3. A. S. Saratikov, A. I. Vengerovskii, V. S. Chuchalin, I. M. Sedykh, A. A. Semenov, A. I. Syrchina, N. N. Pogodaeva, V. N. Trofimov, and K. L. Zaikov, Khim-farm. Zh., No. 6, 38 (1990).
4. A. I. Syrchina, A. L. Vereshchagin, M. F. Larin, and A. A. Semenov, Khim. Prir. Soedin., 725 (1989).
5. T. J. Mabry, K. R. Markham, and M. B. Thomas, The Systematic Identification of Flavonoids, Springer, New York (1970).

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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othe ring B. The PMR spectrum of compound (II) exhibited the signals of the protons H-5 (7.84 ppm, d, 9 Hz), H-6 (6.86 ppm, dd, 9 and 2.5 Hz), H-8 (6.94 ppm, d, 2.5 Hz), H-2',6' (7.88 ppm, d, 9 Hz), H-3',5' (6.91 ppm, d, 9 Hz), and H-3 (6.68 ppm, s). The PMR spectrum of compound (III) differed from that of flavone (II) by the presence of the signal of the protons of a CH_3O group at 3.84 ppm. Otherwise, the spectra of these two substances were very close. In the UV spectrum of flavone (III) a bathochromic shift of the short-wave band was observed in the presence of sodium acetate.

The facts presented enable compounds (II) and (II) to be identified as 4',&-dihydroxy- and 7-hydroxy-4'-methoxyflavone, respectively [2, 3].

Kaempferol (IV) (3,4'5,7'-tetrahydroxyflavone) – yellow crystals with the composition $C_{15}H_{10}O_6$ (M^+ 286), mp. 286-287°C (aquelus alcohol), λ_{max} 267, 368 nm.

Robinin (V) – yellow crystals with the composition $C_{33}H_{40}O_{19}$, mp 250-251 (methanol), λ_{max} 266, 347 nm. As the result of acid hydrolysis, compound (V) was split to form kaempferol and the monosaccharides D-galactose and L-rhamnose. The PMR spectrum glycoside (V) contained the signals of the protons of kaempferol, of two methyl groups of rhamnose residues (1.04 ppm, d, 5.6 Hz, and 1.11 ppm, d, 5.6 Hz), of three anomeric protons at 4.39 (br. s), 5.34 (d, 7 Hz), and 5.54 ppm (br. s), and of hydroxy groups in the positions C-5 (12.56 ppm, s) and C-4' (10.20 ppm, s) and also of other protons of the carbohydrate moeity. Glycoside (V) formed an acetate the PMR spectrum of which contained signals of the protons of two aromatic and nine alcoholic acetate groups. Consequently compound (V) was a trioside of kaempferol, and it was identical in its physicochemical constants with robinin [4]. The parameters of the ^{13}C NMR spectrum of glycoside (V) agreed completely with those for robinin [5].

This is the first time that the above-mentioned compounds have been isolated from Oxytropis species.

LITERATURE CITED

1. K. F. Blinova and E. I. Sakanyan, Raser. Res., 22, 266 (1986).
2. T. J. Mabry, K. R. Markham, and M. B. Thomas, The Systematic Identification of Flavonoids, Springer, New York (1970).
3. A. A. Ryabinin and E. M. Il'ina, Zh. Prikl. Khim., 28, No. 5, 663 (1955).
4. V. I. Akhmedzhanova, Khim. Prir. Soedin., 638 (1986).
5. E. Wenkert and H. E. Gottlieb, Phytochemistry, 16, 1811 (1977).