and butanol. Two-dimensional chromatography in the n-propanol—water—acetic acid (7:2:1) and 15% acetic acid systems on Filtrak FN-8 paper (cardboard, preparative fast) enabled a number of flavonoids to be isolated. The use of chemical, physicochemical, and spectral analytical characteristics permitted the structures of the substances to be established.

Substances (I) and (II) were identified as apigenin and luteolin, mp 346-347°C and 331-333°C, respectively. Substance (III) had mp 251-253°C; UV spectrum: λ^{CH_3OH} 269, 302 sh., 334 nm; it was identified as acacetin 7-glucopyranoside (tilianin). The results obtained were confirmed by an analysis of the products of the hydrolysis of substance (III).

Substance (IV) could not be obtained in the crystalline state. UV spectrum: $\lambda^{CH_3OH+0.1\%\,HCl}$ 279, 504 sh., 544 nm. On the basis of the results of an analysis of the initial compound and also of the derivatives obtained in the course of stepwise hydrolysis, substance (IV) was identified as delphinidin 3-diglucoside.

LITERATURE CITED

1. É. V Gella and L. I. Prokosheva, Khim. Prir. Soedin., 270 (1970).
2. N. Z. Sagdullaeva, R. L. Khazanovich, P. E. Krivenchuk, and A. I. Tikhonov, in: Abstracts of the 2nd Symposium on Phenolic Compounds [in Russian], Alma-Ata (1970), p. 45.
3. L. P. Smirnova, V. I. Glyzin, A. V. Patudin, and A. I. Ban'kovskii, Khim. Prir. Soedin., 668 (1974).
4. S. N. Brieskorn and W. Biechele, Arch. Pharm., 557 (1971).

CHEMICAL STUDY OF PLANTS OF THE MONGOLIAN FLORA ISOFLAVONES OF Ammopiptanthus mongolicus

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Ammopiptanthus mongolicus (family Fabaceae) is a perennial poisonous subshrub growing in the desert zone of the Mongolian People's Republic. A number of alkaloids have been isolated from it previously [1]. The presence of phenolic compounds in this plant has been established by qualitative reactions and the TLC method.

Comminuted leaves collected in the fruit-bearing period in the environs of Mount Zuramtai (South Gobi aimak) were extracted with ethanol. The concentrated ethanolic extract was diluted with water and was shaken out successively with hexane, benzene, ether, chloroform, and ethyl acetate.

When the ethereal extract was concentrated, a precipitate deposited from which, by column chromatography on polyamide, a flavonoid was isolated with the composition $C_{15}H_{10}O_5$, M^+ 270, mp 346-348°C, λ_{max} 270, 297 infl., 340 nm, which was identified as apigenin [2, 3].

The residue obtained after the ethereal extract had been evaporated was separated on columns of polyamide and of silica gel. Five individual isoflavonoids (I-V) were isolated.

Substances (I) — $C_{15}H_{10}O_4$, M^+ 254, mp 318-322°C, λ_{max} 239, 249, 260 infl., 305 nm — and (II) — $C_{16}H_{12}O_4$, M^+ 268, mp 262-264°C, λ_{max} 240 infl., 250, 260 infl., 306 nm — were identified from their IR, PMR, and mass spectra as daidzein and formononetin, respectively [2-4].

Substance (III) $C_{16}H_{12}O_6$, M^+ 284, mp 250-252°C, λ_{max} 250, 261 infl., 293, 309 (infl.)nmn (log ε 3.56, 3.55, 3.41, 3.33). Its UV spectrum was characteristic for a 3',4',7-trihydroxyflavone [2, 4]. According to PMR and mass spectra, (III) contained one methoxy and two hydroxy groups. The presence in the mass spectrum of peaks of ions with m/z 148, 137, and 133, arising as the result of the retrodiene decomposition of (III) showed that one of the hydroxy groups was present in ring A, and the OCH_3 and the other OH group of ring B.

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Consequently, substance (III) was either calycosin (4',7-dihydroxy-4'-methoxyisoflavone). The physical constants and spectral characteristics of (III) and its acetate coincided with whose of 3'-hydroxyformononetin [5].

Substance (IV): $C_{16}H_{12}O_5$, M^+ 284, mp 332-334°C, λ_{max} 231, 262, 321 nm (log ε 3.63, 3.72, 3.39). It was assigned on the basis of its UV and PMR spectra to the 4',6,7-trihydroxyisoflavone derivatives and contained one methoxy and two hydroxy groups. Intense peaks of ions with m/z 166 and 151 in the mass spectrum of (IV) showed the presence of OH and OCH_3 groups in ring A. On comparing the physicochemical and spectral properties of (IV) with those of glycetein (4',7-dihydroxy-6-methoxyisoflavone) and kakkatin (4',6-dihydroxy-7-methoxyisoflavone), we came to the conclusion that the isoflavone that we had isolated was kakkatin [4, 6].

Substance (V): $C_{22}H_{22}O_9$, M^+ 430, mp 213-215°C, $[a]_D$ − 59.2° (methanol), λ_{max} 232, 250 infl., 261, 303 nm (log ε 3.94, 4.01, 4.04, 3.57). It was, according to its IR and PMR spectra, a glycoside. The acid hydrolysis of (V) gave formonononetin and D-glucose (TLC and GLC). On the basis of these chemical and spectral characteristics, compound (V) was identified as formononetin 7-O-β-D-glucopyranoside (ononin) [2-4].

This is the first time that the above-mentioned flavonoids have been isolated from A. mongolica.

LITERATURE CITED

1. A. Séléngé, M. V. Telezhenetskaya, and S. Yu. Yunusov, Khim. Prir. Soedin., 559 (1976).
2. I. J. Mabry, K. R. Markham, and M. B. Thomas, The Systematic Identification of Flavonoids, Springer, New York (1970), p. 165.
3. Rodd's Chemistry of Carbon Compounds, (ed. S. Coffey), Elsevier, Amsterdam, Vol. IV, Part E (1977), p. 214.
4. V. A. Bandyukova and A. L. Kazakov, Khim. Prir. Soedin., 669 (1978).
5. M. R. Parthasarathy, R. N. Puri, and T. R. Seshadri, Indian J. Chem., 7, No. 2, 118 (1969).
6. M. Kubo, M. Sasaki, K. Namba, S. Naruto, and H. Nishimurar, Chem. Pharm. Bull., 23, 2449 (1975).

CHEMICAL STUDY OF PLANTS OF THE MONGOLIAN FLORA

COUMARINS OF Salsola laricifolia

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Plants of the genus Salsola (family Chenopodiaceae) have long been used in Chinese and Tibetan medicine [1]. However, the chemical composition of representatives of this genus has been studied far from adequately. Salsola laricifolia Turcz. et Litw. is a perennial subshrub found in the desert region of the Mongolian People's Republic [2]. The local population use it in diseases of the liver and stomach.

Qualitative reactions and TLC showed that the epigeal part of the plant collected in the fruit-bearing period in the South Gobi arimak contained coumarins. The comminuted plant was extracted with ethanol, the concentrated ethanolic extract was diluted with water, and it was shaken out successively with hexane, chloroform, ethyl acetate, and butanol. By column chromatography on silica gel, the chloroform fraction yielded compounds (I-V), and the ethyl acetate and butanol fractions compound (VI).

Compound (I)−$C_{11}H_{10}O_5$, mp 195-197°C, $\lambda_{max}^{CH_3OH}$ 210, 257, 313 nm; +CH_3COONa, 328 nm (increase in intensity)− and (II)−$C_{11}H_{10}O_5$, mp 149-151°C, $\lambda_{max}^{CH_3OH}$ 226, 256 infl., 343 nm;

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