FLAVONOIDS OF SOME SPECIES OF Cicer OF THE CENTRAL ASIAN FLORA

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The results of a preliminary chromatographic investigation of the epigeal parts of six species of the genus Cicer (chick-pea), family Fabaceae (Leguminosae) growing in the territory of Central Asia in the cultivated and wild forms have shown that they are rich in flavonoid compounds (Table 1).

Chromatography on Filtrak FN-3 paper was conducted in the presence of authentic samples of the corresponding substances in the solvent systems 15% acetic acid and n-butanol–acetic acid–water (4:1:5) by the descending method.

The species Cicer macranthum M. Pop. was subjected to a more far-reaching chemical investigation for flavonoids. The total flavonoids were isolated and purified by known methods [1]. With the aid of column chromatography on a polyamide sorbent with elution by ethanol–water in various ratios we isolated from C. macranthum, and identified, six individual substances (I-VI):

Substance I – $C_{15}H_{10}O_7$, mp 310-313° (from methanol), λ_{max} 370, 256 nm;

Substance II – $C_{16}H_{12}O_4$, mp 255-257° (from ethanol), λ_{max} 300, 250 nm;

Substance III – $C_{15}H_{10}O_4$, mp 318-320° (from ethanol), λ_{max} 305, 249 nm;

Substance IV – $C_{24}H_{20}O_{11}$, mp 178-180° (from ethanol), $[\alpha]_D^{20}$ −68.0° (c 0.49; ethanol); λ_{max} 350, 267 nm;

Substance V – $C_{21}H_{20}O_{12}$, mp 232-234° (from ethanol), $[\alpha]_D^{20}$ −60.0° (c 0.15; methanol); λ_{max} 365, 260 nm;

Substance VI – $C_{22}H_{22}O_9$, mp 210-213° (from ethanol), $[\alpha]_D^{20}$ −25.3° (c 0.40; methanol); λ_{max} 301, 258, 251 nm.

The results of a comparison of the products obtained by acid and enzymatic hydrolysis and of IR, UV, and PMR spectra with literature information [2], and also the absence of de-

TABLE 1

Flavonoid	C. arietinum	C. macranthum	C. pungens	C. flexuosum	C. baldshuanicum	C. kopetdagnense
Kaempferol	+	±	−	+	−	+
Quercetin	+	+	+	−	+	±
Isorhamnetin	±	−	+	−	−	−
Pratensein	+	±	±	±	±	±
Formononetin	++	+	±	++	+	+
Biochanin A	+	−	−	−	−	+
Daidzein	+	++	+	++	+	+
Kaempferol 3-glucoside	++	+	−	+	−	+
Kaempferol 7-glucoside	+	−	−	−	−	−
Quercetin 3-glucoside	−	±	+	−	++	−
Quercetin 3-galactoside	−	+	−	−	±	−
Isorhamnetin 3-glucoside	+	−	+	±	−	−
Formononetin 7-glucoside	++	+	±	++	−	±
Biochanin A 7-glucoside	−	−	−	−	−	+
Daidzein 7-glucoside	−	−	−	+	+	−

+) Easily detectable amount of the substance; ++) considerable amount; ±) insignificant amount; −) absence of the given substance.

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pressions of the melting points of mixtures with authentic specimens permitted us to identify the substances isolated as quercetin (I), formononetin (II), daidzein (III), kaempferol 3-glucoside (IV), quercetin 3-galactoside (V), and formononetin 7-glucoside (VI).

LITERATURE CITED

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FLAVONOIDS OF Cicer songoricum

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With the aim of finding the most promising species of the Cicer (chick-pea) genus as sources of flavonoid compounds, we have studied the chemical composition of C. songoricum Stenh. ex DC., family Fabaceae (Leguminosae).

In the epigeal part of the wild food plant C. songoricum growing on the mountain ranges of Central Tadzhikistan we have detected ten substances of flavonoid and isoflavonoid nature.

The comminuted raw material was exhaustively extracted with 96% ethanol in an apparatus of the Soxhlet type. The alcoholic extract was evaporated to an aqueous residue, and this was treated successively with chloroform and ethyl acetate. The concentrated chloroform and ethyl acetate extracts were chromatographed on columns of polyamide sorbent using as eluents mixtures of chloroform and ethanol and of water and ethanol with increasing concentrations of the latter.

Substances (I)-(IV) were isolated from the chloroform extract and (V)-(X) from the ethyl acetate extract:

Substance I – formononetin $C_{16}H_{12}O_4$, mp 260-262°, λ_{max} 304, 251, 240 nm;

Substance II – biochanin A $C_{16}H_{12}O_5$, mp 213-214°, λ_{max} 330, 263 nm;

Substance III – daidzein $C_{15}H_{10}O_4$, mp 318-320°, λ_{max} 305, 250, 239 nm;

Substance IV – pratensein $C_{16}H_{12}O_6$, mp 273-274°, λ_{max} 283, 260 nm;

Substance V – kaempferol $C_{16}H_{10}O_6$, mp 275-277°, λ_{max} 370, 296, 265 nm;

Substance VI – isorhamnetin $C_{16}H_{12}O_7$, mp 305-307°, λ_{max} 371, 254 nm;

Substance VII – ononin (formononetin 7-O-β-D-glucopyranoside) $C_{22}H_{22}O_9$, mp 210-212°, $[\alpha]_D^{20}$ −25.3° (c 0.3; methanol), λ_{max} 260 nm;

Substance VIII – biochanin A 7-O-β-D-glucopyranoside $C_{22}H_{22}O_{10}$, mp 208-210°, $[\alpha]_D^{20}$ −24.4° (c 0.4; methanol), λ_{max} 323, 262 nm;

Substance IX – astragalin (kaempferol e-O-β-D glucopyranoside) $C_{21}H_{22}O_{11}$, mp 178-180°, $[\alpha]_D^{20}$ −69.0° (c 0.4; ethanol), 350, 267 nm;

Substance X – isorhamnetin 3-O-β-D-glucopyranoside $C_{22}H_{22}O_{12}$, mp 170-172°, $[\alpha]_D^{20}$ −26.3° (c 0.5; ethanol), λ_{max} 355, 255 nm.

The structures of all the substances isolated were confirmed by the results of elementary analysis, UV and IR spectroscopies, and a study of the products of acid, alkaline, and enzymatic hydrolyses, and also by comparison with authentic specimens and literature information [1].

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