POLYSACCHARIDES OF SOYBEAN HYPOCOTYLS

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Polysaccharides of soybean cotyledons and hulls were fractionally extracted by the use of water, ammonium oxalate, and sodium hydroxide solutions as successive extracting agents, and component sugars of the obtained polysaccharides were identified by paper chromatography and by preparation of crystalline derivatives of each component sugar.[1,2] The polysaccharides of soybean cotyledons were further separated by paper electrophoresis and the presence of araban and arabogalactan was revealed in both the hot-water-soluble and the ammonium oxalate-soluble polysaccharides.[3] However, no information had been available as for polysaccharides of soybean hypocotyls.

This work was undertaken to find the composition of polysaccharides of soybean hypocotyls, and it was found that the main component of soybean hypocotyl polysaccharides was a hot-water-soludle polysaccharide containing ribose.

Experimemental

1. Fractionation of Soybean Hypocotyl Polysaccharides

1.1. Sample

The defatted soybean flake used as raw material was donated by Nippon Kôyu Kôgyô K.K., through the courtesy of Mr. Torao SAKAKIHARA, Director of the Mizushima Factory, Kurashiki, Okayama-ken. This flake contained 10% moisture and 1.5% crude fat.[4]

1.2. *Fractionation of Polysaccharides*

The defatted soybean flakes were pulverized and sieved to collect seed hulls and hypocotyls. The seed hulls were expelled by the use of controlled current of air. The purified hypocotyls were further pulverized and then subjected to the fractionation of polysaccharides according to a scheme outlined in Fig. 1.

1.3. *Detection of Component Sugars by Paper Chromatography*

Each of the polysaccharides (0.2 g) was hydrolyzed with 2 N H_2SO_4 in a sealed glass tube by heating in boiling water for 4 hrs. The hydrolyzate was neutralized with $BaCO_8$ and the formed precipitate was removed by centrifugation and filtration through Tôyô Roshi No. 5 C filter paper. The filtrate was concentrated to about 1 ml under reduced pressure below 40°C to be examined by paper chromatography. Two-dimensional paper chromatography was carried out with phenol-water (4:1) and n-butanol-pyridine-water (6:4:3) as the solvent systems and 3% p-anisidine-HCl in water-saturated n-butanol as the spraying reagent. The results are shown in Table I.

It was interesting to see that a water-soluble polysaccharide containing ribose was dominant in the hypocotyls. No ribose was found in the free sugars,[5] the oligosaccharides,[6] and the polysaccharides of cotyledons[1] and hulls.[2] Then the next experiments were made to obtain more detailed information about the existence of ribose in the hot-water-soluble

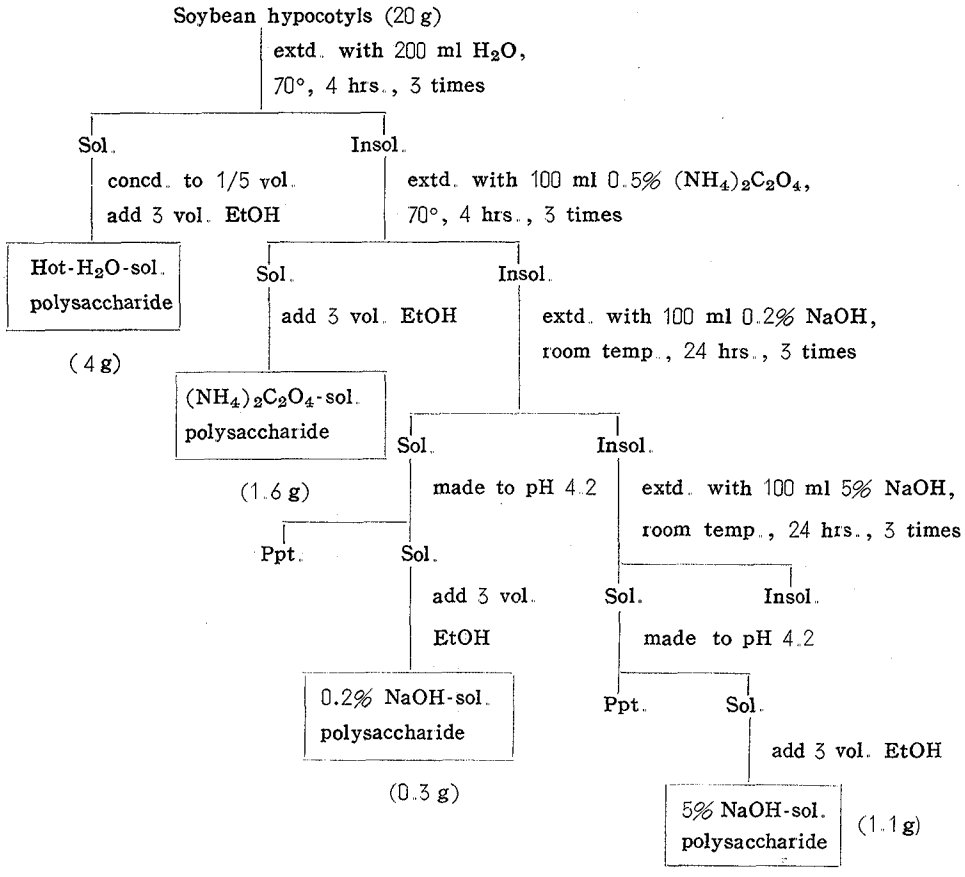


Fig. 1. Fractionation of polysaccharides

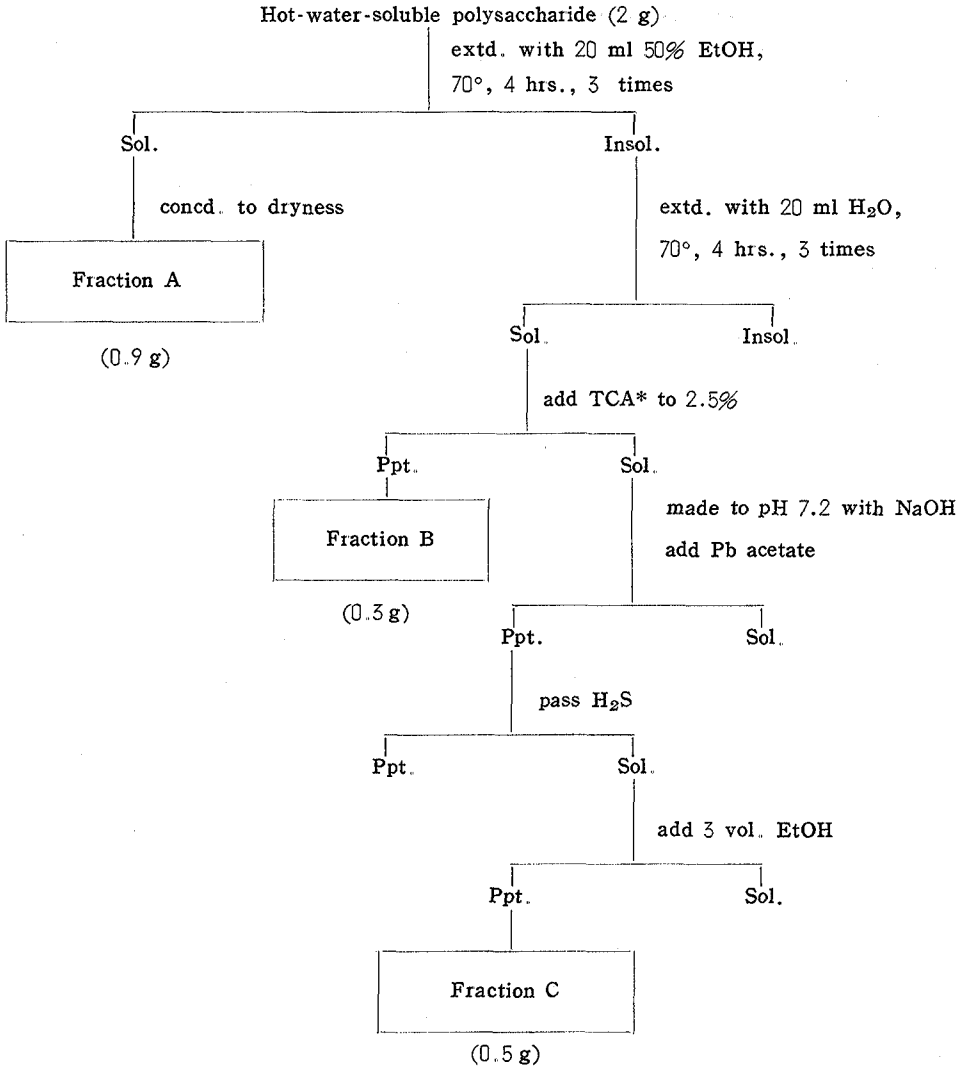
Table I. Component sugars of the hypocotyl polysaccharides

Polysaccharides soluble in	Rhamnose	Fucose	Ribose	Xylose	Arabinose	Mannose	Glucose	Galactose	Galacturonic acid
Hot water	−	−	+	−	++	±	+	++	+
0.5%$(NH_4)_2C_2O_4$	−	−	±	±	++	−	−	++	++
0.2% NaOH	±	±	−	+	++	−	−	++	+
5% NaOH	+	+	−	++	++	±	+	++	+

polysaccharide of soybean hypocotyls.

2. **Fractionation of Hot-Water-Soluble Soybean Hypocotyl Polysaccharide and Detection of Component Sugars in Each Fraction**

The hot-water-soluble polysaccharide obtained in the experiment 1 was fractionated according to the scheme given in Fig. 2. The main fraction was soluble in an aqueous 50% ethanol solution. The detection of component sugars in each fraction was performed by the method described in 1.3 and the results are given in Table II.



*TCA : trichloroacetic acid

Fig. 2. Fractionation of the hot-water-soluble polysaccharide

Table II. Component sugars of the fractions of the hot-water-soluble polysaccharide

Fractions	Ribose	Arabinose	Mannose	Glucose	Galactose	Galacturonic acid
A	++	+	±	++	+	−
B	+	++	−	+	++	±
C	++	++	±	+	++	+

Discussion

The hypocotyl polysaccharides may be characterized by the presence of ribose-containing polysaccharides, while the cotyledon polysaccharides are specific in the high content of fucose-containing hemicellulose B_1 and the hull polysaccharides are characteristically rich in a pectic substance. These specific distribution of sugars in polysccharides of different tissues of soybean may be related with the physiological functions of each tissue. Further, the informations obtained by the experiments of this series will be usefull to develop the utilization of defatted soybean flake.

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ダイズ胚軸の多糖類

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要旨　著者らはダイズ種皮および子葉部の多糖類につき一連の研究を行ない，いくつかの新知見を発表してきた．しかし胚軸部については特別研究がなされていなかったので，この実験を行ない，ダイズ各組織における多糖類の特性を検討した．胚軸には熱水可溶性多糖類が多く，この多糖類にはかなり多量のリボースが含まれていた．種皮多糖類ではペクチン様物質が多く，子葉部にはアルカリ可溶性のヘミセルロースが多い．これらの事実から，ダイズ種子の各組織中に含まれている多糖類とその組織の生理的機能との間には密接な関係があると考えられる．この点の研究は興味ある問題であろう．また，われわれの一連の研究によりダイズ種子の多糖類の特性がかなり明らかにされたので，これらの実験結果は，脱脂ダイズの利用面を開発するための基礎資料となるものと考えられる．

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