THE QUINONES OF SOME SPECIES OF SAGE

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We have previously [1-4] reported the isolation from the roots of Salvia nemorosa L. of acetoxyroyleanone, hydroxyroyleanone, and nemorone. By thin-layer chromatography on silica gel G in systems 1) chloroform–ethyl acetate (85 : 15) and 2) chloroform, we have isolated from a petroleum-ether extract of the roots of Salvia nemorosa L. another two yellow crystalline substances, one of which has proved to be a new quinone, and we have called it desacetylnemorone, while the second has been identified as royleanone, which has been isolated previously from the roots of Inula royleana DC [5].

Desacetylnemorone, $C_{20}H_{26}O_5$, has mp 195-197°C (Kofler block), mol. wt. 346 (mass spectrometrically), R_f 0.35 (system 1).

IR spectrum, λ_{max}, cm^{-1}: 3600, 3420, 2750, 1715, 1655, 1632 and 1618. The bands at 3600 and 3420 cm^{-1} represent the absorption of hydroxy groups, those at 2750 and 1715 cm^{-1} are characteristic for the vibrations of the CH and CO bonds of an aldehyde group, those at 1655 and 1632 cm^{-1} relate, respectively, to a quinoid carbonyl and to a quinoid carbonyl bound by an intramolecular hydrogen bond with a neighboring hydroxy group, and the 1618 cm^{-1} bond is due to the vibrations of the C = C bonds of a quinone ring. UV spectrum: λ_{max}^{EtOH} 205, 265 and 410 nm (log ε 4.05; 4.00 and 2.85 nm; $\lambda_{max}^{EtOH+NaOH}$ 228, 265 and 536 nm (log ε 4.20; 3.80 and 3.10).

When desacetylnemorone was compared with the product of the alkaline hydrolysis of nemorone obtained previously, it was found that they were identical. Consequently, this substance has the structure of 7,12-dihydroxy-10-formyl-13-isopropyl-4,4-dimethyloctahydrophenanthrene-11,14-quinone.

Apart from Salvia nemorosa L., we have made a chemical study of the quinones of the roots of another six species of sage: S. carduacea Benth, S. deserta Schang, S. officinalis, L., S. pachystachya Trautv., S. pratensis L., and S. verbenaca L. From each species we isolated and identified acetoxyroyleanone, $C_{22}H_{30}O_5$, mp 211-214°C, $[\alpha]_D^{20}$ −12, 4° ($CHCl_3$), and hydroxyroyleanone $C_{20}H_{28}O_4$, mp 172-174°C, $[\alpha]_D^{20}$ −130.5° ($CHCl_3$).

In a qualitative examination of the petroleum-ether and chloroform extracts of the roots of the various species of sage by thin-layer chromatography on silica gel G in the systems mentioned above (using as markers the royleanones and tanshinones from Salvia nemorosa L. and Salvia milthiorhiza Bunge, respectively, the former appearing on the plates in the form of lilac spots and the latter in the form of orange or yellow spots), it was shown that only quinones of the royleanone type are characteristic for some species (Salvia carduacea Benth., S. deserta Schang., S. illuminata Klok., S. korolkowii Rgl. et Schmal., S. moldavica Klok., S. nemorosa L., S. officinalis L., S. pachystachya Trautv., S. pratensis L., S. ringens Sibth et Sm., S. verbenaca L., S. virgata Jacq.), and only those of the tanshinone type for others (S. aethiopis L., S. argentea L., S. canariensis L., S. canescens C. A. Mey., S. ceratophylla L., S. chloroleuca Rech., S. columbariae Benth., S. glutinosa L., S. kopetdaghensis S. Kudr., S. lilacinocaerulea Nevski, S. limbata C. A. Mey, S. linczevskii Kudr., S. macrosiphon Boiss., S. mithiorhiza Bunge, S. roemeriana Scheele., S. sclarea L., S. spinosa L., S. syriaca L., S. verticillata L.).

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No quinones were found in Salvia nilotica Murr and Salvia viridis L.

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