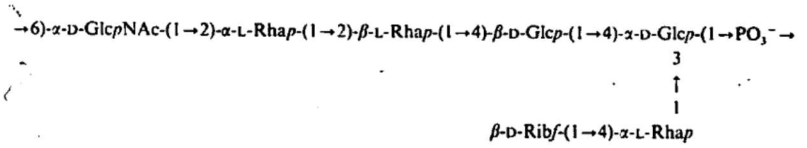
ABSTRACT

This thesis consists of five chapters. The first chapter is a general introduction about the types of polysaccharides found in nature, their structural features, uses and industrial applications. It also describes the bioactivity of both microbial and plant polysaccharides.

The second chapter of the thesis deals with the experimental methods and spectroscopic techniques that are most widely used in structural studies of polysaccharides. Chemical degradation methods which depend either on the linkage type or on specific structural features in the polysaccharide are also described.

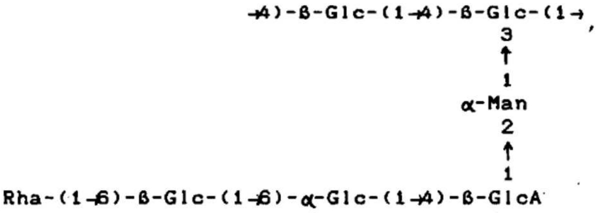
The structural studies of a capsular polysaccharide isolated from *Streptococcus pneumoniae* type 7B are described in the third chapter. The identities and the modes of linkage of the constituents were determined using sugar, methylation and phosphorous analysis together with 1D and 2D NMR spectroscopy. The sequence of sugars in the polymer chain was established from interresidue n.O.e. data. The structure (1) proposed for the polysaccharide was supported by NMR spectroscopy, f.a.b.-m.s. and methylation analysis of the oligosaccharides isolated after partial hydrolysis with aqueous 48% hydrogen fluoride.



$$\begin{array}{l}\rightarrow 6)\text{-}\alpha\text{-D-Glc}p\text{NAc-}(1\rightarrow 2)\text{-}\alpha\text{-L-Rha}p\text{-}(1\rightarrow 2)\text{-}\beta\text{-L-Rha}p\text{-}(1\rightarrow 4)\text{-}\beta\text{-D-Glc}p\text{-}(1\rightarrow 4)\text{-}\alpha\text{-D-Glc}p\text{-}(1\rightarrow \mathrm{PO_3}^-\rightarrow\\ \hspace{21em} 3\\ \hspace{21em}\uparrow\\ \hspace{21em} 1\\ \hspace{15em}\beta\text{-D-Rib}f\text{-}(1\rightarrow 4)\text{-}\alpha\text{-L-Rha}p\end{array}$$

(1)

The fourth chapter deals with the structural studies of an extracellular polysaccharide called "Acetan" elaborated by *Acetobacter xylinum*. This study was carried out to obtain additional evidence for structure (2) proposed by Dankert *et al* (Institut de Investigaciones Bioquimicas " Fundación campomar" and Faculted de Ciencias Exactas Y Naturales, Argentina).



$$\begin{array}{l}\hspace{13em}\rightarrow 4)\text{-}\beta\text{-Glc-}(1\rightarrow 4)\text{-}\beta\text{-Glc-}(1\rightarrow\\ \hspace{22em} 3\\ \hspace{22em}\uparrow\\ \hspace{22em} 1\\ \hspace{21em}\alpha\text{-Man}\\ \hspace{22em} 2\\ \hspace{22em}\uparrow\\ \hspace{22em} 1\\ \text{Rha-}(1\rightarrow 6)\text{-}\beta\text{-Glc-}(1\rightarrow 6)\text{-}\alpha\text{-Glc-}(1\rightarrow 4)\text{-}\beta\text{-GlcA}\end{array}$$

(2)

Several degradations at the site of the uronic acid residue were carried out in order to isolate the oligosaccharide side chain. Some of the uronic acid degradations were not satisfactory. A successful enzymic degradation of the polysaccharide with (1→4)-ß- glucanase resulted in the isolation of the heptasaccharide repeating unit. Results obtained from the degradations suggested that the sequence of the two glucosyl residues in the side chain shown in (2) is incorrect and should be interchanged.

The final chapter of the thesis describes structural studies of two plant polysaccharides isolated from the leaves of *Litsea gardneri* and the bark of *Cinnamomum zeylanicum* (Lauraceae). Determination of the glycosyl composition and the glycosyl linkage composition were carried out using GLC, GLC-MS together with ^{1}H and ^{13}C NMR spectroscopy. The structural study of degraded poly- and oligosaccharides suggested the presence of a (1→4) ß-xylan backbone in both polysaccharides. Some of the xylopyranosyl residues in the backbone were shown to be substituted at *O*-2 or *O*-3 position with terminal xylopyranosyl-, terminal arabinofuranosyl- or short side chains of xylopyranosyl residues. The study indicated that these two polysaccharides were less branched than the polysaccharides isolated from other plants of the Lauraceae.