Chemistry of Natural Compounds, Vol. 35, No. 4, 1999

CARBOHYDRATES OF *Melo zard Pang*

M. A. Khodzhaeva, M. T. Turakhozhaev, and E. Rakhmanzade

UDC 547.917

Alcohol-soluble carbohydrates, water-soluble polysaccharides, and pectin substances have been isolated from melon juice pulp. The substances isolated have been studied by IR spectroscopy.

The literature includes an investigation of the dependence of the transportability and keeping quality of melons on their content of pectin substances (PcSs) [1]. V. V. Arasimovich has studied the chemical composition of melons and the viscosity of the water-soluble pectin relative to *Citrullus edulis* [2]. In [3] a rise in the mass of the PcSs up to a value of 86,000 with an increase in ripeness of a white-flesh variety of eastern melons is reported. There is no other information on the carbohydrate composition of melons.

We have investigated the pulp of a melon of the species *Melo zard Pang*, variety Belye abrikosy, after the production of the juice and the isolation of the seeds in the Tashkent preserves factory (this operation has also been started up in the Ferganskaya and Khorezmskaya oblasts). The alcohol-soluble carbohydrates (ASCHs) and the water-soluble polysaccharides (WSPSs) were extracted successively from a weighed sample of the air-dry raw material with 80% alcohol, while the pectin substances were obtained separately by three methods, and some of their physicochemical properties were studied (Table 1). The ASCHs were freed from noncarbohydrate components by preparative PC. As can be seen from the table, the bulk of the carbohydrates was formed by the ASCHs and the PcSs, the amount of pectin ranging from 3.6 to 4.34% on the weight of the raw material, depending on the method of isolation.

The samples of WSPSs and PcSs consisted of amorphous powders colored light cream to cream, depending on the method of isolation, that were readily soluble in water to form viscous solutions. The molecular masses of the samples under investigation were calculated from the dependence of molecular mass on characteristic viscosity [4] (see Table 1).

As can be seen from the table, the molecular mass of the pectin isolated largely depended on the nature of the extractant.

The mono- and oligosaccharides of the ASCHs were analyzed by PC (systems 1 and 2), and glucose, fructose, and sucrose were detected in a ratio of 1.6:1:1.4. Glucose and fructose were identified by PC (system 2) among the products of the complete acid hydrolysis of a sample of the WSPSs, i.e., they were glucofructans. The fructose content was 94.7%. The IR spectrum of the WSPSs contained absorption bands in the 815, 880, and 945 cm^{-1} regions as typical absorption of 2→1 bonds linking fructofuranose units [5]. The region of wavelengths around 945 cm^{-1} covered the vibration of the fructose ring in inulin, which means that the WSPSs were glucofructans of the inulin type [6].

Analysis of the products of acid hydrolysis of all the samples of pectin by PC (system 1) revealed the monosaccharides: glucose, galactose, arabinose, and galacturonic acid.

The following absorption bands were characteristic for the IR spectrum of the PcSs: 840 cm^{-1} (α- configuration), 1750 cm^{-1} (stretching vibrations of a methoxycarbonyl group), and 1050 and 1080 cm^{-1} (1→4 glycosidic bond).

Thus, the alcohol-soluble carbohydrates, the water-soluble polysaccharides, and the pectin substances of melon juice pulp have been investigated and characterized.

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (998 71) 120 64 75. Translated from Khimiya Prirodnykh Soedinenii, No. 4, pp. 442—444, July-August, 1999. Original article submitted October 26, 1996.

 0009-3130/99/3504-0394$22.00

TABLE 1. Carbohydrate Composition of *Melo zard Pang*

Extractant	Yield, %			Characteristics of the PcSs		
	ASCHs	WSPSs	PcSs	λ, %	[η]	Mol. mass
80% alcohol	12.9					
Water		1.08				
0.5% $H_2C_2O_4$			4.3	86.1	0.49	47800
0.3% HCl			3.8	8.63	0.48	45780
0.2% H_3PO_4			3.6	81.4	0.34	36600

EXPERIMENTAL

Transmission and diffuse reflection IR spectra were recorded on a Perkin-Elmer single-beam Fourier IR spectrometer (model 2000; 100 scans, resolution 4 cm^{-1}). The samples were prepared by molding into tablets with KBr.

For the determination of molecular masses we used a VPZh capillary viscometer with a diameter of 0.62 mm.

PC was conducted by the descending method using Filtrak 11, 13 and the systems 1) butan-1-ol—pyridine—water (6:4:3) and 2) water-saturated phenol. The revealing agents were aniline hydrogen phthalate and the Bonner reagent (7). Titrimetric results were obtained by the method of [8].

Isolation of the Alcohol-soluble Carbohydrates. A concentrated solution of the mono- and oligosaccharides in the form of a syrup was extracted as in [9]. The syrup was analyzed by PC (system 2), and glucose, fructose, and sucrose were detected. For quantitative determination, the sugars were separated by preparative PC, and glucose, sucrose, and fructose were determined in a ratio of 1.6:1:1.4 by Kolthoff's method [10].

Isolation of the Water-soluble Polysaccharides. After the alcoholic extraction, to isolate the WSPSs the pulp was treated as in [9]. A sample (50 mg) of the WSPSs was hydrolyzed with 0.5 N H_2SO_4 (2.5 ml) in the boiling water bath for 2 h. Hydrolysis product was neutralized with barium carbonate, and the solution was filtered and evaporated. One part of the hydrolysate was analyzed by PC (system 2), and fructose and glucose were detected; their quantitative contents — 94.7% of fructose and 5.3% of glucose — were determined by Kolthoff's method [10].

Isolation of the Pectin Substances. The residue after the extraction of the WSPSs was divided into three parts. The first part was treated with a 0.5% solution of oxalic acid at 70°C for 2 h. The extract was dialyzed against distilled water, evaporated, and precipitated with alcohol (1:3). The second part of the pulp residue was extracted with a 0.3% solution of hydrochloric acid on the boiling water bath for 30 min. After filtration, the extract was precipitated with alcohol (1:3). The third part of the pulp residue was subjected to treatment with 0.2% phosphoric acid for 90 min. After filtration, the extract was precipitated with alcohol (1:3).

Samples of the PcSs (50 mg each) were hydrolyzed with 2 N H_2SO_4 in the boiling water bath for 48 h. The hydrolysis products were neutralized with barium carbonate, and the solution was filtered and evaporated. Each hydrolysate was analyzed by PC (system 1), and glucose, galactose, arabinose, and galacturonic acid were detected.

REFERENCES

1. I. G. Tityapova, in: *Collection of Papers by Post-graduate Students and Young Scientific Workers* [in Russian], Vsesoyuz. In-t Rastenievodstva, No. 3 (7), 240 (1963).
2. V. V. Arasimovich, *The Biochemistry of Cultivated Plants* [in Russian], Moldova, No. 4 (1966) p. 12.
3. Y. Yabumoto, *Mie Daigaku Nogakubu Gakufutsu Hokoku*, **48**, 483 (1975).
4. M. Hiroshi and M. Takashi, *Pept. Food Res. Inst.*, **14**, 6 (1959).
5. K. P. Lester, *Anal. Chem.*, **22**, No. 2, 276 (1950).
6. L. M. Verstraeten, *Anal. Chem.*, **36**, 1040 (1964).

7. T. G. Bonner, *Chem. Ind.*, 345 (1960).
8. T. B. Aimukhamedova, D. É. Alieva, and N. P. Shelukhina, *The Properties and Use of Pectin Sorbents* [in Russian], Ilim, Alma-Ata (1984), p. 131.
9. M. A. Khodzhaeva and Z. F. Ismailov, *Khim. Prir. Soedin.*, 137 (1979).
10. M. N. Zaprometov, *Biochemical Methods of Plant Analysis* [in Russian], Moscow (1970), p. 232.