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PHYTOCHEMICAL INVESTIGATION OF Paliurus spina-christi

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We have previously reported a chemical study of the neutral lipids of Paliurus spina-christi Mill. (Christ's thorn) [1]. The interesting biological activity of an extract of the plant impelled us to study it phytochemically.

In the fruit of Christ's thorn we detected flavonoids, the total amount of which, determined photocolometrically, was 2.5% [2]. On separating the combined flavonoids on a column of polyamide sorbent [3] we isolated three individual compounds.

Substance (I) - light yellow crystals with the compositions $C_{27}H_{30}O_{16}$, mp 190-192°C, $[\alpha]_D^{20} -11.4^\circ$ (c 0.5; methanol). Acid hydrolysis led to an aglycon in the form of yellow acicular crystals with the composition $C_{15}H_{10}O_7$ (M^+ 302), mp 315-316°C, identical with quercetin. D-Glucose and L-rhamnose were found in the carbohydrate fraction of the hydrolysate.

Substance (II) - dark yellow acicular crystals with the composition $C_{21}H_{20}O_{12}$, mp 216-217°C, $[\alpha]_D^{20} -55.2^\circ$ (c 0.1; dimethylformamide). On acid hydrolysis, this substance was split into D-glucose and quercetin.

Substance (III) - yellow acicular crystals with the composition $C_{21}H_{20}O_{12}$, mp 235-237°C, $[\alpha]_D^{20} -60.0^\circ$. Acid hydrolysis gave the aglycon quercetin, and D-galactose was shown to be present in the carbohydrate fraction.

On the basis of their physicochemical constants and spectral characteristics, substance (I) was characterized as rutin, (II) as isoquercitrin (quercetin 3-O- β -D-glucoside), and (III) as hyperoside (quercetin 3-O- β -D-galactoside) [4, 5].

The presence of epigallocatechin, gallocatechin, and catechin in the leaves, fruit, and flowers of Christ's thorn has been established previously [6], and coumarins [7] and traces of steroid compounds [8] have been detected.

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ISOFLAVONOIDS OF *Cicer mogoltavicum*

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Many plants of the family *Leguminosae* produce various isoflavonoids playing the role of phytoalexins, phytoestrogens, and growth inhibitors [1, 2]. There is information on the presence of isoflavonoids in some species of chick pea [2, 3]. In the present communication we give the results of a study of the flavonoids of the roots of *Cicer mogoltavicum* A. Korol (Mogoltavian chick pea) collected in the Kara-Tau mountains, Dzhambul province.

The comminuted roots (1 kg) were extracted at room temperature with chloroform six times, and then with ethanol six times. The concentrated chloroform and ethanol extracts were chromatographed on columns of silica gel in chloroform-hexane and chloroform-isopropanol solvent systems. As a result, the chloroform extract yielded compounds (I-IV) and ethanol extract (V and VI).

On the basis of the results of a study of the IR, UV, and PMR spectra, the preparation of methyl ethers and of acetyl derivatives, and the results of acid hydrolysis and a comparison with authentic samples, the compounds (III) (V) and (VI) that had been isolated were identified as known isoflavonoids.

Compound (I) - inerin, $C_{16}H_{12}O_5$, mp 178-179°C (methyl ether with mp 184-185°C);
 $\lambda_{max}^{ethanol}$ 282, 287, 311 nm (log ϵ 3.53, 3.59, 3.78) [2, 4].

Compound (II) - biochanin A, $C_{16}H_{12}O_5$, mp 213-214°C (diacetate with mp 190-191°C),
 $\lambda_{max}^{ethanol}$ 263, 335 (infl.) nm (log ϵ 4.48, 3.73) [2, 4].

Compound (III) formononetin, $C_{16}H_{12}O_4$, mp 260-261°C (methyl ether with mp 170-171°C),
 $\lambda_{max}^{ethanol}$ 239 (infl.), 251, 261 (infl.), 304 nm (log ϵ 4.28, 4.32, 4.28, 4.01) [5].

Compound (IV) - pratensein, $C_{16}H_{12}O_6$, mp 273-274°C, $\lambda_{max}^{ethanol}$ 264, 283 (infl.) nm (log ϵ 4.39, 4.05) [2, 4].

Compound (V) - ononin (formononetin 7-O- β -D-glucopyranoside), $C_{22}H_{22}O_9$, mp 215-216°C (tetraacetate with mp 186-187°C), $\lambda_{max}^{ethanol}$ 251 (infl.), 262, 302 nm (log ϵ 4.01, 4.03, 3.55) [5].

Compound (VI) - trifolirhizin (inerim O- β -D-glucopyranoside), $C_{21}H_{24}O_{10}$, mp 140-141°C (tetraacetate with mp 186-187°C, $\lambda_{max}^{ethanol}$ 278, 285, 311 nm (log ϵ 3.57, 3.58, 3.81) [6].

According to the results of thin-layer chromatography, substances (II-V) were also present in the epigeal part of the plant.

This is the first time that the isoflavonoids mentioned above have been isolated from Mogoltavian chick pea.

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