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ALKALINE HYDROLYSIS OF NATURAL COTTONPLANT STEM LIGNIN IN THE PRESENCE OF DEMETHYLATED LIGNIN

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In the present communication we give the results of the alkaline hydrolysis of the natural lignin of cottonplant stems in the presence of catalytic amounts of demethylated lignin (DML).

Hydrolysis was performed in an 8% solution of NaOH (ratio of alkali to plant material 10:1) in an autoclave at 160°C for 3 h. The amount of DML was 2% on the weight of the plant material. The yields of hydrolysis products extracted by ether at pH 8 and by ethyl acetate at pH 2 amounted to 10.8 and 10.0% of the weight of the plant material. The DML was obtained by the method of [1].

Analysis of the ether fraction of monomeric products by GLC (Table 1) showed the absence of syringyl structural units, which may indicate a demethoxylation of the lignin fragments during alkaline hydrolysis. An analogous pattern has been observed in the alkaline hydrolysis of natural cottonplant stem lignin in the presence of anthraquinone [2].

TABLE 1. Monomeric Products of the Alkaline Hydrolysis of Natural Cottonplant Stem Lignin, % in the Mixture

Substance	Temperature 160°C	
	without DML	+2% of DML
Phenol	3.5	5.2
Guaiacol	10.2	13.2
1-*p*-Hydroxyphenylethanol	8.4	13.6
p-Hydroxyphenylethane	7.9	13.7
p-Hydroxyphenylpropane	6.0	8.2
Guaiacylethane	1.2	1.9
Guaiacylpropane	11.8	17.5
1-Guaiacylpropan-1-ol	8.1	9.5
3-*p*-Hydroxyphenylpropan-1-ol	7.5	21.0
3-Guaiacylpropan-1-ol	10.3	–
Syringylpropane	6.6	–

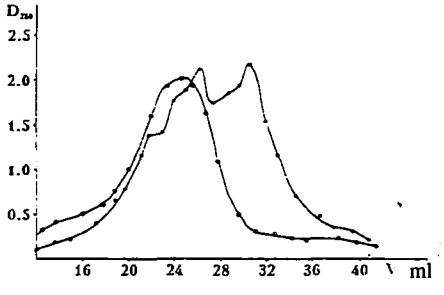

Fig. 1. Gel filtration curves for the ethyl acetate fraction of the products of the alkaline hydrolysis of cottonplant stem lignin: *a*) hydrolysis at 160°C without DML; *b*) hydrolysis at 160°C + DML.

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The composition of the ethyl acetate extracts was investigated by gel chromatography on Sephadex LH-20 (eluent ethanol—water (9:1)). In the presence of DML some shift was observed of the maximum of the molecular-mass distribution curve in the direction of higher molecular masses, which showed an increase in the proportion of hydrolysis products with a higher molecular mass (Fig. 1).

Thus, DML, just like the effective delignification catalyst anthraquinone, promotes a more far-reaching degradation of cottonplant stem lignin.

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