POLYSACCHARIDES OF *Asimina triloba*

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The common pawpaw (*Asimia triloba* (L.) Dun.), family *Annonaceae*, is cultivated on the southern shore of the Crimea, in Georgia, in the south of Krasnodar krai [1], and in the F. N. Rusanov Botanical Garden of the Academy of Sciences of the Uzbek SSR. The plant arrived in the SSR and in western Europe from the USA and Brazil. The common pawpaw is one of the frost-resistant species among representatives of the *Annonaceae*. According to A. Takhtadzhyan, Asia and Australia are the main centers of distribution of the *Annonaceae* [2, 3].

The majority of the fruits of the *Annonaceae* are edible. The oils isolated from the seeds are used for food purposes and for soapboiling, and the wood as a source of production of alcohols, while the flowers of *Cananga odorata* form a raw material for perfumery [4].

Out of 41 genera, 150 species have been investigated in the chemical respect [4-6].

The pawpaw growing in the territory of Uzbekistan has not previously been studied for its carbohydrate content.

In the present paper we report on the amount of carbohydrates in the plant and their monosaccharide composition. The ethanol-soluble sugars (ESs), the water-soluble polysaccharides (WSPs), the pectin substances (PSs), and the alkali-soluble polysaccharides (hemicelluloses; HMCs) were extracted successively from one sample of the raw material [7].

The quantitative ratio of the monosaccharides in the polysaccharides was established by the GLC of hydrolysates after their conversion into the corresponding polyol acetates [7]. Table 1 gives the amounts and composition of the polysaccharides on the absolutely dry weight of the raw material.

TABLE 1

Product	Yield, %	Monosaccharide, moles						
		Ram	Ara	Xyl	Man	Gal	Glc	uronic acid
Ripe fruit with skin								
ES*	66,0							
WSPS†	4,23	1,0	14,1	2,2	6,1	5,66	62,2	++
PS	1,15	1,0	6,4	Tr.	1,5	3,3	79,2	+++
HMC-A		1,0	5,6	2,54	1,2	3,7	85,1	+
HMC-B	7,44	1,0	6,4	2,80	2,4	37,5	58,7	—
		1,0	4,0	13,5	1,7	2,5	55,0	++
Unripe fruit with skin								
ES*	11,13							
WSPS‡	7,7	1,0	2,9	1,0	Tr.	2,2	15,0	++
PS	2,2	1,0	4,4	Tr.	Tr.	1,0	23,3	+++
HMC-A		—	Tr.	—	—	—	Tr.	—
HMC-B	34,8	1,0	5,74	5,21	—	1,81	29,2	++
Seeds with hard coat								
ES*	11,3							
WSPS†	1,1	1,0	5,7	—	48,3	18,3	11,0	+
PS	0,12	1,0	7,4	1,3	14,1	14,6	11,0	++
HMC-A + B	4,24	1,0	2,97	11,0	1,42	6,57	20,9	+

*The ratios of the sugars were not determined.
†On extraction with cold and hot water.
‡Hot aqueous extraction.

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As can be seen from Table 1, the amount of ESs in the ripe fruit, that of HMCs in the unripe fruit, and that of ESs in the seeds were high. The ESs contained free glucose, fructose, sucrose, and its homologs. The high amount of HMCs in the unripe fruit is connected with the presence of starch in them. All the polysaccharides formed a blue coloration with a solution of iodine [5]. Analyses of the IR and ^{13}C NMR spectra of the polysaccharides unambiguously showed that the arabinose had the furanose form and the other sugars the pyranose form.

Thus, the edible fruit of the pawpaw [4] can be used in the food industry independently or in combination with other fruits as a jellifying agent.

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CARBOHYDRATES OF *Hyacinthus litwinovii*

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Continuing a chemical investigation of plants of the family *Liliaceae* [1, 2], we have studied the carbohydrates of the bulbs of the *Hyacinthus litwinovii* Czerniak (Litwinow's hyacinth) collected in the Ashkhabad province in the flowering period. From a weighted sample of the air-dry raw material the carbohydrates were isolated by the well-known method of 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 [3].

The polysaccharide fractions were hydrolyzed with 2 N H_2SO_4 at 100°C for 10-24 h, and the monosaccharides in the hydrolysates were identified by PC and GLC [2].

Glucose, fructose, sucrose, and oligosaccharides containing fructose were found in the ethanolic extract (yield 20%).

The water-soluble polysaccharides were obtained with a yield of 9.7%. They consisted of a white amorphous powder and dissolved in water forming a viscous solution giving no starch reaction with iodine. The IR spectrum of the water-soluble polysaccharide had adsorption bands at (cm^{-1}): 820 (pyranose ring); 880 (β-glycosidic bond); and 1250 and 1740 (ester group). Arabinose (Ara), mannose (Man), glucose (Glc), and galactose (Gal) were found in the hydrolysis products in a ratio of 1:35.2:2.8:1. The polysaccharide was separated with the aid of Fehling's solution into two fractions: a glucomannan and a polysaccharide — from the mother solution by dialysis and precipitation with ethanol. On hydrolysis, the polysaccharide gave Ara, Man, Glc, and Gal in a ratio of 1:2.7:3.8:2. The IR spectrum of the glucomannan lacked the absorption band of the ester groups. In a hydrolysate of it, glucose and mannose were found in a ratio of 1:13.5. In the products of the periodate oxidation of the glucomannan (30 mg, 10 ml of 0.3 M $NaIO_4$, 20°C, 18 days) followed by reduction of the polyaldehyde (60 mg of $NaBH_4$, 16 h), and hydrolysis (0.5 N H_2SO_4, 100°C, 8 h), PC (propan-1-ol—ethyl acetate—water (7:1:2) system with visualization by a saturated aqueous solution of KIO_4 followed by a 1% solution of $KMnO_4$) showed the presence of considerable amounts of erythritol

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