ESTERS OF THE ROOTS OF Ferula kuhistanica

A. I. Saidkhodzhaev and G. K. Nikonov

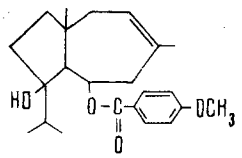
UDC 547.913.5:668.5;547.587.52

Continuing a study of plants of the genus Ferula [1-4], from the roots of F. kuhistanika Eug. Kor., collected in the period of vigorous growth in Aman-Kutane (Samarkand oblast), by separation on silica gel we have isolated a substance with the composition $C_{23}H_{32}O_4$, mp 102-103°C, $[\alpha]_D^{26}$ +103.5°.

The UV spectrum of the substance has an absorption band at 260 nm (log ε 4.09) showing the presence of a benzene nucleus in its molecule, and the IR spectrum shows bands at 1700 cm^{-1} (carbonyl of an ester of an unsaturated acid) 1680, 1610, 1580 cm^{-1} (1,4-substituted aromatic nucleus), and 3560 cm^{-1} (hydroxy group). The substance is a new one, and we have called it ferutidin. When it was hydrolyzed by heating in a 5% solution of caustic potash, the neutral fraction of the hydrolyzate yielded ferutinol, $C_{15}H_{26}O_2$, mp 89-°C, $[\alpha]_D^{26}$ +40.1° (c 1.02; methanol) [1, 3], and the acid fraction yielded p-methoxybenzoic acid with the composition $C_8H_8O_3$, mp 183-184°C, which was identified by a comparison of IR spectra and by a mixed melting point. Thus, it has been established that ferutidin is an ester of ferutinol and p-methoxybenzoic acid. In the NMR spectrum of the substance (JNM-4H-100/100 Mz, 0 - HMDS; solution in CCl_4) there were the signals of four ortho protons of an aromatic nucleus in the form of a doublet at 6.70 and 7.75 ppm (J = 10 Hz, 2H each), a singlet at 3.66 ppm (3H) due to a methoxy group in an aromatic nucleus, a multiplet at 5.35 ppm (1H) due to an olefinic proton, and a triplet with secondary splitting at 5.10 ppm determined by a geminal proton to an ester grouping. In addition, in the strong-field region there were the signals of two secondary methyl groups in the form of doublets at 0.79 and 0.88 ppm (J = 6 Hz, 3H each), and the signals of angular (1.05 ppm) and vinyl (1.78 ppm) methyl groups.

The results of a comparison of the NMR spectra of ferutin [1, 3, 5], ferutinin [2, 3, 5], and ferutidin in the strong-field region show that in the last of them the acyl residue is present in the C_6 position. This is confirmed by the fact that when ferutinin [2, 3] was methylated with diazomethane we obtained a product which was identical with respect to its melting point, IR spectrum, and mixed melting point, with ferutidin.

On the basis of these results, we propose the following structure for ferutidin:



By washing the column with petroleum ether-ethyl acetate (3:1) we also isolated ferutinin, $C_{22}H_{30}O_4$, mp 120-121°C [2, 3].

LITERATURE CITED

1. A. I. Saidkhodzhaev and G. K. Nikonov, Khim. Prirodn. Soedin., 579 (1972).
2. A. I. Saidkhodzhaev and G. K. Nikonov, Khim. Prirodn. Soedin., 28 (1973).
3. A. Sh. Kadyrov and G. K. Nikonov, Khim. Prirodn. Soedin., 59 (1972).
4. K. H. Kamilov and G. K. Nikonov, Khom. Prirodn. Soedin., 718 (1972).
5. A. I. Saidkhodzhaev and G. K. Nikonov, Khim. Prirodn. Soedin., 166 (1974).

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Uzbek SSR. Translated from Khimiya Prirodnykh Soedinenii No. 4, pp. 525-526, July-August, 1974. Original article submitted September 11, 1974.