Faculty of Pharmacy, Meijo University, Showa-ku, Nagoya, Japan)

(Received in Japan January 10 1973; received in UK for publication 30 January 1973)

Daphniphyllidine [I, mp (dec.) 264° (B MeI), m/e 485 (M<sup>+</sup>) (C<sub>30</sub>H<sub>47</sub>O<sub>4</sub>N)]<sup>1</sup> is an isomer of desacetyl daphniphylline (II).<sup>2</sup> The IR absorption bands at 1710 and 3430br. cm<sup>-1</sup> indicate the presence of a carbonyl group and a hydroxyl group, respectively. Furthermore, this alkaloid has the NMR signals [0.93 (3H, s), 1.51 (3H, s), 3.45 (1H, d, J= 12Hz), 4.00 (1H, q, J= 12, 2Hz) and 4.20 (1H, m)] corresponding to those of the ketal acid (III),<sup>2</sup> in addition to three methyl signals arising from one isopropyl and one tertiary methyl groups, which must be attached to the same amine moiety as that of daphniphylline (IV), as suggested by the mass spectrum of daphniphyllidine having two characteristic peaks at m/e 286 and 272.<sup>2</sup> The above facts indicate that daphniphyllidine has the same ketal and amine moieties as those of daphniphylline (IV), whereas the chain connecting the two moieties is different. In fact, the NMR spectrum of daphniphyllidine shows a sharp singlet at δ 4.83 (1H), which can be assigned to a proton attached to the carbon atom bearing the hydroxyl group. This signal was shifted to δ 5.63 (1H, s) in the case of the corresponding acetate (V),<sup>3</sup> which was easily obtained on acetylation of daphniphyllidine with Ac<sub>2</sub>O - pyridine (room temp., overnight).

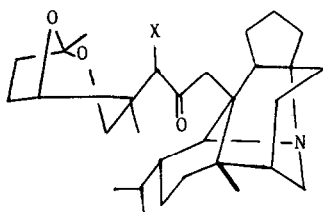
Finally, desacetyl daphniphylline (II) was converted to daphniphyllidine (I) in ca. 50% yield, when heated with NaOMe - MeOH under reflux.

From a biogenetic point of view, the structure of daphniphyllidine (I) is of quite

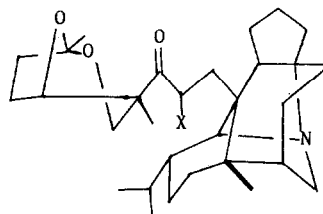
---

\* To whom inquiries should be addressed.

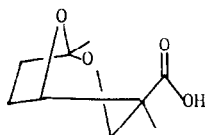
interest, for the position of the carbonyl group is different from that of daphniphylline (IV). As described in the preceding paper,<sup>4</sup> it is quite reasonable that the carbonyl group on the chain connecting the two moieties is located at such a position as found in the structure (VI) of codaphniphylline, which can be formed by the cyclization of squalene 2,3-oxide followed by hydroxylation, oxidative bond fission, and then intramolecular ketal formation. Probably, daphniphyllidine (I) is formed from desacetyl daphniphylline (II) via an endiol (VII), or by direct 1,2-hydride shift at the position of the  $\alpha$ -hydroxy-ketone (in II).



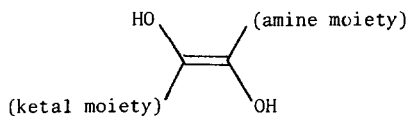
(I) X = OH  
(V) X = OAc



(II) X = OH  
(IV) X = OAc  
(VI) X = H



(III)



(VII)

#### REFERENCES AND FOOTNOTES

1. Daphniphyllidine has been reported as the structurally unknown alkaloid D isolated from the bark and leaves of *Daphniphyllum macropodum* Miq. (M. Toda, H. Irikawa, S. Yamamura and Y. Hirata, *Nippon Kagaku Zasshi*, 91, 103 (1970)).
2. H. Irikawa, N. Sakabe, S. Yamamura and Y. Hirata, *Tetrahedron*, 24, 5691 (1968).
3. A quartet at  $\delta$  5.52 (1H, J = 12, 3Hz) is found in the NMR spectrum of daphniphylline.<sup>2</sup>
4. K. T. Suzuki, S. Okuda, H. Niwa, M. Toda, Y. Hirata and S. Yamamura, Submitted to *Tetrahedron Letters* (1973).