BRIEF COMMUNICATIONS

POLYSACCHARIDES OF *Eremurus*. XXIV. PECTIN SUBSTANCES OF *Eremurus* AND DYNAMICS OF THE ACCUMULATION OF PECTIN IN *Eremurus lactiflorus*

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Continuing an investigation of *Eremurus* polysaccharides, we have studied the amount and composition of the pectin substances (PSs) of the leaves of three species of plants of the genus *Eremurus* and the dynamics of the accumulation of the pectin of the leaves of *E. lactiflorus* Vved., gathered in the environs of the village of Khumsan, Tashkent province.

The pectins were isolated by a known method [1]. After reprecipitation with ethanol they consisted of a light cream-colored powder which dissolved in water to form viscous solutions. Their yields (%) were as follows: *E. baussunensis* O. Fedtsch. (I): 3.6; *E. roseolus* Vved. (II): 18.36; *E. robustus* Rgl. (III): 9.34; *E. lactiflorus* Vved. beginning of vegetation (IV): 10; budding (IVa): 7.5; flowering (IVb): 8.08; fruit-bearing (IVc): 1.6; dormancy (IVd): 21.3.

The $[\alpha]_D^{22}$ (c 0.35; H_2O) values were as follows: +146° (I), +130° (II), +150° (III), +190° (IV), +120° (IVa), +116° (IVb), +132° (IVc), +100° (IVd).

To determine the monosaccharide composition, the isolated pectins were hydrolyzed (2N H_2SO_4, 98°C for 48 h) and the products were analyzed by PC (with the butanol—pyridine—water, 6:4:3, system; spots revealed with acid aniline phthalate) and by GLC [2] [Chrom-5, Czechoslovakia, with a flame-ionization detector, glass column 0.3 × 120 cm, 5% of Silicone XE-60 on Chromaton N-AW-DMCS (0.160-0.200 mm), 210°C, carrier gas helium, 60 ml/min]. The ratio of monosaccharide residues and the quantitative characteristics of the pectins obtained by the titrimetric method [3] are given in Table 1. The amount of PSs in the leaves of different species Eremurus ranged from 3.6 to 18.36%. All the pectins had high positive rotations and consisted mainly of rhamnose, lactose, arabinose, and galacturonic acid residues.

It can be seen from Table 1 that the amount of pectins in the leaves of *Eremurus lactiflorus* varied from 7.5 to 21.3%. The lowest levels of PSs in the leaves was during the budding period and the highest level in the period of dormancy. The quantitative and qualitative compositions of the monosaccharide composition of the PSs of the leaves differed little from one vegetation period to another. The pectin substances obtained had a low degree of methylation. At the beginning of vegetation, the PSs of the leaves of *E. lactiflorus* had a higher degree of methylation and in the state of dormancy a lower one. The amount of galacturonic acid residues in the three types of pectins ranged from 43 to 62%, and in the leaves from 30.1 to 61.4%.

TABLE 1

PS	Ratio of monosaccharide residues, mole						GalUA cont. %	Titrimetric results,* %			
	Rham	Ara	Xyl	Man	Glc	Gal		K_f	K_m	λ	CH_3O
I	1,67	2,4	1	Tr.	Tr.	1,2	54	10,9	6,42	37	4,41
II	6,2	5,25	2,4	1	1	1,17	43	14,9	7,97	34	5,41
III	25,92	6,15	1,76	1	5.6	22	62	11,5	7,06	38	4,8
IV	19,6	5,75	1	6,25	1,63	29,3	30	7,73	11,11	58	4,5
IVa	2,39	4,28	2,5	Tr.	Tr..	1	61,4	10,9	7,9	42	5,37
IVb	1,61	6,9	2,8	Tr..	1	4,7	60	11,72	9,9	45	6,07
IVc	9,6	5	1,6	1	2.25	6,1	54	10,7	9,58	57	6,51
IVd	2,7	2,9	1	Tr..	Tr..	1	46	11,9	8,3	41	5,6

*GalUA is the percentage of galacturonic acid determined by the method of Dische and Rothschild [4]. Here K_f is the free and K_m the methoxylated carboxy groups; λ is the degree of esterification; and CH_3O represents the methoxy group.

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Thus, in an investigation of the dynamics of the accumulation of the PSs in the leaves of *E. lactiflorus* according to vegetation period it was established that the PSs accumulate mainly in the period of dormancy, and their chemical characteristics have been given.

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CARBOHYDRATES OF *Allium*. X. GLUCOFRUCTANS OF *Allium karataviense*

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Continuing a chemical investigation of the plants of the genus *Allium* [1], we have studied the groups of fructans of the onion *A. karataviense*, collected in the budding phase in the Chimkent province, KazSSR.

The carbohydrates were extracted from a single sample of the air-dry raw material by a known method involving fractional extraction successively with 80% ethanol, water, a mixture of 0.5% solutions of oxalic acid and ammonium oxalate at 70°C, and caustic soda [2].

The polysaccharide fractions were hydrolyzed, and the monosaccharides in the hydrolysates were identified by PC and TLC [2]. Glucose and oligosaccharides containing fructose were detected in an ethanolic extract (yield 31%).

The yield of water-soluble polysaccharide (WSPS) amounted to 26.2%. After the determination of protein by Sevag's method [3], the WSPS consisted of a white powder readily soluble in water and possessing no reducing capacity. According to the results of gel filtration on Sephadex G-75, the polysaccharide was polydisperse. To obtain a homogeneous fraction, an aqueous solution (10%) of the polysaccharide was precipitated with various volumes of ethanol (1:2:3). The yields of the fraction were (%): I, 2; II, 63.7; III, 15.6.

We isolated fraction II forming the bulk of the WSPS for further study. In the products of the complete acid hydrolysis of the polysaccharide the main component identified was fructose, with a very small amount of glucose. By Kolthoff's method, 98.9% of fructose was determined in the glucofructan. The glucofructan was homogeneous and had a molecular mass of 24,000, which was determined on a column of Sephadex G-75. Its IR spectrum had the following absorption bands (cm^{-1}): 830 (vibrations of a pyranose ring), 870 (vibrations of β-glycosidic bond), and 940 (vibrations of a furanose ring).

In the products of the Smith degradation of the glucofructan, glycerol and traces of fructose were detected with the aid of PC, which shows the possibility of both 2 → 1 and 2 → 6 glycosidic bonds between the fructofuranose residues.

It follows from the ^{13}C NMR spectra of the glucofructan that the polysaccharides were not a mechanical mixture of inulin and levan since there were signals with chemical shifts (ppm) of 104.7 (C-2) and 76.7 (C-4) relating to C-2 and C-4 of the adjoining units of 2 → 1- and 2 → 6-bound fructofuranose [4] residues:

Residue	C-1	C-2	C-3	C-4	C-5	C-6
2-β-*D*-Fruf1-	61,7	104,7	78,0	75,9 76,7	82,2	63,7
2-β-*D*-Fruf6-	61,3	105,3	77,8	77,6	81,4	64,5
1-α-*D*-Glcp-	93,3	72,2	73,6	70,4	71,5	61,0

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