STUDY OF THE ALKALOIDS OF Sophora alopecuroides

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UDC 547.94

Continuing our investigations of the alkaloids of Sophora alopecuroides [1], we have studied the alkaloid composition of the fraction insoluble in petroleum ether (the plant was collected in the flowering stage).

By the separation of the petroleum-ether-insoluble fraction according to basicity by fractional alkalization with sodium bicarbonate and then with ammonia followed by chromatography of the fractions on a column of alumina, we isolated from fractions 1-7 sophoramine (0.081%), sophocarpine (0.0053%), and neosophoramine (0.002%); from fractions 17-19 we isolated base 13 (0.087%) and a liquid base (0.00014%) with mol. wt. 272 (mass spectrometrically) [R_f 0.97 in a thin layer of alumina of activity grade IV in the petroleum ether–ether (1 : 1), +5% of methanol, system].

Base 13 has the composition $C_{15}H_{22}N_2O_2$, mp 208-210°C, $[\alpha]_D^{20}$ +37° (c 1.14; ethanol), M^+ 262 (low intensity).

Base 13 is very similar to sophocarpine in the nature of its fragmentation and the intensities of the peaks in its mass spectrum: the main peaks of ions with m/e 68, 80, 96, 98, 110, 122, 136, 138, 146, 148, 150, 160, 177, 203, 217 and the strong peaks with m/e 245 (100%) and 246 (M−1 and M^+ for sophocarpine and M−17 and M−16, respectively, for base 13), while the relative intensities of the latter two peaks in relation to the other peaks in the mass spectrum of base 13 are higher than for sophocarpine. In the region of the molecular peak, base 13 has a group of four peaks of low intensity (< 1%), including one with m/e 262 (M^+).

In a study of the NMR spectra of base 13 (using the INDOR method; measurements performed by M. E. Perel'son) it was established that in it, as in sophocarpine, rings C/D are trans-linked and the C_5 and C_7 protons are axial. C_{14}–H: $\delta = 5.83$: $J_{14.13} = 9.5$ Hz; $J_{14.12a} = 2.4$ Hz; $J_{14.12e} = 1.2$ Hz; C_{13}–H: $\delta = 6.43$; $J_{13.14} = 9.5$ Hz; $J_{13.12e} = 5.2$ Hz; $J_{13.12a} = 3.1$ Hz; C_{12}–Ha: $\delta = 2.02$; $J_{12a,12e} = 8.0$ Hz; $J_{12a,11} = 10.8$ Hz; $J_{12a,13} = 3.1$ Hz; C_{12}–He: $\delta = 2.57$; $J_{12e,12a} = 18.0$ Hz; $J_{12e,11} = 6.1$ Hz; $J_{12e,13} = 5.2$ Hz; C_{11}–H: $\delta = 5.04$; $J_{11,12a} = 10.8$ Hz; $J_{11,12e} = 6.1$ Hz; $J_{11,7} = 10.8$ Hz; C_{17}–Ha: $\delta = 4.17$; $J_{17a,17e} = 12.0$ Hz; $J_{17a,5} = 12.0$ Hz; C_{17}–He: $\delta = 3.97$; $J_{17e,17a} = 12.0$ Hz; $J_{17e,5} = 5.4$ Hz.

The same linkage of the rings as in sophocarpine was also confirmed by catalytic reduction over platinum oxide of both substances to give matrine.

In contrast to that of sophocarpine, the IR spectrum of base 13 has no Bohlmann band but there is an absorption band at 950 cm^{-1} (N-oxide).

The reduction of base 13 with zinc in an acid medium to sophocarpine definitively confirmed its structure. Thus, it is sophocarpine N-oxide–sophocarpidine (literature data: mp 202-204°C, $[\alpha]_D^{20}$ +32.4° [2]).

LITERATURE CITED

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All-Union Scientific-Research Institute of Medicinal Plants. Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 259-260, March-April, 1974. Original article submitted August 7, 1973.