ENZYMATIC HYDROLYSIS OF SOYBEAN POLYSACCHARIDES

III. Component Polysaccharides of the Taka-Diastase Hydrolysis Residue of the Soybean Cotyledon Hemicellulose B_1

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The first paper of this series[1] reported that the most parts of arabinose and galactose were removed from the hemicellulose B_1 by Taka-diastase and that rhamnose, fucose, and glucose were concentrated in the enzymatically unhydrolyzable polysaccharide residue. Fucose and rhamnose were found in soybean hemicelluloses by KAWAMURA and NARASAKI[2] for the first time in 1961.

The present investigation was made in anticipation of obtaining some informations for the structures of methylpentoses-containing polysaccharides in the soybean cotyledon hemicellulose B_1.

Materials and Methods

The hemicellulose B_1 and the Taka-diastase solution were prepared according to the procedures reported in the first paper of this series[1].

Enzymatic hydrolysis was performed under the standard conditions given in the above report and the enzymatically unhydrolyzable polysaccharide residue obtained after 48 hr hydrolysis was purified through copper-complex formation. An acid hydrolyzate of the polysaccharide contained rhamnose(+), fucose(++), xylose(++), arabinose(±), glucose (+), galactose(±), and galacturonic acid(++).

An open strip horizontal paper electrophoretic apparatus Toyo Kagaku-sangyo Co. Model CS-II was employed for the electrophoretic separation of component polysaccharides in the enzymatically unhydrolyzable polysaccharide residue.

Electrophoretic conditions and colorimetric determination of separated polysaccharides were virtually the same as those reported by NARASAKI and FUJIMOTO[3].

Component sugars of electrophoretic fractions were identified by paper chromatography after acid hydrolysis as described in the above report[3].

Results and Discussion

Electrophoretic patterns of the enzymatically unhydrolyzable polysaccharide residue are given in Fig. 1. The polysaccharide was clearly separated into four fractions; two moved to the cathode, one remained near the origin, and one moved to the anode.

Table 1 shows component sugars of the electrophoretic fractions obtained by 4 hr run.

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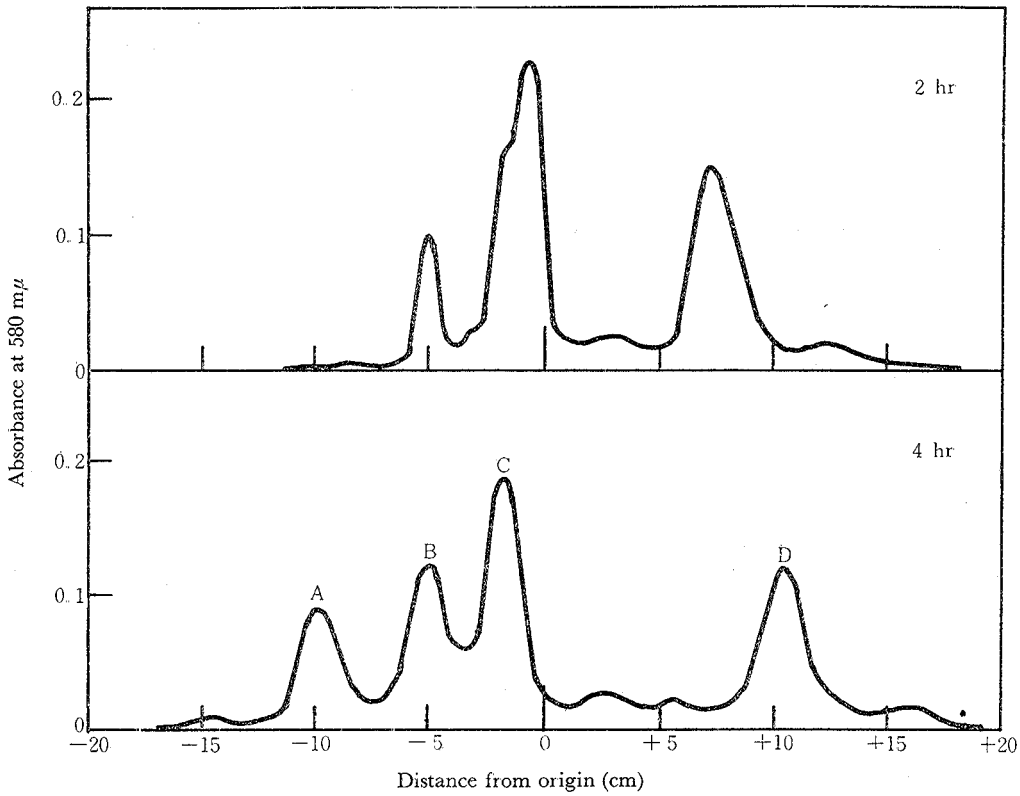

Fig. 1. Electrophoretic patterns.
The polysaccharide, 1%; borate buffer, pH 9.3, μ=0.06; 14.5 V/cm; 0.35-0.57 mA/cm.

Table 1. Component sugars of electrophoretic fractions

Electrophoretic fractions	Rhamnose	Fucose	Xylose	Arabinose	Glucose	Galactose	Galacturonic acid
A	−	−	+++	−	−	−	±
B	−	−	+++	−	−	−	++
C	+	±	++	±	+	±	++
D	−	+++	++	±	−	−	−

The fractions A and B may be xylans. The presence of a xylan containing galacturonic acid was estimated in the second paper of this series[4]. Detection of galacturonic acid-containing xylans both in the enzymatically hydrolyzable and the unhydrolyzable fractions opens new problems to be examined. In any case there may be two kinds of xylans in the hemicellulose B_1, one containing galacturonic acid and the other being homoxylan.

The fraction C contained rhamnose, xylose, glucose, and galacturonic acid and remained near the origin after 4 hr run. Therefore, this fraction may be divided into some sub-fractions under suitable conditions.

Fucose was detected in the fraction D in the combination with xylose. Thus, fucose seemed to be present in a form of xylofucan. The result seems to be very interesting for a new

approach can be opened to clarify the form of fucose in the hemicellulose B_1 of soybean cotyledons.

The present investigation suggests the usefulness of the combination of electrophoresis and the use of enzyme action for the study of polysaccharides in mixtures.

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ダイズ多糖類の酵素分解

III. タカジアスターゼで水解されないダイズ子葉ヘミセルロース B_1 中の多糖類

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ダイズ子葉ヘミセルロース B_1 の70%はタカジアスターゼで加水分解されておもにアラビノース，ガラクトース，ガラクツロン酸を生成する。未分解の多糖類はラムノース，フコース，キシロース，グルコース，ガラクツロン酸をふくんでいる．この多糖類はろ紙電気泳動によってキシロースのみからなる区分，キシロースとガラクツロン酸をふくむ区分，ラムノース，キシロース，グルコース，ガラクツロン酸をふくむ区分，およびフコースとキシロースからなる区分に分離された．したがって，フコースはキシロフカンの形で存在することがわかる．ラムノースをふくむ区分はさらに分別できそうに思われるので，ラムノースの存在形態は明言できない．キシロースは少くとも二つの形，ガラクツロン酸をふくむキシランとそれをふくまないキシラン，で存在することが確認できた。

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