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Partial Structure of Panaxan A, A Hypoglycemic Glycan of *Panax ginseng* Roots*

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The crude drug "Ninjin" (ginseng), the roots of *Panax ginseng* C.A. MEYER (Araliaceae), has been utilized as an indispensable remedy since olden times in Oriental medicine.

Although this crude drug has long been noticed to possess the ability to reduce blood sugar level in normal and experimentally-induced hyperglycemic animals and several constituents have been claimed to have such effects, no remarkable hypoglycemic principle has been isolated.

Recently, we have clarified the hypoglycemic activity of ginseng to be due to the peptidoglycans, panaxan A, B, C, D and E.

The structure of the main peptidoglycan, panaxan A, is studied in the present paper.

Gel chromatography of panaxan A over Sephacryl S-200 gave a value of approximately 14000 for the molecular weight.

Panaxan A was found to consist of mainly D-glucose (92.1%) by quantitative determination and to contain also a small amount of protein moiety (1.7%).

It showed a high positive specific rotation ($[\alpha]_D^{+187^\circ}$) and its $^1\text{H-NMR}$ spectrum exhibited two anomeric hydrogen signal at δ 4.89 (doublet, J 3 Hz) and 5.20 (doublet, J 3 Hz), the ratio of their integrals being *ca.* 3 : 1. These results suggested that all D-glucose units are α -linked.

In the $^{13}\text{C-NMR}$ spectrum of panaxan A, nine signals at δ 60.6, 65.6, 69.7, 70.6, 71.9, 73.3, 81.1, 97.9 and 99.9 were visible. From the chemical shifts, it was apparent that the C-6 carbons occurred at δ 60.6 and 65.6, the C-3 carbons appeared at δ 73.3 and 81.1, and the C-1 carbons arised at δ 97.9 and 99.9, indicating that, in panaxan A, α -glucose units are linked at the 1, 3 and 6 positions.

Panaxan A was methylated with methylsulfinyl carbanion and methyl iodide in dimethyl sulfoxide. The fully methylated derivative was hydrolyzed with dilute sulfuric acid in acetic acid. The products were analyzed by gas-liquid chromatography-mass spectrometry (GLC-MS) after conversion into alditol acetates; 2,3,4,6-tetra-O-methyl-D-glucose, 2,3,4-tri-O-methyl-D-glucose and 2,4-di-O-methyl-D-glucose were identified in a

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