

Evidence of Parent Cell Walls in the Woods of Three Coniferous Species

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Summary

The occurrence of parent cell walls in normal wood of *Cedrus deodara* and compression wood of *Araucaria cookii* and *Pinus halepensis* was studied under the electron microscope. Only part of the parent cell wall traversing the intercellular space was visible in compression wood trachieds of *A. cookii* and *P. halepensis* while parent wall can be seen between two splitted radial rows of trachieds in the normal wood of *C. deodara*.

Key words

parent cell walls, coniferous woods, *Araucaria cookie*, *Cedrus deodara*, *Pinus halepensis*

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Introduction

In 1882 Giltay suggested that at cell division the new cell was not only a partition separating the daughter protoplasts but later each secreted a complete wall around itself. The daughter cells remain enclosed in a common wall derived from the parent cell. This suggestion was overlooked until 1938, when Priestley and Scott (1939) published evidence showing files of daughter cells surrounded by the stretched wall of the original plant cell. Such common walls or their remnants around groups or files of cells have been designated as parent cell walls (Mahmood, 1968; Wardrop, 1952), mother cell walls (Esau, 1965), and original cell walls (Timell, 1973). From the ontogenetic point of view both the parent and the daughter cell walls are primary in nature (Mahmood, 1968). The literature on the occurrence of parent cell walls in lower as well as higher plants is limited. Direct microscopic and indirect evidences based on the existence of differential thickness of radial and tangential walls in the cambial zone of conifers have been provided by various workers. Literature on the subject has been summarized by Mahmood (1968, 1990).

Conifers comprising of 10 genera and 20 species are the chief forest makers and the main source of commercial timber in Pakistan (Baquar, 1995). Mahmood and Athar (1997) made the xylotomic investigations on coniferous wood from Pakistan. The present study is a contribution to the rather limited knowledge of the occurrence of parent walls in coniferous woods.

Materials and methods

The material for the study of parent cell walls was obtained from the Pakistan Forest Institute, Peshawar, Pakistan. These samples were collected from living trees at breast height and shipped to Karachi (courtesy of Dr. K. M. Siddiqui, Director General). The normal wood of *Cedrus deodara* (Roxb. ex D. Don) G. Don f. and compression wood of *Araucaria cookii* R. Br. ex D. Don and *Pinus halepensis* Mill. was softened by boiling in 4% potassium hydroxide for 45 min. and washed with distilled water. Transverse sections were cut with the help of a sharp blade. Comparatively thin sections were dehydrated in acetone, dried using a polaron critical point drier (Bio-RAD), coated with Platinum in coating unit (JFC-1100) and examined under a Jeol (JSM-T200) scanning electron microscope.

Results and discussion

Figs. 1 and 2 present clear pictures of the remnants of parent cell walls as seen in transverse sections of compression wood tracheids of *A. cookii* and *P. halepensis* while Fig. 3 shows remnants of parent walls between two split-

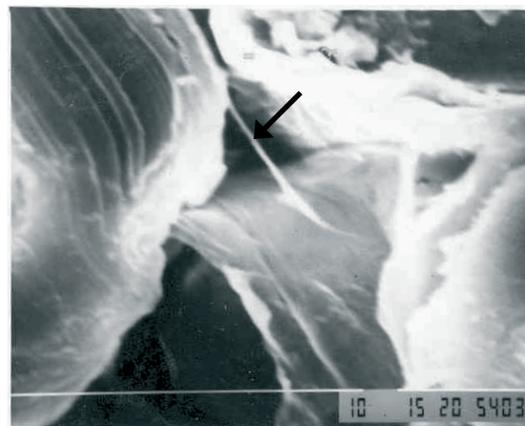


Figure 1.

Transverse section of the compression wood of *Araucaria cookii* observed under SEM. Only part of the parent wall traversing the intercellular space can be seen (marked by arrow). x7500

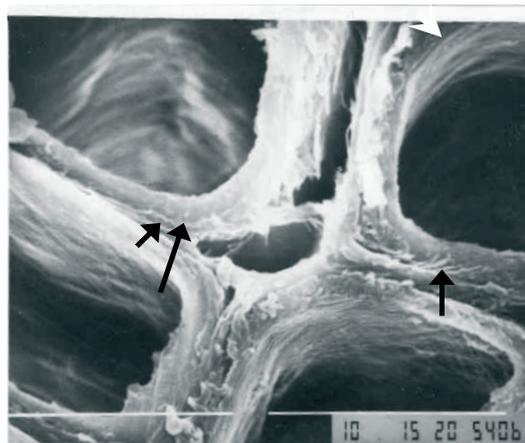


Figure 2.

Transverse section of the compression wood of *Pinus halepensis* observed under SEM. Only part of the parent wall traversing the intercellular space is visible (shown by arrow). Also parental walls can be seen in the intercellular space between tracheids (marked by arrow). x5000

ted radial rows of normal wood tracheids of *C. deodara*. Considering the membranes to be parent walls the conceptual diagram offered by Esau (1965), which pictures the adjustment between new and old cell walls after cell division, explains the origin of the membranes in the intercellular spaces [Esau's Figure 3.9 (D - G)]. On the other hand, the parent cell walls in normal wood are completely embedded in intercellular layers, so it is impossible to identify these without very careful experimental treatment. However, it is possible to observe them between radial files of tracheids as shown in Fig. 3. That only fragments of the cell walls can be demonstrated is consistent with the great radial expansion of the cambium daughter cells

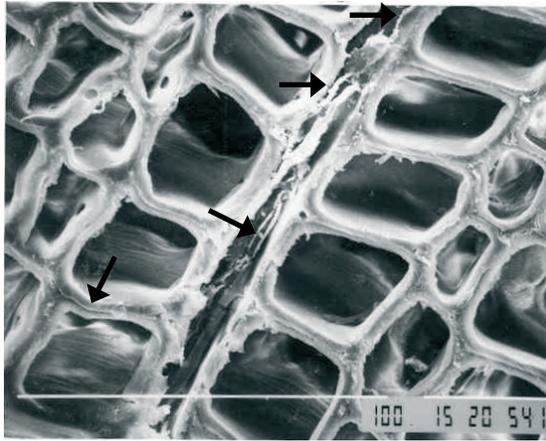


Figure 3. Transverse section of the normal wood of *Cedrus deodara* observed under SEM. Parent wall can be seen between two splitted radial rows of tracheids (shown by arrow). x750

which occurs during differentiation, following periclinal divisions. Remnants of parent cell walls in compression and normal wood tracheids have also been demonstrated by Mio and Matsumoto (1982).

References

- Baquar S. R. (1995). *Trees of Pakistan*. Royal Book Company, Karachi.
- Esau K. (1965). *Plant Anatomy*. 2nd edition. John Wiley & Sons, New York.
- Giltay E. (1882). Sur le Collenchyme. *Archs Né'erl.* 17:432-459.
- Mahmood A. (1968). Cell grouping and primary wall generations in the cambial zone, xylem and phloem in *Pinus*. *Australian J. Bot.* 16:177-195.
- Mahmood A. (1990). The parent cell walls. In: *The Vascular Cambium*, (M. Iqbal, ed.), Research Studies Press, Ltd., Taunton, Somerset, England. pp. 113-126.
- Mahmood A., Athar M. (1997). Xylotomic investigations on coniferous wood from Pakistan. *Pak. J. Bot.*, 29:43-73.
- Mio S., Matsumoto T. (1982). A note on parent cell walls in conifer woods. *IAWA-Bull.*, 3:56-58.
- Priestley J. H, Scott L. I. (1939). The formation of a new cell wall at cell division. *Proc. Leeds Phil. Soc.*, 3: 532-545.
- Timell T. E. (1973). Ultrastructure of the dormant and active cambial zone and the dormant phloem associated with the formation of normal and compression wood in *Picea abies* (L.). Karst. SUNY College of Environmental Science and Forestry, Syracuse, Tech. Rep. 96, pp. 1-94.
- Wardrop A. B. (1952). Formation of new cell walls in cell division. *Nature, Lond.*170-329.

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