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

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Abstract

The results of the X-ray induced morphological alterations in the LM morphology of the following species are presented in this paper: *Knautia drymeia* HEUFF., *Tilia cordata* MILL., *Elaeagnus angustifolia* L., *Hibiscus rosa-sinensis* L., *Opuntia grandis* PFEIFF. The samples selected for investigations are different in taxonomical and ecological points of view. Irradiation induced pollen tube developments were observed only without further morphological alterations. The pollen grains of *Hibiscus rosa-sinensis* and *Elaeagnus angustifolia* are the most resistant among the species presented herein.

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

Introduction

The pollen grains investigated are heterogeneous in morphological and ecological points of view. Pollen grains of *Knautia drymeia* have three occasionally four apertures (pores, cf. LAVRENTIADES, 1965) of brevaxonate type. The similarly brevaxonate but brevicolpate *Elaeagnus angustifolia* pollen grains have several, early *Normapolles* characteristic features, particularly based on the TEM data (cf. KEDVES and PÁRDUTZ, 1982). As regards the pollen grains of the *Tilia* genus the short colpi and the characteristic centripetal endannulus may be pointed out (CHAMBERS and GODWIN, 1961). The investigated *Malvaceae* and *Cactaceae* pollen grains are isodiametric, periporate. TSUKADA (1964), p. 45: „La troisième par son pollen périporé et son exine réticulée (*Opuntia*) constituerait le groupe le plus évoluée." *Hibiscus rosa-sinensis* pollen grains are ornamented with characteristic echinate sculptural elements, pantoporate and spinolous following SAAD (1960).

Materials and Methods

Data of the investigated pollen grains are as follows.

Knautia drymeia HEUFF.

Locality: Botanical Garden of the J. A. University, Collected: I. GÁSPÁR, on 27.05.1995. Irradiation: on the 07.06.1995, LM investigation: on the 07.06.1995.

Tilia cordata MILL.

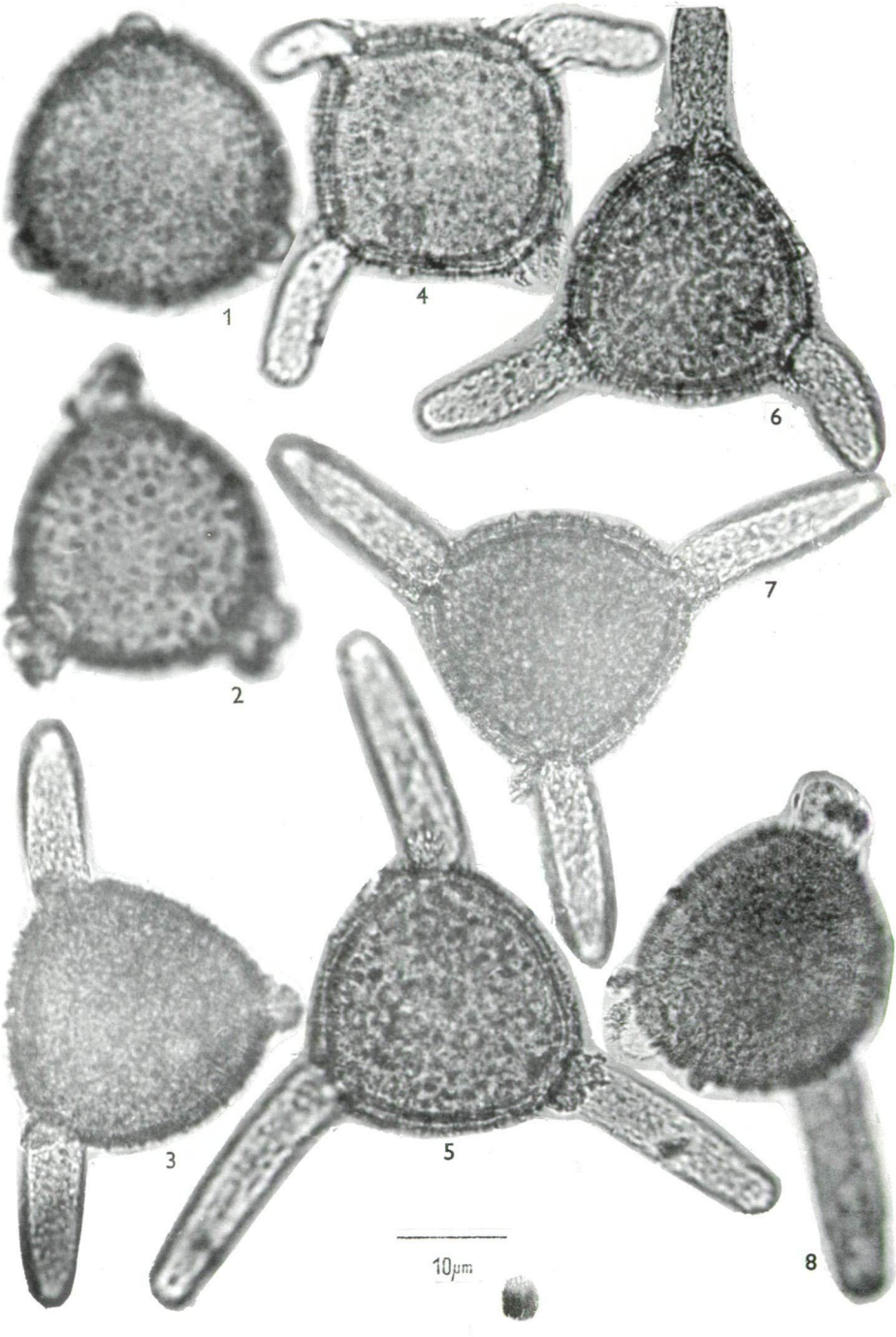

Plate 6.1.

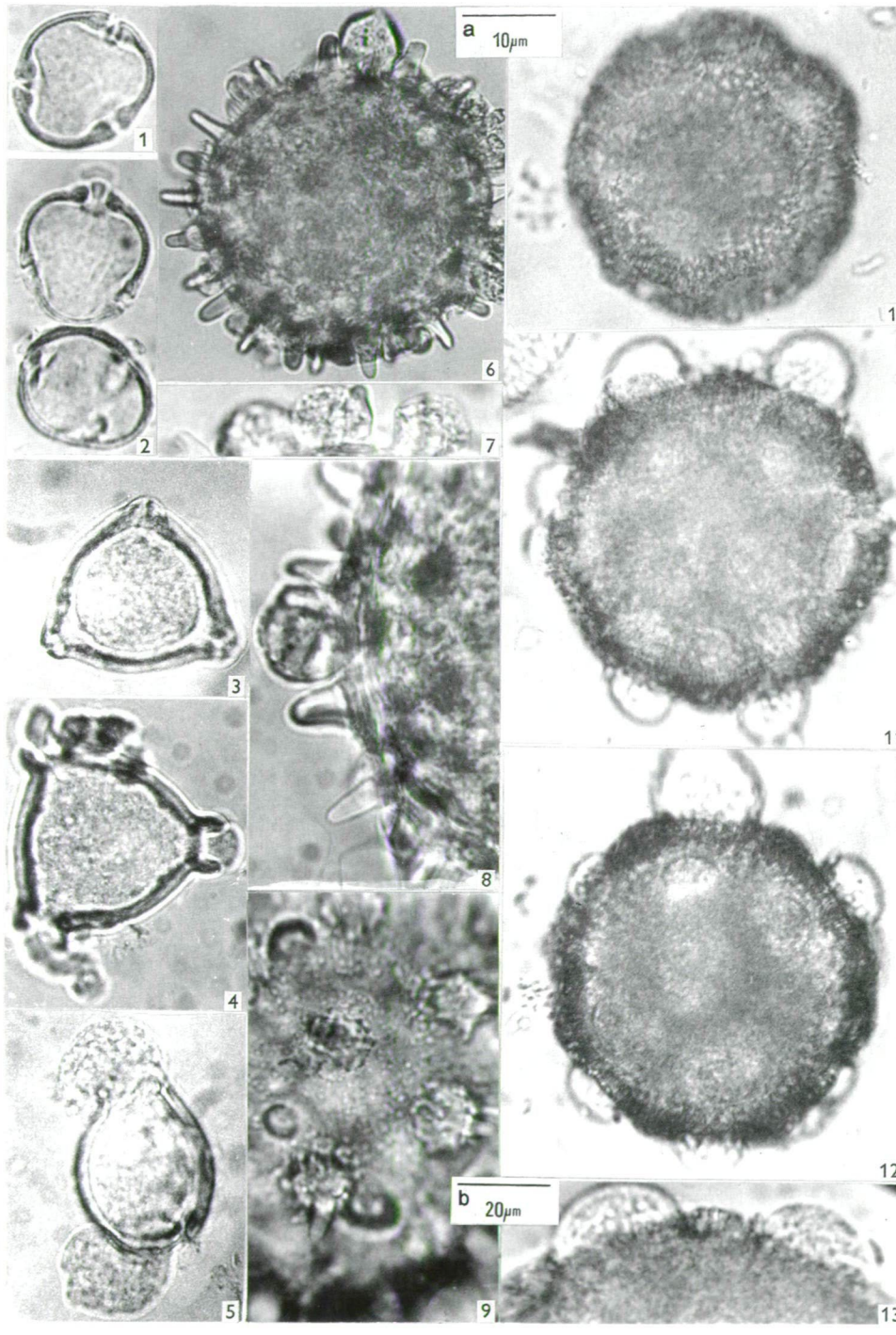

Plate 6.2.

Locality: Garden of the J. A. University. Collected: Á. KÁROSSY, on 12.06.1995. Irradiation: on the 13.06.1995, LM investigation: on the 30.06.1995.

Elaeagnus angustifolia L.

Locality: Botanical Garden of the J. A. University. Collected: Á. KÁROSSY, on 24.05.1995. Irradiation: on the 31.05.1995, LM investigation: on the 04.06.1995.

Hibiscus rosa-sinensis L.

Locality: Botanical Garden of the J. A. University. Collected: Á. KÁROSSY, on 24.05.1995. Irradiation: on the 07.06.1995, LM investigation: on the 10.06.1995.

Opuntia grandis PFEIFF.

Locality: Botanical Garden of the J. A. University. Collected: Á. KÁROSSY, on 15.06.1995. Irradiation: on the 30.06.1995, LM investigation: on the 30.06.1995.

Irradiations of the pollen grains 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. Radiation data: 35 KV, 20 mA, CuK_{α} beam. Length of irradiations: 35'.

Results

Knautia drymeia HEUFF. (Plate 6.1., figs. 1–8)

Very characteristic and long pollen tube development (Plate 6.1., figs. 5–7) were observed at 29.0%. Long and short pollen tube appeared on the same pollen grain after irradiation at 10.0% of the pollen grains (Plate 6.1., figs. 3,4,8). 56.0% of the pollen grains are non-altered (Plate 6.1., fig. 1).

Tilia cordata MILL. (Plate 6.2., figs. 1,2)

49.5% of the pollen grains are non-altered after irradiation (Plate 6.2., fig. 1). Small pollen tubes appeared at 48.0% (Plate 6.2., fig. 2), and only 2.5% are with relatively large pollen tubes.

Elaeagnus angustifolia L. (Plate 6.2., figs. 3–5)

94.5% of the irradiated pollen grains are non-altered (Plate 6.2., fig. 3). Partial pollen tube development appeared at 3.0% after irradiation (Plate 6.2., fig. 4). Characteristic and total pollen tubes were observed at 2.5% of the investigated material (Plate 6.2., fig. 5).

Hibiscus rosa-sinensis L. (Plate 6.2., figs. 6–9)

There are yellow drops superior to the pore, in all probability of protective function. 92.0% of the pollen grains are non-altered (Plate 6.2., fig. 9). Partial pollen tube development was observed at 9.0% of the investigation material (Plate 6.2., figs. 6–8).

Opuntia grandis PFEIFF. (Plate 6.2., figs. 10–13)

52.5% of the irradiated pollen grains are non-altered (Plate 6.2., fig. 10). Partial or more or less total pollen tube development was observed at 47.5% of the investigated pollen grains. The observed pollen tubes are characteristic (Plate 6.2., figs. 10–13).

Plate 6.1.

1–8. *Knautia drymeia* HEUFF., Recent, Experiment No: 1/7-193.

Plate 6.2.

1,2. *Tilia cordata* MILL., Recent, Experiment No: 1/7-246.
3–5. *Elaeagnus angustifolia* L., Recent, Experiment No: 1/7-175.
6–9. *Hibiscus rosa-sinensis* L., Recent, Experiment No: 1/7-197.
10–13. *Opuntia grandis* PFEIFF., Recent, Experiment No: 1/7-252. Magnifications: Figs. 6. 10–12; scale "a", figs. 1–5, 7–9, 13; scale "b".

Discussion and Conclusions

Based on our new data we can come to the conclusions as follows:

1. More or less characteristic and intensive pollen tube development was observed at all species investigated after X-ray irradiation.
2. In comparison with our previous results on *angiosperm* pollen grains the peculiar pollen tube of *Knautia drymeia* suggests the necessity of further investigations on this genus or on the species of this family. The partial dissolution method may be succesful not only with the LM, but with the TEM method, too.
3. Pollen tube development was observed on the genus *Tilia* after 30 days of dissolution with different organic solvents (ethanol, n-propanol, n-butanol and i-amyl alcohol, cf. KEDVES et al., 1998).
4. The resistance of the pollen grains of *Elaeagnus angustifolia* is also interesting.
5. The *Malvaceae* pollen grains seem to be also important objects for experimental palynology methods on LM and TEM level.

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