

fructooligosaccharides. The WSPSs contained as the main monosaccharide residues glucose, xylose, and galactose, together with other sugars in trace amounts.

Thus, the WSPSs in the samples of plants investigated are amyloids and part of them is noncovalently bound with the pectin substances.

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#### POLYSACCHARIDES OF *Primula veris*

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It is known that *Primula veris* L. (cowslip primrose) contains a number of biologically active substances, while infusions and tinctures of the plant possess expectorant properties [1, 2]. However, its chemical composition has been studied inadequately, while the water-soluble polysaccharides (WSPSs) have not been considered previously. We have studied the accumulation and the monosaccharide composition of the WSPSs isolated from the whole plant and its inflorescences and leaves. The plants were collected in the period of mass flowering (May) in the environs of the village of Pronsk, Pronsk region, Ryazan' province, in 1983.

The air-dry raw material, previously purified with ethanol (1:10) and found (moisture content 10.0-11.3%), was extracted with hot water at 90-95°C (1:20) for 1.5 h. The extract was filtered and evaporated, and the residue was treated with 96% ethanol (1.5 volumes). The precipitate of polysaccharides (PSs) was separated off, washed with ethanol and with acetone, and was dried in vacuum over P<sub>2</sub>O<sub>5</sub>. Then the WSPSs were demineralized and their ash content and uronic anhydride content were determined as described in [3]. The ash content of the demineralized PSs was 0.7%. The hydrolysis of the WSPSs and the subsequent operations with them were carried out as previously [4]. The hydrolysates obtained were investigated by PC in the butan-1-ol-pyridine-water (6:4:3) system. The neutral sugars were revealed with aniline phthalate.

It was established that the WSPSs of the cowslip primrose consist of eight monosaccharide components: D-galacturonic acid, D-galactose, D-glucose, L-arabinose, D-xylose, L-rhamnose, and two unidentified monosaccharides chromatographically more mobile than D-xylose and L-rhamnose. The neutral sugars were determined quantitatively by the method described in [5].

The results of the investigation of the WSPSs of the cowslip primrose are given below (5):

Plant organ	Yield of WSPSs	Ash content	Amounts of the total, taken as 100%					<i>GalUA</i>
			<i>Gal</i>	<i>Glc</i>	<i>Ara</i>	<i>Xyl</i>	<i>Rha</i>	
Whole plant	6.6	18.8	41.90	5.82	28.17	7.20	16.91	54.5
Inflorescences	6.2	19.2	27.89	9.32	45.28	7.96	9.55	53.9
Leaves	6.5	18.7	34.80	11.21	29.03	6.99	17.97	55.0

As we see, no appreciable differences are found in the accumulation of PSs in the cowslip primrose and its individual organs or in the amounts of ash and galacturonic acid. The predominating component of the WSPSs of the whole plant and the leaves is galactose and

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of the inflorescence it is arabinose. The amounts of arabinose in the PSs of the whole plant and of the leaves were approximately the same and were at the level of galactose in the inflorescences, which accumulated in them in amounts 1.5 and 1.2 times less than in the whole plant and in the leaves, respectively. The level of xylose was approximately the same in all the PSs. The amounts of rhamnose in the leaves and the whole plant were also basically similar, while in the inflorescences it was present at the level of glucose. In the quantitative respect, glucose accumulated more in the leaves and less in the whole plant.

The results obtained permit the ESPs of the cowslip primroses to be assigned to the class of pectin substances.

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#### MONOCARBOXYLIC ACIDS OF THE ESSENTIAL OILS OF SIBERIAN AND FAR EASTERN SPECIES OF *Ledum*

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The essential oil was obtained by steam distillation from leafy shoots of Siberian and Far Eastern species of *Ledum*: crystal tea ledum, macrophyllous ledum\*, sprawling crystal tea ledum, and ledum-butterbur\*. The acids were isolated by a published method [1]. Their amount in the various species ranged from 0.11 to 3.94%. Only formic and n-valeric acids have been detected previously, with the aid of descending paper chromatography [2].

The acid fractions were analyzed more completely by gas-liquid chromatography. Chromatograms were recorded on a Chrom-5 instrument with a flame-ionization detector. A packed glass column (3 mm × 1.2 m) with 15% of Carbowax 20 M on Chromaton NAW-DMCS as stationary

\*Literal translations of the Russian names; not identified in Western sources [Translator].

TABLE 1. Monocarboxylic Acids in the Essential Oil of the *Ledum* Genus

Acid	Setting point, °C	Amount in the essential oil of the <i>Ledum</i> , µg/g			
		crystal tea	macrophyllous	crawling	butterbur
4.0	138	—	1.51	—	4.00
5.0	148	21.15	0.97	—	2.35
6.0	160	14.97	2.06	1.36	13.28
7.0	163	—	18.27	3.15	22.24
8.0	180	1.49	8.86	5.01	40.54
9.0	189	—	15.83	13.09	66.88
10.0	198	5.30	57.20	9.01	21.44
11.0	212	5.95	94.66	—	67.36
13.0	233	0.83	14.11	—	—
14.0	237	60.85	—	—	—
15.0	246	2.70	—	—	—
16.0	254	0.65	—	—	—
18.0	263	8.79	—	—	—

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