LIGNOCARBOHYDRATE COMPLEXES OF COTTON BOLLS

L. S. Smirnova and Kh. A. Abduazimov

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From ripe cotton bolls, after the isolation of the lignin by mechanical grinding [1], by extraction with dimethylformamide for various times (15, 30, and 45 days) using Bjorkman's method [2] we have obtained lignocarbohydrate complexes (LCH-I, LCH-II, LCH-III).

The LCH's isolated form amorphous light-brown powders readily soluble in hot water, solutions of alkalis, dimethyl sulfoxide, and dimethylformamide. An increase in the time of extraction leads to an increase both in the yield of LCH's (from 3.15 to 4.88%) and also to the amount of carbohydrates (from 13 to 38%).

The lignocarbohydrate complexes were hydrolyzed with 2.5% sulfuric acid and the sugars in the hydrolyzates were determined by Bertrand's method [3]. The results of the chromatography of the hydrolyzates on a plate of silica gel impregnated with sodium phosphate in the butan-1-ol–methanol–water (5:3:1) system with standard sugars as markers showed the presence in them of xylose, arabinose, glucose, and galactose. In their UV spectra, none of the samples of LCH showed the well-defined maximum characteristic for lignin (λ_{max} 280 nm); instead of this there was a shoulder at 260-290 nm.

The results of fractionating the LCH's on a column of Sephadex G-100 equilibrated with water show that all the LCHs are bimodal. The bulk of the LCH's was eluted in a narrow fraction amounting to 74.5%, 68.5%, and 61.8%, respectively, of the total substance of LCH I, II, and III.

As can be seen from the elution curves (Fig. 1), the fractions were eluted with small amounts of solution, i.e., they are of high molecular weight. The low-molecular-weight components were eluted in the form of broader peaks and amounted to 25.5, 31.5, and 38.2%, respectively. When the Bjorkman lignin from cotton bolls was chromatographed on the same column, a single peak was obtained in the region of large eluent volumes. The Bjorkman lignin (mol. wt. 15,000, found by gel chromatography) was eluted after the low-molecular-weight fractions; its molecular weight was less than that of the low-molecular-weight fractions of the LCH's.

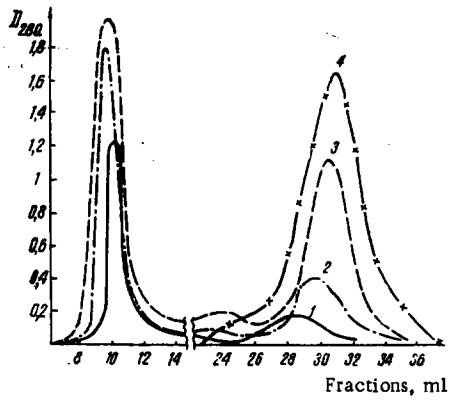

Fig. 1. Gel-chromatographic curves: 1) LCH-I; 2) LCH-II; 3) LCH-III; 4) Bjorkman lignin.

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The UV spectra of the low- and the high-molecular-weight fractions were similar and identical with those of the unfractionated LCH's. The behavior of the LCH's on gel chromatography shows that the lignin in them is strongly bound to the carbohydrates.

Thus, lignocarbohydrate complexes consisting of high-molecular-weight and low-molecular-weight complexes have been isolated from cotton bolls.

LITERATURE CITED

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