POLYSACCHARIDES OF SUBSPECIES OF Cousinia

K. Turdumambetov, N. V. Plekhanova, and
D. A. Rakhimov

UDC 547.917

Continuing an investigation of the carbohydrates of plants of the genus Cousinia [1, 2] we have studied the polysaccharides of the roots of seven species of Cousinia collected in the flowering and incipient fruit-bearing phase on the territory of Kirghizia [3]. The carbohydrates were isolated from one sample of raw material in the following sequence: first the ethanol-soluble sugars (ESSs) [4], then the water-soluble polysaccharides (WSPs) [5], and the pectin substances (PSs) and hemicelluloses (HMCs) [6]. The latter amounted to from 2 to 6% of the weight of the air-dry raw material.

To determine their qualitative and quantitative monosaccharide compositions, the ESSs, WSPs, and PSs were subjected to complete acid hydrolysis, and the sugars in the hydrolysates were identified by PC. Table 1 gives the amounts and monosaccharide compositions of the carbohydrates. As can be seen from Table 1, the ESSs and WSPs predominated, these consisting mainly of fructose and glucose residues in various ratios. They were therefore glucofructans (GFs). The pectin substances had different amounts of ratios of the monosaccharides.

The WSPSs were studied in more detail. They consisted of a white amorphous powder readily soluble in hot water and had a negative specific rotation of between 34 and 40°.

To determine molecular masses we used gel filtration [7] on columns of Sephadexes G-50 and G-75 calibrated with standard samples of dextrans having MM 10,000, 15,000, 40,000, and 80,000. After gel chromatography it was found that all six samples of glucofructans with the exception of that from C. arachnoide were polydisperse (the gel filtration curves of the GFs showed from two to four peaks). Correspondingly, the molecular masses for the samples ranged from 10,000 to 46,000. The GFs isolated from C. arachnoide was homogeneous and had MM 12,000.

TABLE 1

Species of plant and site of collection	Type of carbohydrate	Yield, %	Monosaccharide comp., ratio of the sugars						
			Glc	Fruf	Gal	Ara	Xyl	Rham	Gal UA
C. arachnoide Fish et Meu Village of Torkent	ESSs	2,23	1	18	—	—	—	—	—
	WSPSs	2,75	1	20	—	—	—	—	—
	PSs	1,2	—	—	1	3	1	8	11
C. sewer tzovil Rgl Chychkan gorge	ESSs	0,56	1	11	—	—	—	—	—
	WSPSs	19,3	1	18	—	—	—	—	—
	PSs	2,19	Tr.	—	2	2	1	3	4
C. tianschanica, Kurp-Sai gorge	ESSs	1,7	1	13	—	—	—	—	—
	WSPSs	30,0	1	20	—	—	—	—	—
	PSs	3,1	Tr.	—	3	2	1	2	4
C. Tamarae Juz, Village of Padysha-ATA	ESSs	0,83	1	10	—	—	—	—	—
	WSPSs	1,26	1	16	—	—	—	—	—
	PSs	2,0	1	—	3	5	1	1	7
C. umbroza Rgl, Village of Chon-Aryk	ESSs	2,33	1	10	—	—	—	—	—
	WSPSs	18,3	1	20	—	—	—	—	—
	PSs	6,0	Tr.	—	4	6	1	1	8
C. policephala, Rypz. Village of Kairma	ESSs	1,75	1	10	—	—	—	—	—
	WSPSs	12,5	1	12	—	—	—	—	—
	PSs	2,17	Tr.		2	1	1	1	2
C. tenuisecta Juz, Kok-Bel pass	ESSs	0,15	1	10,2	—	—	—	—	—
	WSPSs	3,05	1	12	—	—	—	—	—
	PSs	2,3	1	—	5	7	1	5	6

Institute of the Chemistry of Plant Substances, Uzbek SSR Academy of Sciences, Tashkent. Institute of Organic Chemistry, Kirghiz SSR Academy of Sciences, Frunze. Translated from Khimiya Prirodnykh Soedinenii, No. 5, pp. 750-751, September-October, 1988. Original article submitted March 14, 1988.

0009-3130/88/2405-0641$12.50

The IR spectra of this glucofructan contained absorption bands at 820, 860, and 940 cm^{-1}, which are characteristic for polysaccharides of the inulin and levan type [8].

The results of IR spectroscopy and the negative specific rotation show a predominance of β-glycosidic bonds in the glucofructans, and the ease of acid hydrolysis is evidence in favor of the furanose form of the D-fructose residues.

Thus, the Cousinia carbohydrates are biopolymers of different natures: ethanol-soluble sugars, water-soluble polysaccharides, pectin substances, and hemicelluloses.

LITERATURE CITED

1. N. V. Plekhanova, K. Turdumambetov, and I. G. Sudinitsina, Khim. Prir. Soedin., 639 (1983).
2. N. V. Plekhanova, K. Turdmambetov, and G. P. Fedorchenko, Medicinal Sugar from Weed Plants of Kirghizia [in Russian], Ilin, Frunze (1985).
3. Flora of the Kirgiz SSR [in Russian], Frunze, Vol. XI (1965), p. 242.
4. N. V. Plekhanova, K. Turdumambetov, A. Berdikeev, and G. P. Fedorchenko, Method of Obtaining Fructosans [in Russian], USSR Inventors' Certificate No. 955928; Byul. Izobret., No. 33, 12 (1982).
5. D. J. Bell and A. Palmer, J. Chem. Soc., 3763 (1952).
6. E. M. Afanas'eva, Rast. Res., 8, No. 2, 192 (1971).
7. H. Determann, Gel Chromatography, Springer, New York (1968).
8. L. M. J. Verstraeten, Anal. Chem., 36, No. 6, 1040 (1963).

LIPIDS OF MARINE ORIGIN.

IV. 1,2-DI-O-ALKYLGLYCEROPHOSPHO- AND -PHOSPHONOLIPIDS FROM THE MARINE SPONGE Ectyodoryx kovdaicum

V. M. Dembitskii

UDC 543.852+593.1.05.088.1

Phosphonolipids have been found in many prokaryotes and eukaryotes [1], and dialkylglycerols are widely represented in archaebacteria [2]. Neither phosphonolipids nor dialkylglycerophospholipids have previously been found in sponges. Continuing an investigation of lipids of marine origin [3], we have studied the phospholipid composition of the marine sponge Ectyodoryx kovdaicum collected in July-August, 1983, in the White Sea from a depth of 15-80 m:

Class of Phospholipids	Amount, % of lipid phosphorus
1-O-Alkyl-2-acyl-sn-glycero-3-phosphoethanolamine	22.1
1,2-Di-O-alkyl-sn-glycero-3-phosphoethanolamine	1.4
1.O-Alk-1'-enyl-2-acryl-sn-glycero-3-phosphoethanolamine	2.0
1-O-Alkyl-2-acyl-sn-glycero-3-(2-aminoethyl)phosphonate	5.7
1,2-Di-O-alkyl-sn-glycero-3-(2-aminoethyl)phosphonate	2.3
Lysophosphatidylethanolamine	3.0
Phosphatidylserine	21.5
Sum of the aminophospholipids	58.0
Phosphatidylcholine (sum of all forms)	26.1
Phosphatidylglycerol	10.2
Phosphatidylinositol	2.5
Phosphatidic acid	3.2
Phospholipids (% of the total lipids)	27.8

The extraction of the lipids and the preparation of the lipid extracts were carried out as we have described previously [4, 5]. IR spectra were taken on Simadzu IR-435 and Specord-

Institute of the Ecology of the Volga Basin, USSR Academy of Sciences, Togliatti.

Translated from Khimiya Prirodnykh Soedinenii, No. 5, pp. 751-752, September-October, 1988. Original article submitted November 11, 1987; revision submitted April 20, 1988.

0009-3130/88/2405-0642$12.50