4. BIOPOLYMER ORGANIZATION OF PARTIALLY DEGRADED EXINES OF SACCATE GYMNOSPERM POLLEN GRAINS

Short communication

M. KEDVES[1], Á. PÁRDUTZ[2] and A. VÉR[3]

1,3. Cell Biological and Evolutionary Micropaleontological Laboratory of the Department of Botany of the J.A. University, H–6701, P.O. Box 657, Szeged Hungary. 2. Institute of Biophysics, Biological Research Center of the Hungarian Academy of Sciences, H–6701, P.O. Box 521, Szeged, Hungary.

In a previous paper (KEDVES, 1988) quasi-crystalloid biopolymer lattice was described from the partially degraded exine of pollen grains of *Pinus griffithii* MCCLELL. Using the modified Markham rotation method several methodical results were published or are in print (e.g.: KEDVES 1989, 1990, KEDVES and ROJIK, 1989, KEDVES et al. 1989, etc.). In the course of modelling the basic biopolymer unit of the quasi-crystalloid skeleton (GÉVAY and KEDVES, 1989) an idea emerged as follows. In all probability organic solvents of pentagonal molecular symmetry may be useful to dissolve the quasi-crystalloid skeleton. An opportunity to get direct informations about the molecular structure of the stabilizing components of the

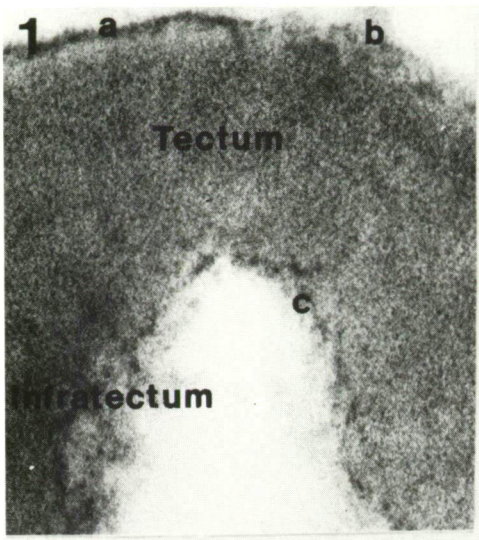
Plate 4.1. ▶

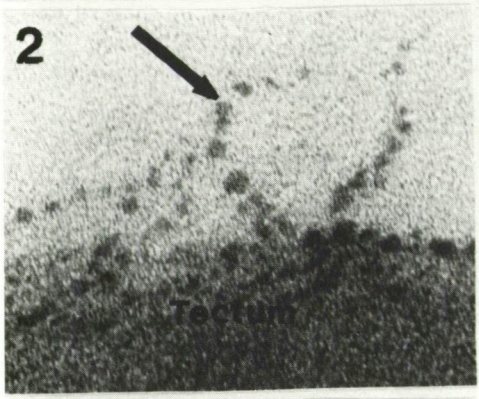
1. *Picea glauca* (MÓNCH.) VOSS.
   Biopolymer organization of the partially degraded ectexine. Experiment No 680. Negative No 531. Magnification 250.000 x.

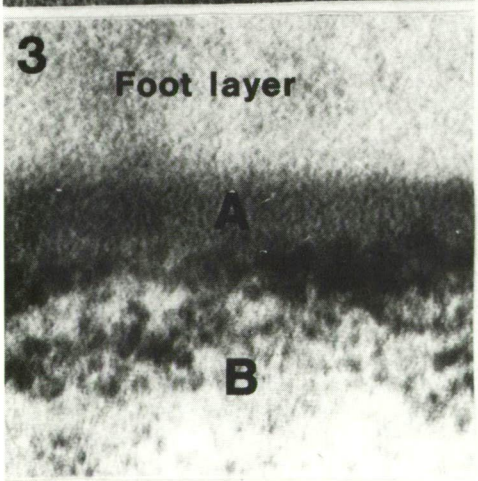
2, 3. *Pinus mugo* TURRA

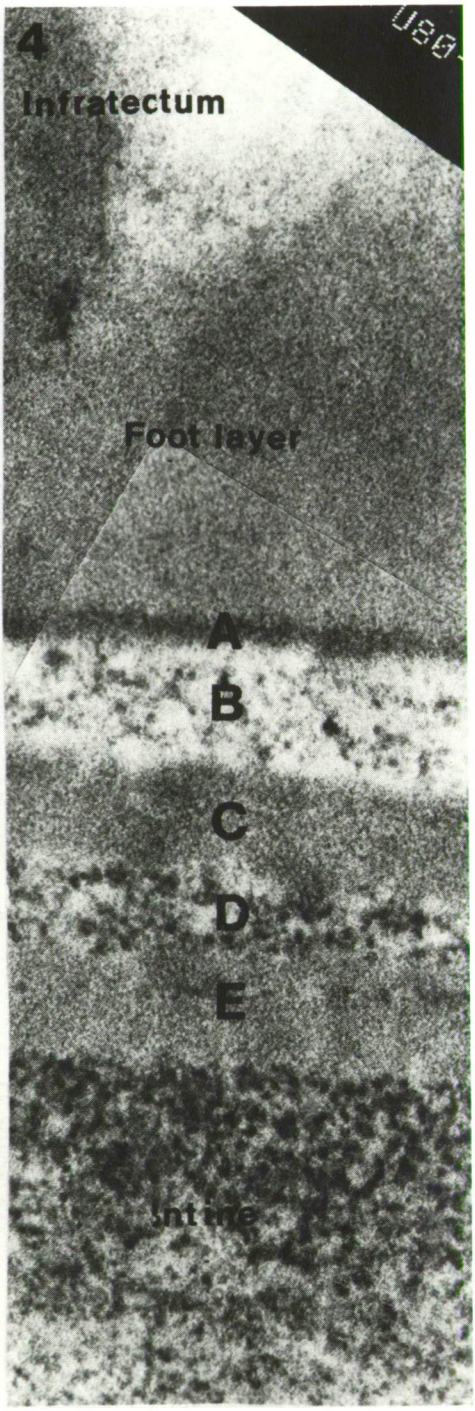
2. Detail from the partially degraded tectum. Well shown is the characteristic glycogen molecular structure, marked with an arrow. Experiment No 634. Negative No 399. Magnification 500.000 x.
3. Biopolymer organization of the inner part of the ectexine and the further inner layers. A = Thin basal layer of the ectexine with strong electron affinity. B = Probably the intine. Experiment No 634, Negative No 393. Magnification 500.000 x.
4. *Picea glauca* (MÖNCH). VOSS.
   Detail from the partially degraded exine. A = This basal layer of the ectexine with strong electron affinity. B– E = Probably the lamellar endexine. The biopolymer organization of layers C and E is identic with those of the outer part of the ectexine. Layers B and D are similar to the intine on the basis of its biopolymer structure after degradation. Experiment No 680. Negative No 529. Magnification 250.000 x.

Experiment No 634: 20 mg. air dried pollen material + 5 ml tetrahydrofuran. Temperature: +5–6 °C, length of time: 12 days.
Experiment No 680: 20 mg air dried pollen material +5 ml diethylether. Temperature: +5–6 °C, length of time: 25 days.


1
a
b
Tectum
c
Infratectum


2
Tectum


3
Foot layer
A
B


4
Infratectum
Foot layer
A
B
C
D
E

plant cell wall, which are interbedded in the frustrations (sensu NELSON, 1986) of the quasi-crystalloid lattice. The following solvents were used: n-pentane, tetrahydrofuran, pyrrolidine. Moreover diethylether was also employed. (Cf. SOUTHWORTH, 1974). Among the first results in the case of exines of *Picea excelsa, Pinus mugo, Pinus nigra* and *Pinus griffithii* we emphasize the following.

1. In general on the surfaces there is a thin protective layer with strong electron affinity (Plate 4.1., fig. 1a). After the disappearance of this layer the ectexine gets strongly damaged (Plate 4.1., fig. 1b, c).

2. Filaments of 5—6 Å corresponding to the glycogen molecular structure (network of chains, cf. DARNELL et al., 1986) were observed (Pl. 4.1., fig. 2.).
3. At the border line between ectexine and intine or further inner layers (Plate 4.1., 4A) can be distinguished by its stronger electron affinity only. The further differences in the ultrastructure are not the same (cf. Plate 4.1., fig. 3, 4).

4. In the centre of negative pentagonal basic biopolymer units of the exine small granular elements can be observed.

5. The negative quasi-crystalloid lattice seems to be same at the borders of the foot layer and the endexine.

6. In the ectexine highly organized biopolymer units were also observed (Plate 4.1., fig. 4).

7. Different solvents have different effects.

This work was supported by the grant OTKA—2, 24/88.

References

DARNELL, J. LODISH, H. and BALTIMORE, D. (1986): Molecular Cell Biology. — Scientific American Books, Inc., New York.

GÉVAY, G. and KEDVES, M. (1989): A structural model of the sporopollenin based on dodecahedrane units. — Acta Biol. Szeged. *35*, 53—57.

KEDVES, M. (1988): Quasi-crystalloid basic molecular structure of the sporoderm. — 7 Internat. Palynol. Congr. Brisbane, Abstracts, 82.

KEDVES, M. (1989): Méthode d'étude des biopolymères de la paroi pollinique à structure quasi-cristalloïde. — Rev. de Micropaléontologie *32*, 226—234.

KEDVES, M. (1990): Quasi-crystalloid basic molecular structure of the sporoderm. — Rev. Palaeobot. Palynol. *64*, 181—186.

KEDVES, M. and ROJIK, I. (1989): Investigation of the biopolymer organization of partially degraded exines with the fragmentation method. — Acta Biol. Szeged. *35*, 71—80.

KEDVES, M. TÓTH, A., FARKAS, E., BELLON, A. and SCHMÉL, Á. (1989): Methodical problems of the biopolymer organization of partially degraded ectexine. — An. Univ. Budapestinensis de R. E. Nom. Geol.

NELSON, D.R. (1986): Quasicrystals. Scientific American *254*, 42—51.

SOUTHWORTH, D. (1974): Solubility of pollen exines. — Amer. J. Bot. *61*, 36—44.