

MALTOL FROM NEEDLES OF *Abies sibirica*

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From the needles of *Abies sibirica* (Siberian fir) we have isolated a substance with the composition $C_6H_6O_3$ (I), mp 159-160°C (methanol), mol. wt. 126 (mass spectrometry), readily subliming at 140°C. Compound (I) absorbs in the UV region at λ_{max} (methanol) 277 nm (log ϵ 3.93). Its NMR spectrum ($CDCl_3$) has the signals of the protons of a methyl group (singlet with an intensity of 3H at δ 2.23 ppm) and a hydroxy group (broad singlet, 1H, at δ 3.63 ppm). The presence of a hydroxy group in compound (I) was confirmed by the formation of its monomethyl derivative on methylation with diazomethane (mol. wt. 140, mass spectrometry). In the NMR spectrum (CCl_4) of the methyl ether of (I), the broad singlet of the proton of the hydroxy group disappears and a singlet (3H) of a methoxy group appears at δ 3.73 ppm.

The benzoylation of (I) led to a monobenzoate with mp 110-112°C (aqueous methanol).

The hydroxy group in substance (I) forms an intramolecular hydrogen bond, which is confirmed by the band of its stretching vibrations in the IR spectra [3260 cm^{-1} (KBr) and $3260, 3415\text{ cm}^{-1}$ ($CHCl_3$)]. The hydroxy group is probably in the α position to the carbonyl [1660 cm^{-1} (KBr) and 1674 cm^{-1} ($CHCl_3$)]. This is in harmony with the fact that when the compound is methylated the frequency of absorption of the carbonyl group rises to 1715 cm^{-1} .

Substance (I) is unsaturated. Its IR spectrum has bands corresponding to the vibrations of a conjugated double bond.

Two doublets in the weak field (δ 6.30 and 7.83 ppm, $J=5.5\text{ Hz}$) in the NMR spectrum of (I) correspond to protons on one of the double bonds in a γ -pyrone ring [1].

On the basis of the results obtained, the compound (I) isolated from the needles of the Siberian fir can be identified as 3-hydroxy-2-methyl- γ -pyrone, or 2-methylpyromeconic acid. This substance - maltol - has been found previously in the needles of *Abies alba* Mill. [1] (silver fir).

LITERATURE CITED

1. NMR Spectra Catalog, Spectrum 455, Varian Associates, Palo Alto, California (1962).
2. W. Feuerstein, Ber., 34, 1804 (1901).

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