BRIEF COMMUNICATIONS

POLYSACCHARIDE COMPOSITION OF A PECTIN COMPLEX FROM THE INFLORESCENCES OF *Tanacetum vulgare*

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The isolation of a water-soluble polysaccharide complex from the inflorescences of *Tanacetum vulgare* L. has been reported previously [1, 2]. It was established [3] that the maximum accumulation of water-soluble polysaccharides takes place in the period of mass flowering of the plant. A pharmacological study has shown [4] that the polysaccharide complex has an anti-ulcer action in experiments on rats with various types of experimental gastric ulcers.

The polysaccharide composition of the substances has been studied with the use of a number of methods of fractionation [5, 9, 10]. On alkaline saponification [5], two fractions (I) and (II), were obtained in a ratio of 6 : 1 (preparatively). The main component, (I), was D-galacturonic acid — 70% [6]. Among the neutral monosaccharides, galactose, glucose, arabinose, xylose, and rhamnose were detected by PC and GLC [7, 8] in a quantitative ratio of 2 : 1 : 2 : 2 : 1; $[\alpha]_D^{20}$ + 260° (c 0.25%; water, in the form of the sodium salt). The fraction behaved as a homogeneous product on reprecipitation via the Ca polyuronate [9] and precipitation by quaternary ammonium bases [10].

From (I) with the aid of sodium acetate [5], a homopolysaccharide was isolated which contained D-galacturonic acid residues, $[\alpha]_D^{20}$ + 310° (c 0.1; water, in the form of the sodium salt). From the mother solution, by precipitation with ethanol, a polysaccharide was isolated which behaved as a homogeneous product when fractionated on DEAE-cellulose. The polysaccharide contained 64% of D-galacturonic acid and the neutral monosaccharides (PC, GLC), galactose, glucose, arabinose, xylose, and rhamnose in a quantitative ratio of 5 : 3 : 3 : 1 : 4, $[\alpha]_D^{20}$ + 202° (c 0.1%; in water, in the form of the sodium salt).

Fraction (II) contained 20% of galacturonic acid and the neutral monosaccharides (PC, GLC) galactose, glucose, arabinose, xylose, and rhamnose in a quantitative ratio of 10 : 8 : 3 : 1 : 2, $[\alpha]_D^{20}$ + 65° (c 0.2%; water).

From fraction (II) with the aid of Cetavlon [10], two polysaccharides, (III) and (IV), were obtained, which were present in a quantitative ratio of 1 : 3 (preparatively). Polysaccharide (III) contained 30% of a uronic acid and the neutral monosaccharides galactose, glucose, arabinose, xylose, and rhamnose in a quantitative ratio of 9 : 5 : 2 : 1 : 4, $[\alpha]_D^{20}$ + 70° (c 0.2%, water). Polysaccharide (IV) contained 18% of uronic acid and the neutral monosaccharides galactose, glucose, arabinose, xylose, and rhamnose in a quantitative ratio of 8 : 7 : 2 : 1 : 1, $[\alpha]_D^{20}$ + 21° (c 0.25%; water).

Thus, it has been established that the pectin complex isolated from the inflorescences of *Tanacetum vulgare* L. consists of four different polysaccharides.

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POLYSACCHARIDES OF *Ungernia*.

XI. A STUDY OF THE GLUCOFRUCTANS OF *Ungernia vvedenskyi*

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In a preceding paper [1] we have reported the structure of ungeromannan-V isolated from the bulbs of *Ungernia vvedenskyi* Khamidkh. In the present communication we give informa-mation on the determination of the structure of a glucofructan from the same plant.

The comminuted air-dry raw material was first treated with ethanol (96% and 82%) in order to eliminate low-molecular-weight compounds and mono- and oligosaccharides, and it was then extracted with water and the ungeromannan-V [2] was precipitated by the addition of ethanol, the concentration of the latter being brought to 70%. The mother ethanolic solution was concentrated. The precipitate of ungeromannan-V and protein impurities was eliminated by the addition of a solution of neutral lead acetate, and the excess of the latter was eliminated with a saturated solution of sodium sulfate. Then the solution was de-ionized with KU-2 cation-exchange resin and evaporated to a syrup, and the latter was triturated with ethanol. This gave the total glucofructans with a yield of 1% on the air-dry raw material.

For purification, the combined glucofructans were dissolved in water and dialyzed. The dialyzed solution was evaporated and precipitated with ethanol. The yield of product was 20% on the initial combined glucofructans. In a hydrolysate, PC showed mainly fructose and glucose.

The glucofructan was a white hygroscopic amorphous powder readily soluble in water and in dimethyl sulfoxide, $[\alpha]_D^{20} - 65°$ (c 1; water). Gel filtration on Sephadex G-50 showed it to be homogeneous with a molecular weight of 2000, which corresponds to a degree of polymerization of 12.

The IR spectrum of the glucofructan has absorption bands at (cm^{-1}) 3600-3200 (hydroxy group), 940 (vibrations of a furanose ring), 880 (vibrations of a β-glycosidic bond), and 820 (vibrations of a pyranose ring). These absorption bands are characteristic for inulin [3].

Periodate oxidation and Smith degradation were carried out as described by Tomoda and Saton [4]. The consumption of periodate and the yield of formic acid per 1 mole of hexose unit were 0.99 and 0.07 mmoles, respectively. In a hydrolysate of the oxidation products, PC in the butan-1-ol—pyridine—water (6 : 4 : 3) system showed the presence of glycerol, which was identified by GLC in the form of the polyol acetate [5].

The isolation of glycerol is evidence in favor of a 2 → 1 bond between the monosaccharide units.

Methylation of the glucofructan was performed by Hakomori's method [6]. A permethylate was obtained which, after formolysis and hydrolysis, was studied by TLC in the methyl ethyl ketone—1% aqueous ammonia (30 : 4) system. 3,4,6-Tri-O-Me-D-fructose (the main product), 1,3,4,6-tetra-O-Me-D-fructose, and 2,3,4,6-tetra-O-Me-D-glucose were identified in the hydrolysate. The results of methylation were in agreement with those of periodate oxidation.

The partial hydrolysis of the glucofructan was carried out in 0.1% acetic acid at 100°C for 20 min. PC showed the presence of sucrose, in addition to fructose and glucose.

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