Title	Plant mucilages. XI. isolation and characterization of a mucous polysaccharide, "paniculatan", from the barks of hydrangea paniculata
Sub Title	
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Publisher	共立薬科大学
Publication year	1976
Jtitle	共立薬科大学研究年報 (The annual report of the Kyoritsu College of Pharmacy). No.21 (1976.) ,p.108- 109
JaLC DOI	
Abstract	
Notes	抄録
Genre	Technical Report
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AN00062898-00000021-0108

No. 21 (1976)

Plant Mucilages. XI. Isolation and Characterization of a Mucous Polysaccharide, "Paniculatan", from the Barks of *Hydrangea paniculata**

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The inner bark of *Hydrangea paniculata* SIEB. (Saxifragaceae) contains large amounts of mucilage. The mucous solution extracted from it with water has been used as a good size for the traditional paper manufacture in Japan.

On the chemical property of the mucilage, Hara reported that it is a galactoarabinan, and Komatsu, *et al.* found arabinose, galactose, glucose, rhamnose and galacturonic acid in the hydrolysate of it. More recently, Machida, *et al.* obtained a polyuronide composed of galactose, rhamnose and galacturonic acid in the molar ratio of 10 : 7 : 3, and they presumed that it is the essential part of the mucilage. But the homogeneity of the polysaccharides obtained by the former investigators was uncertain, and it must be the cause of the disagreement of their conclusions. We have now isolated a pure mucous polysaccharide from the inner barks of *Hydrangea paniculata*, and its properties are described in the present paper.

The material barks were ground and extracted with cold water. The crude mucilage was precipitated from the extract by addition of ethanol. The solution of the precipitate was applied to a column of DEAE-cellulose (carbonate form). None of the substances adsorbed was eluted with water, and a mucous polysaccharide was obtained from the eluate with 1 M ammonium carbonate solution.

The polysaccharide was homogeneous by the ultracentrifugal analysis, and gave one spot on glass-fiber paper electrophoresis in alkaline borate buffer. No nitrogen was found in it and it showed a positive specific rotation. Its solution in water gave the high intrinsic viscosity value of 54.0 at 28°. And the relative viscosity of the polysaccharide is about two times as high as the value of the crude mucilage in the same condition. From this result and the yield, it is conceivable that the pure polysaccharide is the representative substance in the mucosity of water extract from the inner bark.

The complete hydrolysis of the polysaccharide was accomplished and the hydrolysate was applied to preparative paper partition chromatography. L-Rhamnose, D-galactose, 4-O-methyl-D-glucuronic acid and D-galacturonic acid were obtained as the component sugars, and they were respectively identified by the synthesis of each derivative. They were also analyzed by means of cellulose thin-layer chromatography.

* 本報告は *Chem. Pharm. Bull.* (Tokyo), **24**, 230—234 (1976) に発表

The measurement of osmotic pressure gave the value of 109000 as the molecular weight of the ammonium salt of the polysaccharide and this value was also supported by the result of gel chromatography. The infrared spectrum of it has the absorption bands of 1730 and 1250 cm^{-1} suggesting the presence of ester linkages. The acid hydrolysate of the polysaccharide was analyzed by GLC, and it gave one peak, whose retention time was equal to that of authentic sample of acetic acid. The acetyl content of the polysaccharide was determined to be 2.0% by GLC. The name "paniculatan" is proposed for the polysaccharide.

The periodate-oxidized polysaccharide was treated with sodium borohydride, and analysis of the components of the reduction product revealed the presences of rhamnose, galactose and galacturonic acid in it, but no 4-O-methyl-glucuronic acid was found in the product. This result shows the fact that all rhamnose units, five sixteenth of galactose units and about one fourth of galacturonic acid units in the polysaccharide are not decomposed with periodate.

The complete degradation of 4-O-methyl-glucuronic acid by periodate oxidation suggests that all residues of this component uronic acid are located on the terminals of the polysaccharide. This result and the value of formic acid liberation show a high branching structure for the polysaccharide.

It can be presumed that the majority of neutral component sugars form backbone structure of the polysaccharide. Datailed elucidation of the structure will be reported in following papers.