Chemistry of Natural Compounds, Vol. 34, No. 4, 1998

TERPENOID COUMARINS OF *Ferula sumbul*

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UDC 547.9:582.89

Ferula sumbul Hook (fam. Apiaceae) has long been used by man thanks to its attractive nutmeg odor. An extract from the roots is employed as a fixative replacing musk [1]. We have studied the roots of this plant for the presence of coumarins.

Air-dry roots of *F. sumbul* (0.4 kg) gathered in the phase of the withering of the epigeal part on June 25, 1996 in the Kashkadar'inskaya oblast (upper reaches of the R. Kyzyldar'ya, Gissarskii range) were exhaustively extracted with a 1:1 mixture of ethanol and methanol. The extract was evaporated in vacuum and the residue was treated with ethyl acetate to extract the coumarins. Evaporation of the ethyl acetate extract yielded a total of 35 g of substances, which were chromatographed on a column of type KSK silica gel at a ratio of substance to support of 1:20, with elution by mixtures of petroleum ether–ethyl acetate having successively increasing concentrations of the latter.

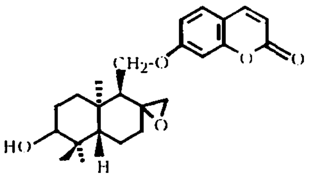
As a result of chromatographic separation with elution by petroleum ether–ethyl acetate (6:1), (4:1), and (2:1) systems, four compounds of coumarin nature were isolated: (**1**) — $C_{24}H_{28}O_4$, mp 142-143°C, M^+ 380; (**2**) — $C_{24}H_{30}O_4$, mp 137-138°C, M^+ 382; (**3**) — $C_{24}H_{30}O_4$, mp 116-117°C, M^+ 382; and (**4**) — $C_{24}H_{30}O_5$, mp 144-145°C, M^+ 398.

By a comparison of physicochemical constants and spectral characteristics (IR, mass, PMR), with those given in the literature, coumarins (**1**)-(**3**) were identified as conferol (**1**), conferone (**2**), and moschatol (**3**), respectively [2-4]. Compound (**4**) proved to be new, and we have named it sumferin.

Sumferin (**4**) is a derivative of umbelliferone, as was shown by maxima in the UV spectrum that are characteristic for 7-O-coumarin derivatives: ν_{max} 222, 244, 254, 295, 325 nm.

In the IR spectrum of compound (**4**) absorption bands appeared at (cm^{-1}) 3550 (hydroxy group), 1725 (α-pyrone C=O), 1620, 1560, and 1515 (aromatic nucleus). Its PMR spectrum contained the signals of the protons of three tertiary methyl groups at (ppm) 0.85, 1.01, and 1.13 (s, 3H each, $C_{5'}$-$2CH_3$, $C_{9'}$-CH_3), signals of the protons of an exomethylene group at 2.75 (s, 2H), and a broadened singlet at 3.38 (br.s, 1H, $W_{1/2}$ = 6Hz) assigned to a gem-hydroxylic proton. There were signals from the methylene protons in a $C_{1'}-CH_2-O-$ grouping in the form of a two-proton multiplet with its center at 4.22 ppm. In the weak-field region, signals were observed of the protons of a monosubstituted coumarin nucleus: doublets at (ppm) 6.12 and 7.54 of 1H each (J = 9.5 Hz) were assigned to the H_3 and H_4 protons, respectively, a multiplet at 6.78 ppm (2H) to the H_6 and H_8 protons, and a doublet at 7.35 (1H, J = 8.5 Hz) to the H_5 proton.

A comparison of the results that we had obtained with the literature showed that sumferin has the structure (**4**):



The proposed structure was conformed by the oxidation of gummosin with perphthalic acid, which led to a compound identical with sumferin in all respects.

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