Chemistry of Natural Compounds, Vol. 40, No. 6, 2004

BRIEF COMMUNICATIONS

MANNAN AND GLUCOFRUCTAN FROM *Jucca gloriosa*

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UDC 547.917

We previously reported the isolation of carbohydrates [1] from *J. gloriosa* Lenn. [2]. Herein we present results from a study of the mucous polysaccharide and glucofructan from roots.

Mannose and arabinose in a 26:1 ratio and traces of glucose and galactose were found in the hydrolysate of mucous polysaccharide by paper chromatography (PC) and GC.

We called it juccamannan owing to the predominance of mannose. The polysaccharide is a white amorphous powder that is soluble in water, DMSO, and formamide to form viscous solutions, $[\alpha]_D^{21}$ -28° (*c* 1.0, water). Juccamannan occurs in the partially acetylated form in the plant. This was confirmed by the presence of an absorption band in the IR spectrum (KBr, max) at 1740-1245 cm^{-1} for the ester. Treatment of juccamannan with Fehling's solution and base causes saponification of the acetyls. This was confirmed by the lack of the aforementioned absorption bands and the loss of solubility in water. Juccamannan has properties similar to those of mannans from bulbs of *Ungernia* plants [3].

Glucofructan is a white, hygroscopic, amorphous powder that is freely soluble in water, $[\alpha]_D^{22}$ -25° (*c* 0.5, water), M.W. 2100. It consists of 92.3% furctose and 7.7% glucose. The IR spectrum has absorption bands at 820 and 940 cm^{-1}, which are characteristic of indulin-type glucofructans; at 860 cm^{-1}, levan.

The facile acid hydrolysis (2 h, 0.1 N H_2SO_4) and the negative specific rotation of the glucofructan in addition to the IR spectrum are consistent with a β-glycoside bond between the fructofuranose units. The structure of the glucofructan was studied after preliminary characterization using ^{13}C NMR spectroscopy. The spectrum was solved as before [4-6]. The ^{13}C NMR spectrum of glucofructan was recorded mainly in the range 60-105 ppm.

The spectrum exhibits chemical shifts of fructofuranose units bonded by 2→1 and 2→6 glycoside bonds (Table 1).

The quantitative ratio of 2→1 and 2→6 bonds was calculated by integrating the corresponding peaks, 2.3:1. The heterogeneity of the glucofructan with respect to the bond type was determined from the presence of peaks at 104.8 (C-2) and 76.7 ppm (C-4). This distinguishes C-2 and C-4 of coupling units where the 2→1 and 2→6 bonded fructofuranose units are next to each other.

Glucose is located at the reduced end of the polymeric chain and is bonded to fructose C-2. This is indicated by the chemical shift of C-1 of α-D-Glc*p* (93.3 ppm), which is characteristic of this type of bonding.

Thus, native acetylated mannan and glucofructan containing β-2→1- and β-2→6-bonded fructofuranose units in a single polymeric chain were isolated for the first time from *J. gloriosa*. Furthermore, the simultaneous presence in *J. gloriosa* roots of two types of reserve polysaccharides, mannans and glucofructans, is interesting from a biochemical viewpoint.

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TABLE 1. ^{13}C NMR Chemical Shifts in Glucofructan of *J. gloriosa* Roots

Residue	C-1	C-2	C-3	C-4	C-5	C-6
β-2→1-bound fructofuranose units	62.0	104.3*	78.2	75.9**	82.3	63.4
β-2→6-bound fructofuranose units	61.6	104.8*	78.7	76.1**	81.3	64.3
α-D-glucopyranose	93.3	72.8	73.7	70.6	72.2	61.6

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*For coupling points, 104.9.

**For coupling points, 76.7.

REFERENCES

1. D. A. Rakhimov, E. S. Kondratenko, and S. A. Khamidkhodzhaev, *Khim. Prir. Soedin.*, 638 (1983).
2. F. N. Rusanov, *Introduction and Acclimatization of Plants* [in Russian], 1st Ed., Izd. Akad. Nauk Uzb. SSR, Tashkent (1962).
3. D. A. Rakhimov, G. Mutalshaikhov, and Z. F. Ismailov, *Khim. Prir. Soedin.*, 433 (1977).
4. W. Funcke and C. Sonntag, *Carbohydr. Res.*, **75**, 305 (1979).
5. M. A. Khodzhaeva, Z. F. Ismailov, E. S. Kondratenko, and A. S. Shashkov, *Khim. Prir. Soedin.*, 23 (1982).
6. R. K. Rakhmanberdieva, G. V. Nikonovich, D. A. Rakhimov, and Kh. T. Sharipov, *Khim. Prir. Soedin.*, 15 (1986).