# AN INVESTIGATION OF THE RESIN OF THE ROOTS OF *Ferula rigidula*

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From the neutral fraction of the resin of the roots of *Ferula rigidula* D. C. (collected in the Nakhichevan ASSR) obtained by acetone extraction we have isolated by chromatography on a column of $Al_2O_3$ a crystalline substance (I) with the composition $C_{11}H_{12}O_4$, mp 87-88°C (aqueous ethanol). This substance has also been detected in the resin of the roots of *Ferula oopoda*.

The IR spectrum of the compound (paraffin oil) showed strong absorption bands at 1685 $cm^{-1}$ (CO group conjugated with an aromatic ring), 1518, 1605, and 1630 $cm^{-1}$ (C=C of a benzene ring), 2860 $cm^{-1}$ (methoxy group), and 2800 $cm^{-1}$ (methylenedioxy group). There are no strong maxima in the 1200-1300 $cm^{-1}$ region. On treatment with 5% KOH, the substance did not undergo saponification or any other change. These results permit the conclusion that the band at 1685 $cm^{-1}$ in the spectrum of (I) is due to a keto group conjugated with a benzene ring.

The reduction of (I) with sodium tetrahydroborate in methanol gave an aromatic alcohol (II) with the composition $C_{11}H_{14}O_4$, the IR spectrum of which contained the bands of an alcoholic hydroxy group (3400 $cm^{-1}$), of an aromatic system (1510, 1620, 1640 $cm^{-1}$), of a methylenedioxy group (2780 $cm^{-1}$), and of a methoxy group (2860 $cm^{-1}$). There was no band of a keto group (1680 $cm^{-1}$).

The NMR spectrum of (I) (100 MHz, δ scale, solvent $CCl_4$, HMDS — 0) had the signals of a $CH_3$—$CH_2$—group (triplet at 1.10 ppm, 3H, and quartet at 2.76 ppm, 2H, J = 7 Hz), of a methylenedioxy group (singlet at 5.91 ppm, 2H), of a methoxy group (singlet at 3.83 ppm, 3H), and of aromatic protons (doublets at 6.94 and 7.07 ppm, 1H each, J = 2 Hz). The spin—spin coupling constant of the aromatic protons shows their meta position [1].

The IR and NMR spectra of compound (I) and of an aromatic compound (mp 85-86°C, (II)) obtained from *Ferula karatavica* Rgl. et Schmalh. [2] coincided. Consequently, the substance that we have isolated is 3,4-methylenedioxy-5-methoxy-1-(1-oxopropyl)benzene. The same compound has been obtained from the resin of the roots of *Ferula ugamica* Korov. (mp 91-92°C, III) [3], from *Laserpitium latifolium* L. (mp 88°C) [4-6], and from myristicin (mp 93°C) [7].

The results of a direct comparison of the IR and NMR spectra of (I) and (III) also showed their identity. The shift by 13 Hz between the aromatic protons in the NMR spectrum of (I) does not exclude the possibility of the presence in them of a 2,3-methylenedioxy-5-methoxypropiophenone structure.

## LITERATURE CITED

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