

13. HELICAL BIOPOLYMER ORGANIZATION IN CHANNELS OF THE TECTUM OF PARTIALLY DEGRADED POLLEN GRAINS OF *ALNUS GLUTINOSA*

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Short communication

Helical biopolymer structure was first described by ROWLEY, DAHL and ROWLEY (1980) from partially degraded ectexine of *Artemisia vulgaris*. Later using the atomic force microscope ROWLEY, FLYNN and TAKAHASHI (1995) described helical biopolymer structures from the pollen exine in *Nuphar*. Investigations with atomic force and scanning tunneling microscopy (WITTBORN, RAO, EL-GHAZALY and ROWLEY, 1996), and scanning tunneling microscopy (WITTBORN, RAO, EL-GHAZALY and ROWLEY, 1998) illustrated helical units. During our TEM investigations of partially degraded exines we observed helical structures as well as quasi-periodic of quasi-equivalent structure, i. e.: KEDVES, BORBOLA, TRIPATHI and MADHAV KUMAR (2000). In our present results, the papers of FLYNN and ROWLEY (1971) and ROWLEY, EL-GHAZALY and ROWLEY (1987) are particularly important with respect to tapetal channels.

During our investigations on allergenic pollen grains interesting structures were observed in the partially degraded ectexine of *Alnus glutinosa* (L.) GAERTN. The TEM pictures taken with an Opton EM-902 instrument (resolution 2-3 Å) resolved well defined globular biopolymer units in a helical arrangement.

The general survey picture (Plate 13.1., fig. 2) illustrates the ultrastructure of the ectexine after partial degradation. The electron dense layer is shown at the surface of the tectum, in the tectum channels, in the surfaces of the elements of the infratectal layer, and the inner surface of the foot layer. In highly magnified micrographs (Plate 13.1., figs. 1,3) tectal channels (20-31 Å in diameter) are illustrated. Evident are electron dense globular granules (3-5 Å) in a helical arrangement (Plate 13.1., figs. 1,3). In lower part of picture 1, the helical organization of the channel of the ectexine is evident. This organization was documented in several publications of ROWLEY.

In conclusion this contribution support how complex is the molecular and biopolymer structure of the pollen wall.

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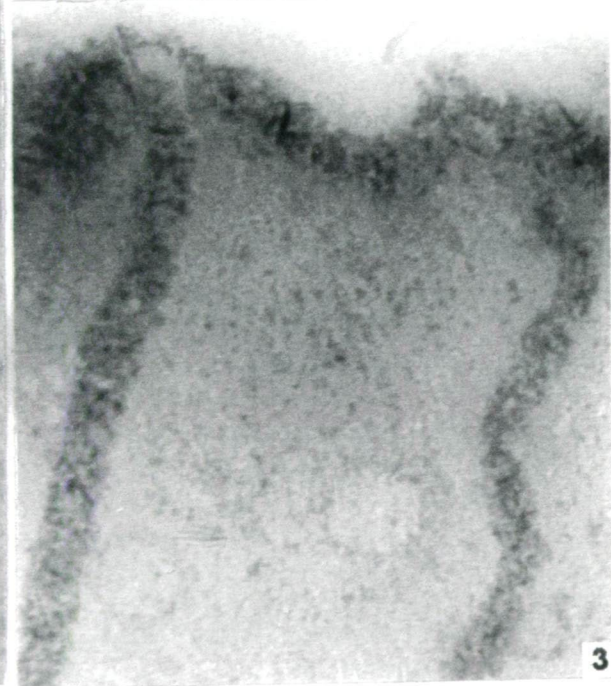
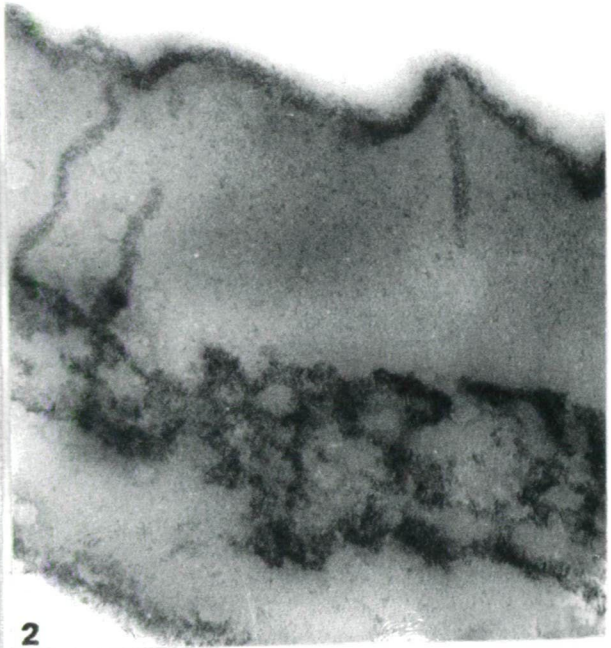
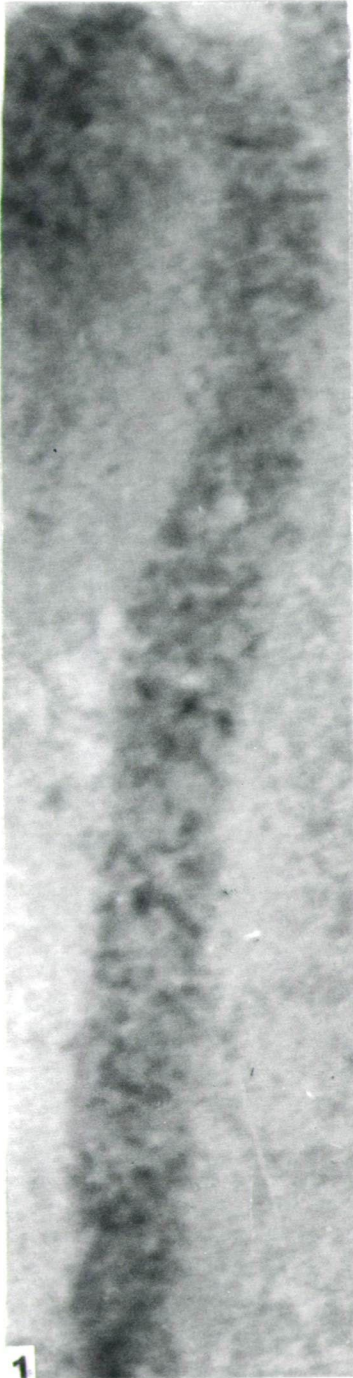


Plate 13.f.

Plate 13.1.

- 1-3. *Alnus glutinosa* (L.) GAERTN. partially degraded ectexine. Experiment No.: T-12-16.
 1. Biopolymer organization of the tectum channel. Illustrated are the globular electron dense biopolymer units, and the helical organization of the channel. Negative No.: 9714, 500.000x.
 2. General survey picture of the partially degraded ectexine. Negative No.: 9712, 100.000x.
 - 3 Detail of the partially degraded tectum channels. Negative No.: 9714, 250.000x.
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References

- FLYNN, J.J. and ROWLEY, J.R. (1971): Wall microtubules in pollen grains. *Zeiss Infor.* 76, 40-45.
- KEDVES, M., BORBOLA, A., TRIPATHI, S.K.M. and MADHAV KUMAR (2000): Transmission electron microscopic studies on partially degraded pollen grains of *Phoenix sylvestris* LINN. - *Plant Cell Biology and Development (Szeged)* 12, 93-103.
- ROWLEY, J.R., DAHL, A.O. and ROWLEY, J.S. (1980): Coiled construction of exinous units in pollen of *Artemisia*. - 38th Ann. Proc. Electron Microscopy Soc. Amer., San Francisco, California, 1980 G.W. BAILEY (ed.) 252-253.
- ROWLEY, J.R., EL-GHAZALY, G. and ROWLEY, J.S. (1987): Microchannels in the pollen grain exine. - *Palynology* 11, 1-21.
- ROWLEY, J.R., FLYNN, J.J. and TAKAHASHI, M. (1995): Atomic Force Microscope Information on Pollen Exine Substructure in *Nuphar*. - *Bot. Acta* 108, 300-308.
- WITTBORN, J., RAO, K.V., EL-GHAZALY, G. and ROWLEY, J.R. (1996): Substructure of spore and pollen grain exines in *Lycopodium*, *Alnus*, *Betula*, *Fagus* and *Rhododendron* investigation with Atomic Force and Scanning Tunneling Microscopy. - *Grana* 35, 185-198.
- WITTBORN, J., RAO, K.V., EL-GHAZALY, G. and ROWLEY, J.R. (1998): Nanoscale Similarities in the Substructure of the Exines of *Fagus* Pollen Grains and *Lycopodium* Spores. - *Annals of Botany* 82, 141-145.