

6. X-RAY EFFECT ON THE LM MORPHOLOGY OF SOME GYMNOSPERM AND ANGIOSPERM POLLEN GRAINS

M. KEDVES and Á. KÁROSSY

Cell Biological and Evolutionary Micropaleontological Laboratory of the Department of Botany of the J. A. University, H-6701, P. O. Box 993, Szeged, Hungary

Abstract

Pollen grains of the following species were the subjects of the present contribution: *Pinus sylvestris* L., *Ranunculus acris* L., *Castanea sativa* MILL., and *Erica herbacea* L. Based on our results, the pollen grains of *Pinus sylvestris*, and *Erica herbacea* are very resistant to the X-ray irradiation. Not so characteristic pollen tube development in high quantity (71.0%) was observed at *Castanea sativa*. At *Ranunculus acris* in 39.0 per cent we have observed partial or complete pollen tube development after CuK α irradiation during 35 s.

Key words: Palynology, X-ray effect, light microscopy.

Introduction

The investigated material of this contribution is heterogeneous from taxonomical and pollen morphological point of view. Saccate *gymnosperm*, *angiosperm* tetrad, and pollen grains of early types of *angiosperm* from the *Ranunculaceae*, and *Fagaceae*, were the subject of this experimental study. Previously *Pinus* and *Castanea* pollen grains were investigated with the partial dissolution method within this research program. Results of the irradiated peculiar *gymnosperm* pollen grains (*Welwitschia mirabilis*) were the subject of another paper (KEDVES and PÁRDUTZ, 1997). At this species partial pollen tube development was observed.

Materials and Methods

Data of the investigated pollen grains are as follows:

Pinus sylvestris L.

Locality: Botanical Garden of the J. A. University. Collected: Dr. I. SZÖLLÖSI, on 25.05.1995. Irradiation: on the 25.05.1995, LM investigation: on the 25.05.1995.

Plate 6.1

- 1,2. *Pinus sylvestris* L. Recent. Experiment No: 1/7-127.
- 3-9. *Ranunculus acris* L. Recent. Experiment No: 1/7-181.
- 10-12. *Castanea sativa* MILL. Recent. Experiment No: 1/7-250.
- 13-16. *Erica herbacea* L. (*E. carnea* L.). Recent. Experiment No: 1/7-179.

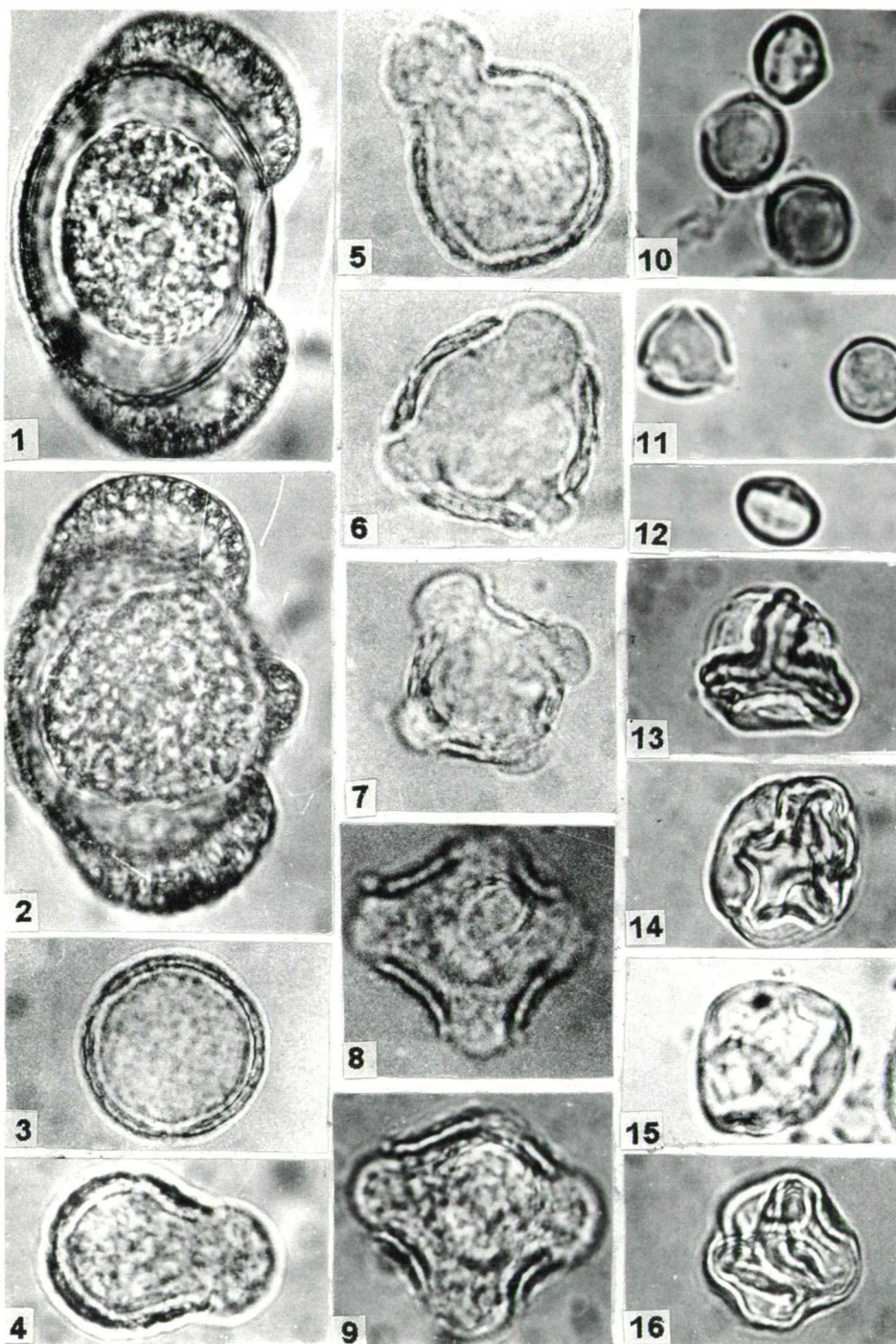


Plate 6.1.

Ranunculus acris L.

Locality: Botanical Garden of the J. A. University. Collected: Á. KÁROSSY on 01.06.1995. Irradiation: on the 01.06.1995, LM investigation: on the 04.06.1995.

Castanea sativa MILL.

Locality: Botanical Garden of the J. A. University. Collected: I. GÁSPÁR, on 12.06.1995. Irradiation: on the 13.06.1995, LM investigation: on the 30.06.1995.

Erica herbacea L.

Locality: Botanical Garden of the J. A. University. Collected: Á. KÁROSSY, on the 01.06.1995. Irradiation: on the 01.06.1995. LM investigation: on the 05.06.1995.

Length of irradiations: 35 s. Radiation data: 35 KV, 20 mA, CuK α beam. The irradiations were made with a BRON-OM1 apparatus in the Radiological Laboratory of the Department of Mineralogy, Petrography and Geochemistry of the J. A. University, Szeged.

Results

Pinus sylvestris L. (Plate 6.1., figs. 1,2)

This species is very resistant to X-ray irradiation. Not so characteristic pollen tube development was observed at 1.5 per cent of the investigated pollen grains (Plate 6.1., fig. 2). At the greatest part of the pollen grains (98.5%) the LM morphology of the pollen grains have not altered (Plate 6.1., fig. 1).

Ranunculus acris L. (Plate 6.1., figs. 3-9)

61.0% of the pollen grains have not altered after irradiation (Plate 6.1., fig. 3.). Total pollen tube development at 16.5% (Plate 6.1., figs. 6-9), partial one at 22.5% (Plate 6.1., figs. 4,5) of the investigated pollen grains.

Castanea sativa MILL. (Plate 6.1., figs. 10-12)

Partial, and not so characteristic pollen tube development was observed at 71.0% of the irradiated pollen grains (Plate 6.1., figs. 10,11). The quantity of the non-altered pollen grains is relatively low (29.0%), (Plate 6.1., fig. 12).

Erica herbacea L. (Plate 6.1., figs. 13-16)

The greatest part (88.0%) of the irradiated pollen grains have not altered (Plate 6.1., figs. 13,14,16). At 12 per cent not clearly perceptible pollen tube development was observed (Plate 6.1., fig. 15).

Discussion and Conclusions

The pollen grains of the saccate *gymnosperm* pollen grains are important in our research program, because quasi-crystalloid biopolymer structure was observed for the first time at *Pinus griffithii* McCLELL (KEDVES, 1988). During our investigation of the high temperature effect, the alterations were also moderate (KEDVES, HEGEDŰS and OLÁH, 1992). Based on the TEM results of the irradiated pollen grains of *Pinus griffithii* (KEDVES, PÁRDUTZ and TÓTH, 1998) the resistance of the sporopollenin was emphasized.

The alterations in the LM morphology of the irradiated pollen grains of *Ranunculus acris* are typical. *Castanea sativa* is interesting because its very tiny pollen tube development.

The resistance of the pollen tetrads of *Erica herbacea* is also worth of mentioning. It seems that in general the experimental study of the tetrads needs detailed investigations in the future.

References

- KEDVES, M. (1988): Quasi-crystalloid basic molecular structure of the sporoderm. – 7 Internat. Palynol. Congr., Brisbane, Abstracts, 82.
- KEDVES, M., HEGEDŰS, A. and OLÁH, I. (1992): High temperature effect of some bisaccate *gymnosperm* pollen grains. – Plant Cell Biology and Development (Szeged) 3, 14-37.
- KEDVES, M. and PÁRDUTZ, Á. (1997): Experimental investigations on the pollen grains of *Welwitschia mirabilis* HOOK. – 3rd Symposium of African Palynology, Johannesburg, 24.
- KEDVES, M., PÁRDUTZ, Á. and TÓTH, A. (1997): X-ray effect on the ultrastructure of the pollen grains of *Pinus griffithii* MCCLELL. – Plant Cell Biology and Development (Szeged) 9, 93-102.