AN INVESTIGATION OF THE LIGNIN OF THE COTTON PLANT. IV

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The present paper gives the results of a detailed investigation by the GLC method of the products of the nitrobenzene oxidation of the cotton plant and its lignin during the growth of the plant.

In the products of the oxidation of all the samples, in addition to the vanillin and syringaldehyde found previously [1, 2], we determined p-hydroxybenzaldehyde and p-hydroxybenzoic acid (Table 1). Consequently, the p-coumaric structural units of lignin are presnt in all periods of vegetation of the cotton plant. With the development of the latter, the total yield of aldehydes increases both on the oxidation of the plant itself and on the oxidation of the dioxane lignin (DLA).

The amount of guaiacyl structural units is made up of the total of the vanillin, acetovanillone, and ferulic acid; the amount of syringic units from the sum of the syringaldehyde and the acetosyringone; and the number of p-coumaric units from the sum of the p-hydroxybenzaldehyde and p-benzoic acid. The quantitative ratios between the three types of structural units change during the growth of the plant. On the basis of the number of guaiacyl structural units, as the cotton plant grows the number of "syringic" components increases and the number of p-hydroxycoumaric components falls sharply.

The lignin becomes more high methoxylated. The total yield of aldehydes from the oxidation of the plant is higher than from the oxidation of the DLA obtained by Pepper's method [3]. These facts show the nonidentity of the native lignin and the DLA.

The work was performed with a "Tsvet-4" chromatograph with a flame-ionization detector and a two-meter stainless-steel column with an internal diameter of 4 mm filled with 4% of PÉGA on Chromaton NAW (60-80 mesh). Column temperature 220°C [poly(ethylene adipate)], evaporator temperature 250°C, rate of flow of carrier gas (helium) 140 ml/min.

TABLE 1. Content of Aromatic Aldehydes and Acids in the Products of the Oxidation of the Stems of the Cotton Plant and DLA, Identified by the GLC Method, %

Substance	Plant			Lignin		
	vegetation periods					
	early	flowering	after harvesting	early	flowering	after harvesting
p-Hydroxybenzaldehyde	0,37	0,015		Traces		0,07
p-Hydroxybenzoic acid	0,87	0,046	0,26	0,16	0,11	Traces
Vanillin	0,66	1,55	8,33	0,055	0,38	4,2
Acetovanillin	0,53	0,6	-	0,017	0,085	0,14
Ferulic acid	0,29	0,22	0,13	—	0,017	0,07
Syringe acid	0,04	0,25	7,78	0,005	0,11	1,75
Acetosyringone	0,012	0,04	—	—	—	—
Total yield	2,67	2,72	16,5	0,24	0,70	6,23

* The yields of aldehydes are calculated on the plant.

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On the chromatograms, the products of nitrobenzene oxidation were identified by their retention times in comparison with those of added standard substances. The quantitative evaluation was performed by the area normalization method [4].

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