POLYSACCHARIDES OF SAPONIN-BEARING PLANTS. CARBOHYDRATES OF *Yucca gloriosa*

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In *Yucca gloriosa* L. only the steroid saponins have been investigated in detail [1] and the other biologically active substances, including carbohydrates, have been studied inadequately.

In the present communication we give information on a study of the carbohydrates of *Yucca gloriosa* collected in the botanical garden of the Academy of Sciences of the Uzbek SSR* [2]. The air-dry comminuted raw material (leaves and roots separately) was treated successively with chloroform and methanol in order to eliminate pigments and low-molecular-weight substances. The carbohydrates were then isolated by the well-known method of fractional extraction successively with 70% ethanol, water, hot water, oxalic acid, and caustic soda solutions of various concentrations. The polysaccharides (PSs) were hydrolyzed with 2 N H_2SO_4 at 100°C for 12-48 h, and the sugars and the hydrolysates were investigated by PC and GLC [3]. The results obtained are given in Table 1.

When the ethanolic extract from the roots was left to stand, it deposited a mucilaginous PS (with a yield of 1.6%) that was soluble in water to form clear and very viscous solutions. In a hydrolysate of it we detected mannose and arabinose in a ratio of 26:1 and trace amounts of glucose and galactose. The PS contained acetic acid residues, as was shown by its IR spectrum: ν_{max}^{KBr} 1245, 1740 cm^{-1}.

After the separation of the PS, the mother liquor was treated successively with lead acetate and sodium sulfate to eliminate noncarbohydrate components. Then the solution was evaporated to a syrup. This was dialyzed against distilled water. Treatment of the dialysate with acetone gave a glucofructan with a yield of 4.9%. In the external dialysis solution, fructose, glucose, sucrose, and fructose-containing oligosaccharides were detected by PC (water-saturated phenol with an alcoholic solution of urea as the visualizing reagent).

*The materials for investigation were supplied by V. K. Ivanova.

TABLE 1. Amounts and Monosaccharide Compositions of Hydrolysates of the Polysaccharide (PS) Fractions, % on the Absolutely Dry Weight of the Raw Material

Plant organ and extractant	Yield of PSs	Ratio of monosaccharides						
		Rha	Ara	Xyl	Man	Glc	Gal	GalUA
Roots								
70% Ethanol	14.9							
Water, 20°C	2.0	1	3,6	Tr.	32,7	4,4	9,7	+
Water, 90°C	1,6	2,1	5,3	Tr.	2 4	1	8,3	+
0,5% solution of $C_2H_2O_4$ + $(NH_4)_2C_2O_4$, 70°C	2.1	1,9	5,9	Tr.	1	Tr.	9,3	+
NaOH, 8%, 20°C	23	1,0	4,9	11,5	2,5	9 1	7.8	+
NaOH, 15%, 20°C	1.4	1,0	5,1	11	6,1	12,1	8,1	+
Leaves								
70% Ethanol	7,6							
Water, 20°C	1.5	1	3 0	Tr.	7,1	Tr.	4.5	
Water, 90°C	1,7	7,1	12,8	1	8,7	3	14.3	+
0,5% solution of $C_2H_2O_4$ + $(NH_4)_2C_2O_4$, 70°C	4,8	18,4	17,6	1,0	Tr.	4,6	32,8	+
NaOH, 8%, 20°C	6,3	1,9	3	16 8	1	5,8	6	+
NaOH, 15%, 20°C	4,6	1	2	9,3	15,3	13	4	+

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In an ethanolic extract of the leaves the same mono- and oligosaccharides were found as in the roots, but the mucilaginous PS was absent.

The PSs extracted by cold water from the roots and leaves containing no glucan of the starch type, as was shown by the negative reaction with iodine.

According to the results of titrametric analysis [4], the pectins of the leaves had the following quantitative characteristics (%): free carboxy groups, K_f: 7.9 methoxylated carboxy groups, K_e: 6.3; degree of esterification: 44; methoxy groups: 4.3.

Thus, fractionation has shown that the carbohydrate complex of *Yucca gloriosa* L. includes a considerable amount of mono- and oligosaccharides water soluble polysaccharides, pectins, and hemicelluloses.

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