HELICAL ORIENTATION OF THE MICROFIBRILS IN FIBRES OF MASTIXIODENDRON PACHYCLADOS (K. SCHUM.) MELCH.

by

Thomas Nilsson
The Swedish University of Agricultural Science, Department of Forest Products, Box 7008, S-750 07 Uppsala, Sweden

Summary

The helical winding direction of the microfibrils in the S_2 wall layer of *Mastixiodendron pachyclados* (K. Schum.) Melch. has been determined. In contrast to a large number of other wood species an S-helical orientation was found.

Meylan and Butterfield (1978) reported on the helical winding direction of microfibrils in the S_2 wall layer in tracheids, fibres and narrow vessel members of 250 woody species. A Z-helical (left-handed) orientation was found in all of the woody species examined, which led the authors to suggest that this was the normal arrangement.

The wood-degrading soft rot fungi are characterized by their ability to grow within the S_2 cell wall layer of woody species. By degradation of the cell wall substance they form localized holes which are commonly known as soft rot cavities. Early on Bailey and Vestal (1937) showed that the cavities are oriented in chains which closely follow the orientation of the microfibrils within the S_2 wall layer. This has been confirmed by several later reports. It is thus possible to obtain information of the orientation of the microfibrils by observing the orientation of the cavities in fibres of soft rot attacked wood.

During a study of soft rot decay patterns in a large number of woody species, including several tropical ones, the winding direction of the microfibrils within S_2 was determined by observing the orientation of the soft rot cavities formed. The soft rot attack was achieved by placing the wood samples in moist compost soil. The soft rot cavities were generally oriented in Z-helices in the S_2 cell wall layers. However, one exception to this pattern was found in *Mastixiodendron pachyclados* (K. Schum.) Melch. where the cavities were oriented in an S-helix. The direction of the pit apertures in the fibre walls also indicated that the microfibrils in the S_2 wall layer are oriented in an S-helix. The angle between the longitudinal cavities and the fibre axis was approximately 10°. The same angle was found between the pit apertures and the fibre axis. In some fibres the pit apertures and cavities were more or less parallel to the fibre axis.

Cavities formed in the S_1 layer of the fibres indicate the presence of two layers, one with an S-helical and one with a Z-helical orientation. The angles to the fibre axis were approximately 60–65° and 20° respectively.

The wood sample was obtained from Papua New Guinea through the courtesy of Mr. Colin Levy.

References

Bailey, I.W. & M.R. Vestal. 1937. The significance of certain wood-destroying fungi in the study of the enzymatic hydrolysis of cellulose. J. Arn. Arbor. 1: 196–205.

Meylan, B.A. & B.G. Butterfield. 1978. Helical orientation of the microfibrils in tracheids, fibres and vessels. Wood Sci. Technol. 12: 219–222.

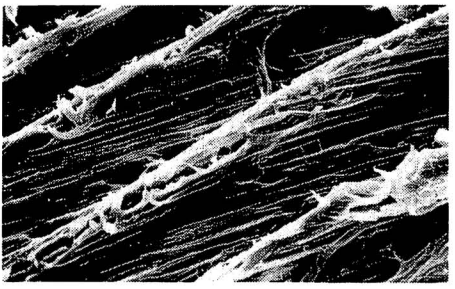

Fig. 1. Longitudinal section through fibres of *Mastixiodendron pachyclados* showing pits and cavities in the fibre walls. Note that the picture shows the under part of the fibres. The cavities and the pits in the upper parts of the fibres are oriented in the opposite direction, i.e. an S-helical orientation.