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ALKALOIDS OF THE CULTIVATED SPECIES *Aconitum anglicum* AND *A. raddeanum*

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Continuing a study of the alkaloids of cultivated species of the genus *Aconitum* L. [1], we have investigated the hypogeal organs (rhizomes with roots) of *A. anglicum* Stapf (period of withering of the phytomass and ripening of the seeds) and *A. raddeanum* Rgl. (period of the beginning of the aftergrowth of the epigeal part) cultivated in the Polar-Alpine Botanical Garden (PABS) and sent by A. P. Gorelova. The first of them is a high-mountain species of central and southern Europe grown from seeds of culture originally obtained from the Reykjavik Botanical Garden. The second is a species from the Manchurian flora grown from seeds of culture originally obtained from the Moscow Main Botanical Garden.

The plant *A. anglicum* has proven to be resistant to the unfavorable factors of the Subarctic environment and capable of seed renewal. *A. raddeanum*, on the other hand, flowers irregularly and does not give ripe seeds under the conditions of introduction into PABS [2]. Our study is the first for both these plants.

The alkaloids were extracted with chloroform from the air-dry comminuted raw material of *A. anglicum* (1140 g) that had previously been treated with sodium carbonate solution, and the dried chloroform extract was then treated with acid. After alkalinization, the acid solution yielded 2.9 g of alkaloids (0.25% of the weight of the dry raw material). By chromatography, the mixture of alkaloids yielded songorine and songorine N-oxide, mp 200-201°C (from acetone–hexane). The substances were identified by direct comparison (mixed melting point, TLC, IR, mass, and PMR spectra) with authentic specimens of the alkaloids obtained from *A. firmum* [3] and *A. monticola* [4].

It must be mentioned that the solubilities in organic solvents and the melting point ascribed to songorine N-oxide in the literature [4] actually relate to songorine N-oxide hydrochloride, which had mp 255-257°C (decomp., from alcohol), close to that given in [4] for songorine N-oxide, which, unlike its hydrochloride, is readily soluble in ethanol and methanol.

The total alkaloids (3 g, 0.95% of the weight of the dry raw material) were obtained from the hypogeal parts of *Aconitum raddeanum* (312 s) in a similar way to that described above. Chromatography of the mixture of alkaloids on alumina gave base (**1**) (0.05 g) with the composition $C_{25}H_{39}NO_5$; the crystalline alkaloid (**2**) (0.7 g) with the composition $C_{23}H_{37}NO_4$; and atisine chloride, which was obtained in the individual form by preparative TLC. Atisine chloride was identified by direct comparison with an authentic specimen (mixed melting point, IR and mass spectra) [5].

Base (**2**) had mp 110-112°C (from petroleum ether). Mass spectrum (EI, 70 eV), m/z (I_{rel}, %): 391 (M^+, 5), 376 (2), 361 (25), 360 (100), 312 (10). The IR and NMR spectra of (**2**) coincided with those published for sachaconitine, isolated from *A. miyabei* [6]. Since the melting point of (**2**) was lower than that published in [6], we obtained by acetylation with acetic anhydride in pyridine the monoacetyl derivative (M^+ 433) in the form of a transparent film. Its PMR spectrum (100 MHz, $CDCl_3$, δ, ppm, J, Hz) had signals at 4.79 (1H, t, J = 4.5, 14-Hβ), 3.25 and 3.21 (s, 3H each, 2 × OCH_3), 2.02 (s, 3H, OAc), 1.08 (t, 3H, $N\text{-}CH_2\underline{CH_3}$), 0.78 (s, 3H, 18-Me). Consequently the acetylation product was 14-acetylsachaconitine.

It was found that the IR, mass, and PMR spectra of base (**1**) agreed with those for 14-acetylsachaconitine. The alkaloid 14-acetylsachaconitine has previously been isolated from *A. delphinifolium*, [7] and *A. austroyunnanense* [8].

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