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STUDY OF SOME REPRESENTATIVES OF THE FAMILY Umbelliferae

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By adsorption chromatography on neutral alumina, from the total extractive substances of the roots of Seseli peucedamoides K. Pol., Lazer trilobum Borkn., Peucedanum cervarifolium C.A.M., and Peucedanum pauciradiatum Tamamsch. we have isolated aromatic and coumarin compounds. On the basis of physicochemical characteristics, substances with the compositions $C_{12}H_{12}O_4$ (I), mp 85-86°C, from Lazer trilobum; $C_{12}H_8O_4$ (II), mp 188-191°C, from Peucedanum cerevarifolium; and $C_{24}H_{30}O_3$ (III), mp 61-63°C, from Seseli peucedanoides were identified as crocatone, bergapten, and umbelliprenin, respectively [1, 2].

In addition to crocatone and radiatinin [3], from the combined extractive substances of the roots of *Peucedanum pauciradiatum* we isolated a new aromatic compound not previously described in the literature, with the composition $C_{10}H_{10}O_4$ (IV), M⁺ with m/z 194, mp. 169-170°C, which we have called radiatinol. The IR spectrum of (IV) has adsorption bands at (cm⁻¹) 3370 (hydroxylic OH), 1675 (CO of a conjugated ketone), 1630, 1615, 1530 (aromatic ring), and 1060 and 930 (methylenedioxy group). The ¹H NMR spectrum of radiatinol (Fig. 1) shows the signals of protons at (ppm) 1.13 (CH₃-CH₂-, 3 H, triplet, J = 7 Hz); 2.80 (CH₃-CH₂-, 2 H, quartet, J = 7 Hz); 5.95 (-O-CH₂-O-, 2 H, singlet); and 7.0 and 7.25 (hydrogen atoms of a benzene ring, 1 H each, doublets, J = 2.0 Hz). The size of the spin-spin coupling constant of the aromatic protons confirms their meta position [4]. The methylation of radiatinol with diazomethane formed crocatone [1]. The positions of the substituents in crocatone were confirmed by the Overhauser effect. Thus, irradiation of the protons of the methoxy group by a H₂ field led to a rise in the intensity of the signals of the signal from the H-3 proton by 20%, while the intensity of that from the H-1 proton did not change.



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IR spectra (NaCl, mull in paraffin oil) were taken on a UR-20 spectrophotometer; ¹H NMR spectra (in $C_5 D_5 N$, 0 – TMS, δ scale) on a Varian HA 100D spectrometer; and mass spectra on a Varian CH-8 spectrometer; melting points were determined on a Kofler block.

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FLAVONOIDS FROM Trifolium polyphyllum

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Continuing [1] investigations of the flavonoid compounds from *Trifolium polyphyllum* C.A.M. (polyphyllous clover), family *Fabaceae*, collected in July in the environs of the town of Cheget (Kabardino-Balkarsk ASSR), from this plant we have isolated in the individual state and have identified six flavonoid compounds.

The air-dry herbage and roots (simultaneously) were extracted exhaustively with 70% ethanol, the extracts were evaporated to an aqueous residue, and the lipophilic substances were eliminated with chloroform. The aqueous extracts were treated with ethyl acetate. Precipitation with dry chloroform gave the total flavonoids, which were separated on a column containing polyamide sorbent. Six flavonoid compounds were obtained in the individual state (A, B, C, D, E, and F).

Substance A - C₂₂H₂₂O₉, mp 210-212°C (from methanol), $[\alpha]_D^{20}$ -25.3° (c 0.395; methanol); λ_{max} 260 nm (ethanol).

The acid hydrolysis of compound A formed an aglycone with the composition $C_{16}H_{12}O_4$, which was identified from its melting point and UV and IR spectra as 7-hydroxy-4'-methoxyisoflavone (formononetin), and a sugar component, which was identified as D-glucose. By the cleavage of the glycoside with the enzyme from *Aspergillus oryzae*, differential IR spectroscopy [2], and the specific rotation, the presence of a pyranose ring and the β configuration of the glycosidic bond were established.

The glycoside was identified as 7-hydroxy-4'-methoxyisoflavone 7-O- β -D-glucopyranoside (ononin).

Substance B = $C_{2,7}H_{30}O_{1,6}$, mp 180-190°C (water), $[\alpha]_D$ =31.5° (c 0.32; in dimethylformamide); λ_{max} 256, 354 nm (ethanol).

The hydrolysis of substance B yielded D-glucose, L-rhamnose, and an aglycone which was identified from its UV and IR spectra, melting point, and mixed melting point as 3,3',4',5,7-pentahydroxyflavone (quercetin). Quercetin and rutinose were found in the products of enzymatic hydrolysis, and the β configuration of the glycosidic bond was established by differential IR spectroscopy and from the value of the specific rotation.

The characteristics given permit compound B to be identified as quercetin 3-0-]6-0-(L-rhamnopyranosyl)- β -D-glucopyranoside] (rutin).

Substance $C - C_{21}H_{20}O_{11} \cdot 2H_2O$, mp 229-231°C, $[\alpha]_D^{20} - 45.1°$ (c 0.14; in methanol); λ_{max} 267, 354 nm (ethanol). The acid hydrolysis of compound C gave an aglycone with mp 257-276°C, corresponding to 3,4',5,7-tetrahydroxyflavone (kaempferol). Amixture of the aglycone of C and kaempferol gave no depression of the melting point. The aglycone kaempferol and a sugar -

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