SPECIES FLAVONOIDS OF THE GENUS Thermopsis OF USSR FLORA

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We have investigated Th. lanceolata R. Br. (lanceleaf thermopsis, I, Irkutsk oblast), Th. turkestaniea Gandogr. (II, Issyk-Kul' depression), Th. alterniflora Rgl. et Schmalh. (III, Tashkent oblast), Th. dolichocarpa V. Nik (IV, Botanical Gardens of the All-Union Scientific-Research Institute of Medicinal Plants, Moscow), Th. fabacea (Pall.) D.C. (bean thermopsis, V, nursery for medicinal plants, Perm), and Th. alpina (Pall.) Ldb. (VI, Kungei-Alatau range) in the period of their flowering.

In methanolic extracts by two-dimensional paper chromatography in the solvent systems BAW (4:1:5) (1) and 15% acetic acid (2) in I we found not less than nine, in II and IV six, in III 13, in V eight, and in VI 12 flavonoids. By chromatography on polyamide, two substances of flavonoid nature (A and B) were isolated from each of III, IV, V, and VI [1].

Substance A, $C_{21}H_{20}O_{11}$, mol. wt. 488, light yellow acicular crystals with mp 258-259°C (from 70% ethanol), $[\alpha]_D^{20}-98°$ (c 1.02; methanol–pyridine, 1:1), R_f 0.43 (system 1) and 0.17 (system 2). A Bryant test [2] showed that it was a glycoside. With ferric chloride it gave a green coloration (free hydroxy group at C_5).

UV spectrum: λ_{max} in C_2H_5OH 350, 264 nm. Bathochromic shifts with the appropriate reagents showed the presence of free hydroxy groups at C_5, C_3', and C_4' and the absence of a free hydroxy group at C_7 [3].

The hydrolysis of substance A with 10% sulfuric acid gave the aglycone $C_{15}H_{10}O_6$ with mol. wt. 286, mp 329-330°C (from 50% ethanol); UV spectrum: λ_{max} in C_2H_5OH 350, 267 nm; acetate with mp 226-227°C (from 80% ethanol), R_f 0.85 (system 1) and 0.05 (system 2), giving a green coloration with a solution of ferric chloride. Phloroglucinol and protocatechuic acid were found in the products of alkaline degradation. The results of an analysis of the UV spectrum showed that the aglycone had hydroxy groups at C_5, C_7, C_3', and C_4' [4]. The IR spectrum of the aglycone coincided completely with that of a sample of luteolin. A mixture of the latter with the aglycone gave no depression of the melting point.

D-Glucose was found in the hydrolyzate after neutralization with barium carbonate.

The above facts enabled substance A to be identified as luteolin 7-O-D-glucoside (cynaroside), which was confirmed by comparing the IR spectra of substance A and of a sample of cynaroside, and also by the absence of a depression of the melting point of a mixture.

Substance B, $C_{15}H_{10}O_6$, mol. wt. 286, mp 329-330°C (from 50% ethanol); acetate with mp 226-227°C (from 80% ethanol), R_f 0.83 (system 1) and 0.04 (system 2). On the basis of a mixed melting point and IR and UV spectroscopy it was identified as luteolin.

Cynaroside and luteolin were detected by paper chromatography in plants I and II, as well.

From plant V a white substance was isolated with the composition $C_{16}H_{12}O_4$, mol. wt. 268, mp 260-261°C, acetate with mp 169-170°C. The substance was identified as pratol [5], which has been isolated from this plant previously.

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