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This Week's Citation Classic

Northcote D H. Chemistry of the plant cell wall. *Annu. Rev. Plant Physiol.* 25:113-32, 1972. [Department of Biochemistry, University of Cambridge, England]

The wall considered as a composite showed the importance of water in its structure during growth. The diversity of the chemistry of cell wall polysaccharides was generalized in terms of the hydrogen bonds formed between the different polymers and between the matrix and cellulose microfibrils. [The SCI® indicates that this paper has been cited over 90 times since 1972.]

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"The reason I hope that this review has become a *Citation Classic* is that it had something new to say, but the reason I think it is here, is that it is simpler to quote a review article than to quote a number of original papers.

"When the review was requested I was reluctant to attempt it since so many reviews had already been written about plant cell walls. These, and I had written some,[1] gave a mass of detailed chemistry of a bewildering number of different polysaccharides with seemingly an infinite variety of chemical structures. I wished, in this new article, to bring some general viewpoint to this mass of data.

"At the same time it was apparent that material scientists had built up a whole technology to deal with the use of artificial materials such as glass fibre-resins, known as composites. The strength and the advantages of these materials were considered in terms of their fibres, their matrix, and interaction between the fibres and matrix. The cell wall was a natural composite with all the features discussed by the physical scientists for modern artificial composites. Once the wall was considered in this way, it became obvious that one of the major constituents of the wall, especially in its early stages of development, was water. This had, in nearly all the previous discussions, been completely ignored.

"When the wall was regarded as a composite with water as its most variable feature of the matrix, a lot of the differences and diversity in chemical composition of the other constituents seemed to make sense and fit into a reasonable series of generalizations. The review was written so that the wall structure during cell growth and differentiation was referred to the interaction between the matrix and fibrillar phases. The interaction of the polysaccharides of the matrix and cellulose microfibrils was discussed in terms of hydrogen bonds between the polyhydric polymers and thus water associated with these polysaccharides had a prime significance. The importance of pectin could be appreciated and the diversity *of* chemical structure was seen as different solutions to a fundamental, identical problem. The function of lignin as a material to displace water and give the composite, as in curing of a resin, a rigidity, fitted into this general picture.

"The review came at a time when the old problem of the interaction between wall constituents to give coherence to the wall was once again being discussed. Other reviews proposed models in which covalently linked bridges between pectins and hemicelluloses were put forward. However, even if these occur, it is obvious that with polyhydric polymers, hydrogen bonds must provide the major form of interaction and the review attempted to show how these could be influenced during growth and development of the wall. Maybe it served to clarify these ideas —it certainly helped me to write it. I have recently prepared several reviews in this field."[2,3]

1. **Northcote D H.** The biology and chemistry of the cell wall of higher plants, algae and fungi. *Int. Rev. Cytol.* **14**:223-65, 1963.
2. ..... Macromolecular aspects of cell wall differentiation. (Boulter D, ed.) *Encyclopedia of plant physiology. Vol. 16. Gene expression in plants.* New York: Springer-Verlag. In press, 1981.
3. ..... Control of enzyme activity during plant cell development. (Yeoman M M & Truman D E S, eds.) *Differentiation in vitro.* New York: Cambridge University Press. In press, 1981.