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POLYSACCHARIDES OF *Viburnum opulus*

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We have investigated the fruit and leaves of *Viburnum opulus* L. (European cranberry bush) collected in the environs of the village of Goldino, Mikhailov Region, Ryazan'Province.

The European cranberry bush contains a number of biologically active substances [1] and is used in medical practice [1, 2], while its fresh fruit is used as a food [2, 3]. However, the chemical composition of the fruit and, particularly, of the leaves of the cranberry bush have been studied inadequately, and the water-soluble polysaccharides (WSPSs) have not previously been discussed.

The air-dry raw material (moisture content of the fruit 10.2-11.4%, and of the leaves 9.4-10.0%) previously twice purified with ethanol (1:10) for 2 h was extracted with hot water at 90-95°C (1:20) for 1.5 h. The aqueous extract was filtered, evaporated, and treated with 96% ethanol (1.5 volumes). The precipitate of WSPSs was separated off and was washed with ethanol and acetone. The yield of polysaccharides (PSs) from the green fruit was 5.8%, from the ripe fruit 2.5%, and from the leaves collected in the ripe-fruit phase 3.7%. The ash contents of the PSs of the fruit (6.8-7.1%) and of the leaves (18.70%) were determined by burning samples of them in a muffle furnace at 600°C.

The demineralization of the PSs was carried out by reprecipitating aqueous solutions with acidified ethanol, dialysis through a semipermeable membrane, and treatment with KU-2 cation-exchange resin (H^+ form). The ash content of the demineralized WSPSs was 0.4-0.6%. The amounts of uronic anhydride in the PSs of the fruit (unripe, 88.6%, ripe, 85.9%) and of the leaves (75.0%) were established by complexonometric titration [4].

The demineralized WSPSs (0.1 g) were dissolved in 1 N H_2SO_4 (5 ml) and were hydrolyzed on the boiling water bath for 9 h. The resulting hydrolysate was neutralized with $BaCO_3$, filtered, and evaporated, and the residue was studied by descending paper chromatography in the butan-1-ol–pyridine–water (6:4:3) system at 21-23°C for 40-45 h (Leningrad type M ["slow"] paper, density 80 g/m^2). The monosaccharides were revealed with aniline phthalate at 105-110°C for 10 min.

It was established that the PSs of the fruit of the European cranberry bush are composed of the residues of seven monosaccharides: D-galacturonic acid, D-galactose, D-glucose, L-arabinose, D-xylose, and L-rhamnose, and one unidentified monosaccharide present in traces and chromatographically more mobile than L-rhamnose, while the WSPSs of the leaves contained, in addition, another unidentified monosaccharide more mobile than D-xylose.

The neutral sugars galactose, glucose, arabinose, xylose, and rhamnose were determined by the direct densitometry of the chromatograms in a type 3 CS integrating automatic microdensitometer (Joyce-Loebl) and their ratio in the WSPSs of the unripe fruit was found to be 2:0.9:2.2:1.1:1, respectively, in the ripe fruit 5.8:1.2:6.3:1.6:1, and in the leaves 6.3:4.6:5.4:1.3:1. The results obtained permit the PSs of the fruit and leaves of the European cranberry bush to be assigned to the class of pectin substances.

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p-HYDROXYBENZOIC ACID FROM *Centaurea polypodiifolia*

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We have investigated *Centaurea polypodiifolia* Boiss. collected in the Dzhul'fa region of the Nakhichevan ASSR in the fruit-bearing period (August, 1981).

The air-dry comminuted epigeal part of *C. polypodiifolia* (2.5 kg) was extracted with distilled water on a boiling water bath for 2 h. The extract was evaporated to small volume and the residue was treated three times successively with petroleum ether, chloroform, and ethyl acetate. The ethyl acetate extracts were combined, dried over anhydrous sodium sulfate, filtered, and evaporated. The residue (6.3 g) was chromatographed on a column of silica gel (L 40/100 μ); column dimensions 40 × 3.5 cm. Elution was carried out with hexane and with hexane–ethyl acetate (9:1) (4:1) and (3:1). The volume of each fraction was 50 ml.

From the fraction eluted by hexane–ethyl acetate (3:1) a substance with the composition $C_7H_6O_3$, mp 211-213°C, was isolated. The IR spectrum of the substance had the characteristic absorption bands of an OH group (3400 cm^{-1}), of a carboxylic CO group (1620 cm^{-1}), and of a benzene ring (1610, 1600, and 1520 cm^{-1}). The presence in the IR spectrum of the substance of strong bands at 865, 840, and 775 cm^{-1} showed the para substitution of the benzene ring [1]. The results of a comparison of the physicochemical constants and IR spectra, and a mixed melting point, enabled the substance obtained to be identified as p-hydroxybenzoic acid.

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