CONFORMATIONAL STUDIES OF FURANOSIDES – IMPORTANT BIOLOGICAL COMPONENTS

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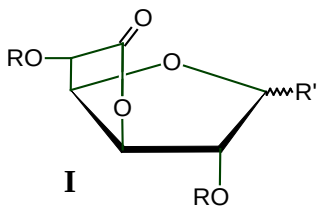
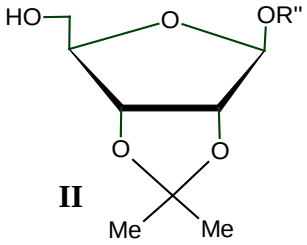
Many biological compounds, e.g. polysaccharides and oligosaccharides, which are important components of a number of microorganisms, fungi and plants, contain a furanose ring in their structure. What is more, furanoses are extremely important constituents of nucleic acids by attaching a phosphate group into the backbone and constituting a place to attach the appropriate bases. A change in conformation of these five-membered rings may have a significant effect on the final conformations of DNA and RNA molecules. Thus, the knowledge of the conformational freedom of the furanose ring is vital for estimation of the biological activity and chemical reactivity of the compounds consisting of furanosides [1, 2].
Despite their ubiquity in biological structures, furanosides have received much less attention than pyranosides as regards the conformational analysis. This is because different conformations of five-membered rings have quite similar energies, whereas six-membered rings are normally present in a single low-energy chair conformation. Therefore, conformations of pyranosides in solution are easily identified by NMR techniques, which is not the case with furanosides. These are equilibrating rapidly on the NMR scale and averaging of coupling constants occurs. However, when a tetrahydrofuran ring is conformationally restricted by a rigid second skeleton, it is possible to predict its conformation [3, 4].
To study conformations of the furanose ring we synthesized two series of conformationally restricted furanosides. The first series consists of D-furano-6,3-lactones and their glycosides (**I**) and the second series of 2,3-*O*-isopropylidene-D-ribofuranosides (**II**).



I



II

R = H, Ac
R’ = different aglycones
R” = different alkyl residues

The ^{1}H NMR spectra of both groups of furanosides are characteristic and indicative of one specific conformation. The conformation of *N*-(β-D-glucofuranosylurono-6,3-lactone)-*p*-nitroaniline was additionally confirmed by single-crystal X-ray analysis.
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