

STRUCTURE OF GIGACTONINE. A NEW DITERPENOID ALKALOID FROM Aconitum gigas Lév. et Van.

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The structure of gigactonine (I), isolated from Aconitum gigas, was determined by IR, NMR and mass spectroscopy and chemical transformations. Thus 18-O-methylgigactonine (II) and the known alkaloid, delsoline, were shown to be identical.

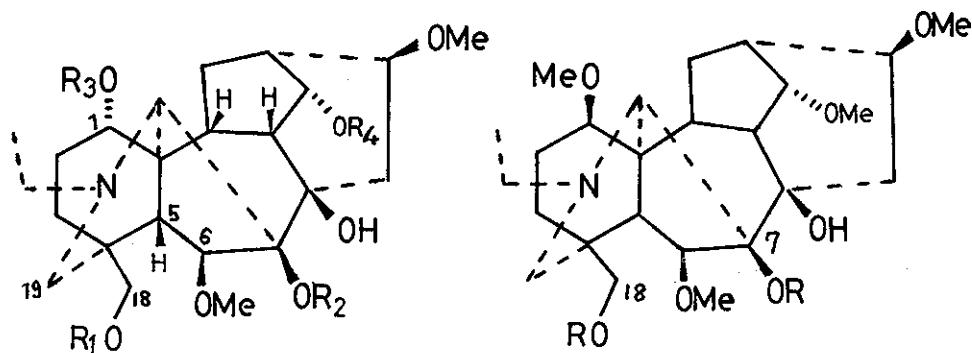
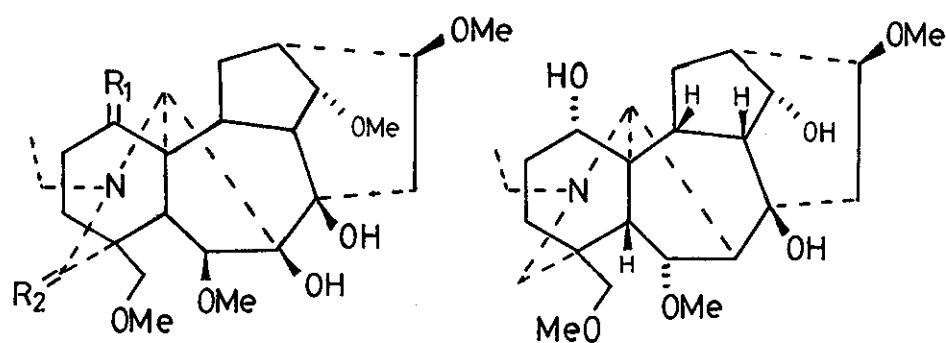
In 1950, Suginome and Ohno reported isolation of lycaconitine¹⁾ from Aconitum gigas Lév. et Van. (Lycocotonum gigas Nakai) and its chemical study.

In the present communication we report isolation of atisine hydrochloride²⁾ and a minor new base, named gigactonine from the roots of the same plant.

Gigactonine, $C_{24}H_{39}O_7N$, mp 168-169°, (containing $\frac{1}{5} CH_3COCH_3$, as solvent of crystallization) $[\alpha]_D^{22} + 49$ (c 1.0, EtOH) showed broad IR absorption at $\nu_{max}^{CH_3} 3460 \text{ cm}^{-1}$ (OH). The ¹H NMR spectrum showed absorptions for a $N-CH_2CH_3$ group (3H, t. $J=7$ Hz) centred at δ 1.08, 3 aliphatic OCH_3 groups (6H, s.) at δ 3.40, 3H, s. δ 3.34) and a proton on carbon 6 bearing OCH_3 group (1H,

s. at δ 4.00). Gigactonine (I) gave a diacetyl derivative (amorphous solid, M^+ m/e 537), which showed 1H NMR signals at δ 4.72 (1H, t, $J=8$ Hz) and δ 3.96 (2H, s.), suggesting the presence of a primary and a secondary alcohols in the original alkaloid. Methylation of hydroxy groups of gigactonine (I) yielded three products: mono-(II) (mp 213°), di-(III) (mp 197-198°), and trimethylated (IV) (amorphous solid) compounds. The third compound IV was proved to be different from the dimethylated lycocitonine (V)³⁾ by comparison of their IR and 1H NMR spectra, although the both compounds showed almost same mass spectra. The dimethylated compound (III) gave an amorphous mono acetate whose 1H NMR spectrum showed a proton on an acetoxylated carbon atom at δ 4.65 (1H, t, $J=7$ Hz). On Cornforth oxidation (CrO_3 -Py-H₂O), mono-methylated compound (II) afforded a six-membered ketone (VI) (amorphous solid, M^+ m/e 465, IR 1690 (C=O)) and a lactam ketone (VII) (mp 201-202°, M^+ m/e 479, IR 1710 (C=O), 1630 (N-C=O)). ^{13}C NMR spectrum of gigactonine (I) showed a very similar pattern to that of the known alkaloid lycocitonine (VIII)⁴⁾ excepting the signals of carbons 1, 5 and 19. ^{13}C NMR signals due to carbons 1, 5 and 19 of gigactonine (I) were observed at δ 73, 45 and 57 ppm and these values were similar to those of neoline (IX)⁵⁾ having α -OH group on carbon 1. These observations indicate structure (II) for gigactonine monomethylether. Structure (II) was completely the same as that of the known delphinium alkaloid delsoline⁶⁾. Identity was confirmed by direct comparison of gigactonine monomethyl ether (II) with delsoline, derived from delcosine (Takao base (I))⁷⁾ by monomethylation⁶⁾. The complete structure of gigactonine can now be represented as (I).

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I : $R_1 = R_2 = R_3 = H$, $R_4 = Me$ II : $R_1 = R_4 = Me$, $R_2 = R_3 = H$ III : $R_1 = R_2 = R_4 = Me$, $R_3 = H$ IV : $R_1 = R_2 = R_3 = R_4 = Me$ X : $R_1 = Me$, $R_2 = R_3 = R_4 = H$ V : $R = Me$ VIII : $R = H$ VI : $R_1 = O$, $R_2 = H_2$ VII : $R_1 = R_2 = O$

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- 2) This alkaloid was separated from polar parts of crude tertiary base and crude quaternary base. Identity was established by direct comparison with the authentic atisine hydrochloride. We wish to thank Prof. S. William Pelletier, University of Georgia, U. S. A., for generous gift of atisine hydrochloride.
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