AN INVESTIGATION OF THE CHEMICAL COMPOSITION OF THE SEEDS OF Salsola collina

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Continuing a study of the chemical composition of Salsola collina Pall. (fam. Chenopodiaceae), we have investigated the seeds of this plant.

The seeds were exhaustively extracted with ethyl alcohol. The combined alcoholic extracts were concentrated in vacuum, and the residue was diluted with water and extracted successively with hexane, chloroform, and n-butanol. Hydrocarbons, fatty acids, fatty acid esters, and sterols were isolated from the hexane- and chloroform-soluble fractions of the extract.

The hydrocarbons, the esters, and the fatty acids, in the form of their methyl esters, were identified by chromato-mass spectrometry on a LKB-2091 instrument using a 30-m capillary column with the deposited phase SE-30 at temperatures of 140-300°C, 8°C/min.

It was established that the hydrocarbon fraction was represented by normal paraffins with from 25 to 31 carbon atoms. Hydrocarbons with odd numbers of methylene units predominated.

The fatty acid fraction contained a set of saturated monobasic carboxylic acids with 14, 16, 18, 20, 22, 24, and 26 carbon atoms, palmitic acid predominating. It also contained oleic, linoleic, and linolenic acids.

The isolation and identification of the free sterols and glycosides were carried out under the conditions described previously [2]. As a result, we identified campesterol, stigmasterol, β-sitosterol. 24-ethylcholestan-3-ol, and their glucosides, corresponding in qualitative composition to the set of sterols from the herbage of S. collina.

The butanol fraction was chromatographed on columns of polyamide in water–methanol and chloroform–methanol gradient systems. The aqueous eluates yielded glycine betaine $C_5H_{11}NO_2$, FAB–MS, m/z: 118 $(M + H)^+$; melting point of the hydrochloride of the glycine betaine 243-245°C [3].

The flavonoid compounds (I-VI) were identified on the basis of their mass and UV spectra and comparison with authentic samples, and also by HPLC on a Milikhrom-1 chromatograph with a 2 × 80 mm column containing the stationary phase Silasorb–SPH (μm) with the mobile phases 15% acetonitrile for (IV) and (V) and 40% methanol for (VI).

The following identifications resulted: (I) – isorhamnetin, $C_{16}H_{22}O_7$ (M^+ 316), mp 302-304°C, λ_{max} (MeOH) 255, 268 sh., 370 nm [4, 5]; (II) – kaempferol, $C_{15}H_{10}O_6$ (M^+ 286), mp 284-286°C, λ_{max} (MeOH), 255, 267 sh., 368 nm [5]; (III) – quercetin, $C_{15}H_{10}O_7$ (M^+ 302), mp 302-304, λ_{max} (MeOH) 255, 269 sh., 370 nm [5]; (IV) – isorhamnetin 3–O–β–D glucopyranoside, $C_{22}H_{22}O_{12}$ (FAB–MS, m/z: 479, 317), mp 170-172°, λ_{max} (MeOH) 255, 355 nm [4]; (V) – quercetin 3-O-β-glucopyranoside, $C_{21}H_{20}O_{12}$ (FAB–MS, m/z: 465, 303), mp. 220-222°C, λ_{max} (MeOH) 257, 360 nm [4]; and (VI): quercetin 3-O-rutinoside (rutin), $C_{27}H_{30}O_{16}$ (FAB–MS, mz: 611, 465, 303), mp. 186-188°C, λ_{max} (MeOH) 257, 360 nm [5].

The chemical composition of the seeds of S. collina has not been studied previously.

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A CHEMICAL STUDY OF PLANTS OF THE MONGOLIAN FLORA

THE FLAVONOIDS OF TWO SPECIES OF Oxytropis

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Plants of the genus Oxytropis (fam. Fabiaceae) are widely used in Tibetan and Mongolian folk medicine. Oxytropis muricata Pall. and O. trichophysa Bge. are employed in diseases of the liver and in the treatment of wounds and of skin diseases [1]. In the present communication we give the results of a study of the flavonoids of the epigeal parts of the above-mentioned plants gathered in the vegetation period on Mongolian territory.

The comminuted air-dry raw material was extracted with ethanol at room temperature five times. The concentrated alcoholic extract was diluted with water and was shaken successively with hexane, chloroform, ethyl acetate, and butanol. From the chloroform and ethyl acetate fractions of O. trichophysa we isolated compounds (I-IV) by column chromatography on silica gel in a chloroform–methanol gradient system. Chromatography of the ether acetate fraction of O. muricata on silica gel in the chloroform–methanol (99:1) system gave compound (IV). After extraction with above-mentioned solvents, the aqueous solution, on standing, deposited a precipitate of compound (V).

For the identification of the substances isolated we used spectral results and also (in the cases of compounds (IV) and (V)) direct comparison with authentic samples.

Liquiritigenin (I) (4',7-dihydroxyflavanone) – white crystals with the composition $C_{15}H_{12}O_4$ (M^+ 256), mp 203-204°C (chloroform–acetone).

The flavanone nature of compound (I) followed from its UV spectrum (λ_{max} 274, 313 nm) and its PMR spectrum, which contained the signals of a proton at C-2 in the form of a doubled doublet with the SSCCs 3 and 13 Hz (4.43 ppm) and the signals of protons at C-3 in the form of two doubled doublets with SSCCs of 13 and 17 Hz for the axial proton at 3.10 ppm and 3 and 17 Hz for the equatorial proton at 2.68 ppm.

Intense peaks of ions with m/z 137 (a + H) and 120 (c) in the mass spectrum showed the presence of one hydroxy group in each of rings A and B.

Analysis of the spectral results, and also a comparison of physicochemical constants, enabled compound (I) to be identified as 4',7-dihydroxyflavanone [2].

4',7-Dihydroxyflavone (II) – yellow crystals with the composition $C_{15}H_{10}O_4$ (M^+ 254), mp 319-321°C (chloroform–methanol), λ_{max} 232, 329 nm.

Pratol (III) (7-hydroxy-4'-methoxyflavone) – light yellow crystals with the composition $C_{16}H_{12}O_4$, mp 272-274°C, λ_{max} 254, 325 nm.

Flavone (II) contained two hydroxy groups and, according to its mass spectrum (ions a + H with m/z 137 and c with m/z 118), one hydroxy group in it was present in ring A and the

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