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LIPID COMPONENTS OF HYDROLYZED LIGNIN

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Free fatty acids and triacylglycerines are detected in extracts of hydrolyzed lignins. The selective sorptivity of hydrolyzed lignins for vegetable oils is apparently related to the dimensions of both the lignin microcells and the molecules of free fatty acid and triacylglycerine.

Hydrolyzed lignin contains lipids and lipophilic substances that degrade its sorption characteristics for vegetable oils [1]. In continuation of our studies on the sorptivity of industrial lignins, we studied the lipids and lipophilic substances of two types of hydrolyzed lignins (HL) in order to determine the effect of this group of substances on the sorptivity of lignins.

Extracts of hydrolyzed lignin from cotton seed pods (HLCSP) and wood chips (HLWC) were shown by TLC using system 1 to contain triacylglycerines (TAG) and free fatty acids (FFA). Dark brown pigments and unidentified lipophilic substances were also present. The content and composition of the extracted substances of HL are given below (%):

Components	HLCSP	HLWC
Extracted substances including:	13.60	9.80
triacylglycerines	1.10	0.54
free fatty acid s	8.20	2.86
pigments and unidentified lipophilic substances	0.50	0.30
nonlipid components	3.80	6.10

The extracted HLCSP contained predominantly FFA; HLWC, nonlipid components. The content of FFA and TAG in HLCSP (70% of the extract mass) was greater than in HLWC (30%). Fatty acids obtained from TAG and FFA were isolated from the HL extract by preparative TLC using system 2. They were analyzed as the methyl esters using GLC (Table 1).

The HL extracts contained saturated acids of the 12:0-20:0 series. Of these, palmitic acid (16:0) dominated. The principal unsaturated acids of the lipid components from HLCSP and HLWC are oleic (18:1) and linoleic (18:2). Lipids of HLWC are enriched in these unsaturated acids.

Previous studies [2] demonstrated that the sorption characteristics of the starting and modified HL for vegetable oils are independent of the nature of the polar functional groups in the lipid molecule. The presence of uncleaved TAG in the HL provides indirect evidence for the existence of microcells in which they are probably contained. An acidic reagent has difficulty reaching these cells owing to the ability of HL to swell in water. This facilitates the preservation of TAG in the native state. FFA and a small amount of TAG oils are adsorbed if HL purified of lipids and lipophilic components are contacted with vegetable oils [1]. Such selectivity for the HL is apparently due to the dimensions of both the microcells and the molecules of FAA and TAG.

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TABLE 1. Fatty-Acid Composition of TAG and FFA of Hydrolyzed Lignins (%, GLC)

Acids	HLCSP		HLWC	
	TAG	FFA	TAG	FFA
12:0	Tr.	-	Tr.	Tr.
14:0	0.7	0.6	0.3	0.3
15:0	0.2	-	Tr.	1.2
16:0	37.6	48.4	18.7	23.9
17:0	0.3	Tr.	Tr.	0.2
18:0	2.8	3.3	2.1	2.2
18:1	26.9	32.0	30.7	29.4
18:2	31.5	15.7	48.2	42.1
20:0	Tr.	Tr.	Tr.	0.7
$\Sigma_{sat.}$	41.6	52.3	21.1	28.5
$\Sigma_{unsat.}$	58.4	47.7	78.9	71.5

EXPERIMENTAL

GLC of the fatty-acid methyl esters was performed on a Khrom-4 chromatograph (Czech Republic) equipped with a flame-ionization detector and a column (2.5 m × 3 mm) packed with Chromaton N-AW-DMCS with 15% Reoplex 400 at a constant temperature of 198°C. The carrier gas was nitrogen.

Analytical and preparative TLC of the lipids was carried out on L 5/40 silica gel (Czech Republic). The following solvent systems were used: 1) hexane—ether—acetic acid (80:20:1); 2) hexane—ether (3:2).

Lipids and lipophilic compounds of HLCSP and HLWC were extracted by a mixture of $CHCl_3$ and methanol (2:1, v/v) by drawing way. Ballast compounds were removed by washing with NaCl (2% solution).

TAG and FFA were identified by comparing their chromatographic mobility with that of authentic compounds isolated from cottonseed oil. Fatty acids were methylated by diazomethane [3].

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