

The epigeal part of *Astragalus melilotoides* Pall. (family Fabaceae), collected in the flowering period in the summer of 1978 in the Buryat ASSR has been investigated for its flavonoid content. Chromatography on paper using color reactions has shown the presence of ten substances of flavonoid nature.

To isolate the total flavonoids, the comminuted herbage was exhaustively extracted successively with 96%, 70%, and 50% ethanol, and then with water. The combined extracts were evaporated in vacuum to a syrupy consistency and the aqueous extract was treated with chloroform to eliminate ballast substances, after which ethyl acetate extracted the flavonoids. The aqueous residue and the ethyl acetate extract were chromatographed on columns of polyamide. The flavonoids were eluted with water and aqueous ethanol in various concentrations.

The ethyl acetate extract yielded substances I, II, and V, and the aqueous residue yielded (III, IV, VI, and VII). They were identified from their chromatographic behavior, physicochemical properties, UV and IR spectra, mixed melting points, and the products of alkaline degradation, and also by comparison with authentic samples.

Substance (I) with the composition $C_{15}H_{10}O_7$, mp 310-312°C (from ethanol) was identified as quercetin.

Substance (II) had the composition $C_{21}H_{10}O_{11}$, mp 177-179°C (from ethanol), $[\alpha]_D^{20} -166^\circ$ (c 0.1; ethanol), R_f 0.66 (BAW (4:1:5)), 0.65 (25% CH_3COOH); $\lambda_{max}^{C_2H_5OH}$ 260, 360 nm. Acid hydrolysis formed quercetin and L-rhamnose (1:1). It was identified as quercetin 3-O- α -L-rhamnoside [1].

Substance (III) had the composition $C_{17}H_{14}O_{16}$, mp 194-196°C, $[\alpha]_D^{20} -48.9^\circ$ (c 0.2; methanol), $\lambda_{max}^{C_2H_5OH}$ 260, 360 nm; R_f 0.63 (BAW (4:1:5)), 0.72 (60% CH_3COOH), 0.39 (15% CH_3COOH). Acid hydrolysis (5% HCl, 3 h) gave quercetin, D-galactose, and L-rhamnose (1:1:1). Substance (III) was identified as quercetin 3-O-L-rhamnosyl- β -D-galactoside or bioquercetin [2].

Substance (IV) had the composition $C_{27}H_{30}O_{16}$, mp 190-191°C (from methanol), $[\alpha]_D^{20} -38.6^\circ$ (c 0.3; methanol); $\lambda_{max}^{C_2H_5OH}$ 260, 360 nm; R_f 0.51 (BAW (4:1:5)), 0.74 (60% CH_3COOH), 0.58 (15% CH_3COOH). The products of acid hydrolysis were found to contain quercetin, L-rhamnose, and D-glucose (1:1:1). Compound (IV) was identified as quercetin 3-O- α -L-rhamnosyl- β -D-glucoside, or rutin [3].

Substance (V), with the composition $C_{15}H_{10}O_6$, mp 276-278°C (ethanol), was identified as kaempferol.

Substance (VI) had the composition $C_{27}H_{30}O_{17}$, mp 178-180°C (methanol), $[\alpha]_D^{20} -24^\circ$ (c 0.1; methanol); $\lambda_{max}^{C_2H_5OH}$ 265, 350 nm; R_f 0.72 (BAW (4:1:5)), 0.51 (15% CH_3COOH), 0.82 (60% CH_3COOH). When this compound was subjected to acid hydrolysis, kaempferol (in 35% yield) and D-glucose were isolated. From its physical properties, hydrolysis products, and UV spectra the glycoside was identified as kaempferol 3-O- β -D-glucopyranosyl- β -D-glucopyranoside [4, 5].

Substance (VII) with the composition $C_{20}H_{30}O_{15}$, had mp 192-196°C (methanol); $[\alpha]_D^{20} -6^\circ$ (c 0.1; methanol); $\lambda_{max}^{C_2H_5OH}$ 260, 360 nm; R_f 0.36 (BAW (4:1:5)), 0.75 (60% CH_3COOH). Acid hydrolysis (5% HCl) gave the aglycone luteolin with mp 325-330°C and sugar components identified as D-glucose and L-rhamnose (yield of the aglycone 37%). Substance (VII) was identified as scolimoside or luteolin 7-O- β -L-rhamnopyranosyl- β -D-glucopyranoside [6].

Leningrad Institute of Pharmaceutical Chemistry. Translated from *Khimiya Prirodnykh Soedinenii*, No. 5, pp. 725-726, September-October, 1979. Original article submitted May 10, 1979.

This is the first time that the flavonoids of *Astragalus melilotoides* have been studied.

LITERATURE CITED

1. V. N. Spiridonov, Dokl. Akad. Nauk SSSR, 169, No. 1, 126 (1966).
2. Ya. Lakhman, V. I. Litvinenko, T. P. Nedezhina, and L. I. Dranik, Khim. Prir. Soedin., 136 (1978).
3. L. V. Shatunova, Khim. Prir. Soedin., 520 (1978).
4. L. I. Boguslavskaya, Khim. Prir. Soedin., 542 (1976).
5. V. I. Litvinenko and V. N. Makarov, Khim. Prir. Soedin., 366 (1969).
6. L. I. Dranik, in: Phenolic Compounds and Their Biological Functions [in Russian], Moscow (1968), p. 53.

FLAVONOL AGLYCONES OF SOME SPECIES OF *Astragalus* GROWING IN

KARA KALPAK

P. Khozhambergenova and K. F. Blinova

UDC 547.972

The composition of the flavonoid aglycones of the epigeal parts of eight species of *Astragalus* L. (milk vetch), family Fabaceae, collected in the flowering period in KaraKalpak, have been investigated.

The total flavonoids from each species were exhaustively extracted by ethanol with heating in the boiling water bath. The extracts were evaporated, freed from ballast substances by preextraction with chloroform, and subjected to hydrolysis with 5% H₂SO₄ with heating in the boiling water bath for 4 h. The completeness of hydrolysis was checked by paper chromatography in 15% acetic acid. The aglycones were extracted from the hydrolysate with diethyl ether. After the solvent had been distilled off, the combined aglycones were separated on columns of polyamide sorbent with elution by aqueous alcohol in various concentrations [1].

The substances isolated were identified from their chromatographic behavior staining with specific reagents, physicochemical properties, and IR and UV spectra [2-5] and also by comparison with authentic samples. From the species investigated, four flavonol aglycones were isolated, three of which were identified as kaempferol, quercetin, and isorhamnetin. The fourth aglycone is now being studied.

The distribution of the aglycones among the species investigated for the first time is given below.

Species	Number of flavonoid substances	Kaempferol	Querce- tin	Isorham- netin	Aglycone 4
<i>Astragalus bacaliensis</i> Bge.	17	+	+	+	—
<i>A. transcaspicus</i> Freyn	20	+	Tr.	—	—
<i>A. lasiophyllus</i> Ledeb	14	+	"	—	—
<i>A. erioceras</i> Fisch. et Mey	8	+	"	—	—
<i>A. flexus</i> Fisch.	14	+	+	+	—
<i>A. contortuplicatus</i> Fisch.	19	+	+	+	+
<i>A. chivensis</i> Bge.	14	+	+	+	+
<i>A. tribuloides</i> Delile	5	+	+	+	—

LITERATURE CITED

1. P. Khozhambergenova, All-Union Scientific Conference on Biologically Active Substances of Natural and Synthetic Origin [in Russian], Leningrad (1977).
2. E. T. Bryant, J. Am. Pharm. Assoc., 39, 481 (1950).
3. A. V. Bandyukova, Rast. Res., 1, No. 4, 596 (1965).

Leningrad Institute of Pharmaceutical Chemistry. Translated from *Khimiya Prirodnikh Soedinenii*, No. 5, pp. 726-727, September-October, 1979. Original article submitted May 15, 1979.