CARBOHYDRATES OF THE FLOWERS OF Convallaria majalis AND C. keiskei

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The flavonoid compositions of Convallaria majalis (lily of the valley) and of C. keiskei Miq. have been reported previously [1]. Continuing an investigation of the chemical compositions of these two species as industrial drug raw materials [2], we have studied the polysaccharide compositions of the flowers.

To isolate and analyze the carbohydrates we used the following methods [3, 4]: to eliminate substances of lipophilic nature the raw material was treated with chloroform, and the carbohydrates were then fractionated in accordance with their properties – the alcohol-soluble sugars (ASSs) were extracted with 82% ethanol, the water-soluble polysaccharides (WSPSs) with water, the pectin substances (PcSs) with 0.5% oxalic acid solution, and the hemicelluloses (HCs) with 7% potassium hydroxide.

After being freed from noncarbohydrate components, the alcohol-soluble sugars were concentrated, precipitated with acetone, and dried in a vacuum desiccator over phosphorus pentoxide. D-Glucose, D-galactose, L-rhamnose, L-arabinose, D-xylose, and D-galacturonic acid were detected by paper chromatography in the n-butanol–pyridine–water (6:4:3) and ethyl acetate–acetic acid–formic acid (18:3:1:4) [sic] systems. The revealing agent used was a solution of aniline phthalate [5].

After precipitation with methanol, the WSPSs, PcSs, and HMs were hydrolyzed with 10% sulfuric acid, and their monosaccharide compositions were investigated. The results are given in Table 1.

The complex investigation of the flowers of C. majalis and C. keiske that was carried out permitted the isolation of the main polysaccharide fractions and the determination of their compositions (Table 1).

TABLE 1. Polysaccharides of the Flowers of Convallaria majalis and of C. keiski

Polysaccharide fraction	Yield [of the polysaccharide fraction] on the raw material, %	Amount of the flowers, % on the polysaccharide fraction				Monosaccharide composition
		acidic sugars	protein	reducing sugars (RSs)	ash	
WSPSs of C.m.	14,88	35,14	6,90	23,33	17,33	Gal, Glc, Ara, Xyl, Rha, GalUA
WSPSs of C.k.	9,02	14,13	7,10	14,29	28,70	Gal, Glc Ara, Xyl, Rha, GalUA
PcSs of C.m.	12,09	33,30	2,35	22,55	12,05	Gal, Glc, Ara, Xyl, Rha, GalUA
PcSs of C.k.	8,63	39,25	11,57	27,90	6,88	Gal, Glc, Ara, Xyl, Rha, GalUA
HMs of C.m.	3,43	0,73	0,17	6,62	41,93	Glc, Ara, Xyl, Rha
HNs of C.k.	3,40	0,56	0,12	7,32	39,63	Glc, Ara, Xyl, Rha

Notes. C. m.) Flowers of Convallaria majalis; C. k.) flowers of Convallaria keiske; underlining indicates the substances in the largest amount.

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The amounts of polysaccharides and reducing and acidic sugars in the WSPS and PcS fractions of C. majalis were approximately the same, and their qualitative and quantitative compositions did not differ. The main monosaccharides were D-galactose and L-arabinose.

The WSPS and PcS fractions of C. keiske differed considerably with respect to the amounts of polysaccharides and reducing and acidic sugars that they contained, although their monosaccharide compositions were similar. Their main monosaccharides were D-galactose, L-arabinose, and D-xylose.

The species investigated differed from one another considerably with respect to their levels of PcSs and reducing and acidic sugars, which confirmed the results of other chemotaxonomic studies [6].

Thus, various carbohydrate fractions have been isolated from the flowers of Convallaria majalis and C. keiske and have been characterized by the monosaccharide compositions of the PcSs, RSs, and acidic sugars that they contained.

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COUMARINS OF Althaea officinalis AND A. armenica

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In the present communication we give the results of a study of the coumarins of the epigeal parts and roots of Althaea officinalis (marshmallow) and A. armenica Ten. [1].

Both species were gathered in 1988 in the floodplains of the R. Belaya (Krasnodarsk Territory): the epigeal parts in the period of incipient flowering, and the roots in the autumn.

The coumarins were isolated by a procedure described previously [2-4]. As a result, nine compounds [(I)-(IX)] were obtained. Under the action of hydriodic acid in a liquid phenol–acetic anhydride medium [5], substances (II) and (III) were converted into substance (I) (coumarin) or into α-pyrone, which showed their coumarin nature. The substances isolated were identified on the basis of physicochemical properties, UV and IR spectroscopy, and parallel comparative paper chromatography in the hexane–formamide, benzene–formamide, chloroform–formamide, and 5% acetic acid systems, and also by mixed melting points with authentic samples and, in the case of glycosides [substances (VII)-(IX)], by acid and enzymatic hydrolysis.

Coumarin (I), $C_9H_6O_2$, mp 67-68°C [2]; herniarin (II, 7-methoxycoumarin), $C_{10}H_8O_3$, mp 117-118°C [3]; umbelliferone (III, 7-hydroxycoumarin), $C_9H_6O_3$, mp 232-234 [5]; scopoletin (IV, 7-hydroxy-6-methoxycoumarin), $C_{10}H_8O_4$, mp 203-205°C [4]; isoscopoletin (V, 6-hydroxy-

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