8. HIGH TEMPERATURE EFFECT ON THE POLLEN GRAINS OF PLATANUS HYBRIDA BROT.

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Abstract

The LM results of the high temperature effect on fresh pollen grains of *Platanus hybrida* are summarized in this paper. The qualitative and the quantitative alterations are presented herein of the fresh and heated pollen grains at 200 °C during 10', 1 hr., 5, 10, 25 and 50 hours. The *Longaxones* characteristic features are more gradually expressed by the increasing lengthening of the time of heating. Short time heating resulted in swelling the pollen grains. Characteristic contraction was observed after 50 hours of heating. By the length of time of the heating, the P/E ration increases with several maxima from 1.3–1.6.

Key words: Palynology, recent, *Platanus hybrida*, high temperature effect.

Introduction

The pollen grains of the *Platanaceae* or *Platanus* type are important in the early evolution of the *angiosperm* pollen grains; cf. DOYLE and HICKEY (1976), DILCHER (1979), and KEDVES (1989). FRIIS and PEDERSEN (1996) carried out combined researches on in situ fossil *Platanus* pollen grains. SEM and TEM data of *Platananthus huberi* (Campanian, U.S.A.), SEM from *P. scanicus* (Santonian) (Campanian, Sweden). The electron dense endexine in the apertural area of *P. huberi* of non-lamellar ultrastructure can be pointed out.

Based on the work of ERDTMAN (1966) and THANIKAIMONI (1973), FRITZSCHE published the first data on the pollen grains of the *Platanus* genus in 1832. There are 69 bibliographical data of the *Platanus* pollen grains in the famous "Index bibliographique..." of the *angiosperm* pollen grains; THANIKAIMONI (1972, 1973, 1976, 1980, 1986), TISSOT (1990) and TISSOT and VAN DER HAM (1994).

During our experimental investigations of recent pollen grains the results of the high temperature effect are remarkable from an evolutionary point of view, too. As regards the earliest *Longaxones* types a short paper was published in 1993 (KEDVES, TÓTH, MÉSZÁROS, BORBOLA and AILER).

This contribution presents the first results of the combined studies on the *Platanus* pollen grains.

Materials and Methods

The pollen material was collected by Dr. M. KEDVES on 30.04.1996. Locality: Ujszeged, Park. The experiments were started on 02.05.1996. Temperature 200 °C, length of time and numbers of experiments are as follows. 0': 1/7-423, 10': 1/7-424, $1^{hr.}$: 1/7-425, $5^{hrs.}$: 1/7-426, $10^{hrs.}$: 1/7-427, $25^{hrs.}$: 1/7-428, $50^{hrs.}$: 1/7-429. The slides were mounted in glycerine-jelly hydrated at 39.6%. The pictures were taken with a Carl Zeiss Jena, objective GF Planachromat HI 100X/1.25/0.17-A.

Results

QUALITATIVE DATA

The fresh pollen grains, according to ERDTMAN (1966) are more or less isodiametric (=subprolate by ERDTMAN) and 3-colpate. The surface is finely reticulate. The pollen grains were observed several times in polar position (Plate 8.1., figs. 2,3), specimens, with typical *Longaxones* character are scarce (Plate 8.1., fig. 1). After 10' of heating (Plate 8.1., figs. 4,5), the expansion of the pollen grains is characteristic, without seeming alterations in the symmetry. After heating of $1^{hr.}$ (Plate 8.1., figs. 6,7) and $5^{hrs.}$ (Plate 8.1., figs. 8,9), the increased size is still remarkable, but the *Longaxones* character becomes more and more definite. Perceptible contraction started after $10^{hrs.}$ of heating (Plate 8.1., figs. 10–12), and endoaperture-like alterations were also observed (e.g.: the right specimen of fig. 12). Similar qualitative alterations were observed at the pollen grains after $25^{hrs.}$ of experiment (Plate 8.1., figs. 13,14). The *Longaxones*, the endoaperture-like characteristic features and the decrease in size of the pollen grains are well shown after $50^{hrs.}$ of heating (Plate 8.1., figs. 15,16).

QUANTITATIVE DATA

1. The alterations of the greatest size (polar axis) of the pollen grains are illustrated on Text-fig. 8.1. The swelling of the pollen grains after a short time of heating is characteristic. Regular alterations were established after experiments lasting for 10', $5^{hrs.}$ and $10^{hrs.}$. The maxima of the variation-statistical graphs of $1^{hr.}$ and $25^{hrs.}$ of heating are at the same value as of the fresh pollen grains. Characteristic contraction of shortening of the polar axis occurred after $50^{hrs.}$ of heating.

2. The variation-statistical graphs of the P/E ratio (Text-fig. 8.2.)

In general every variation-statistical graph has two or three maxima. The first maxima of experiments for 10' and $1^{hr.}$ are a bit minor than those of the fresh pollen grains. On the basis of our results, the real alterations are represented by the second or the last maximum of the graph. To this the P/E ratio of the experiment during $50^{hrs.}$ is very characteristic. The P/E values between 10 and 20 per cents may characterize the alterations at this kind of pollen grains.

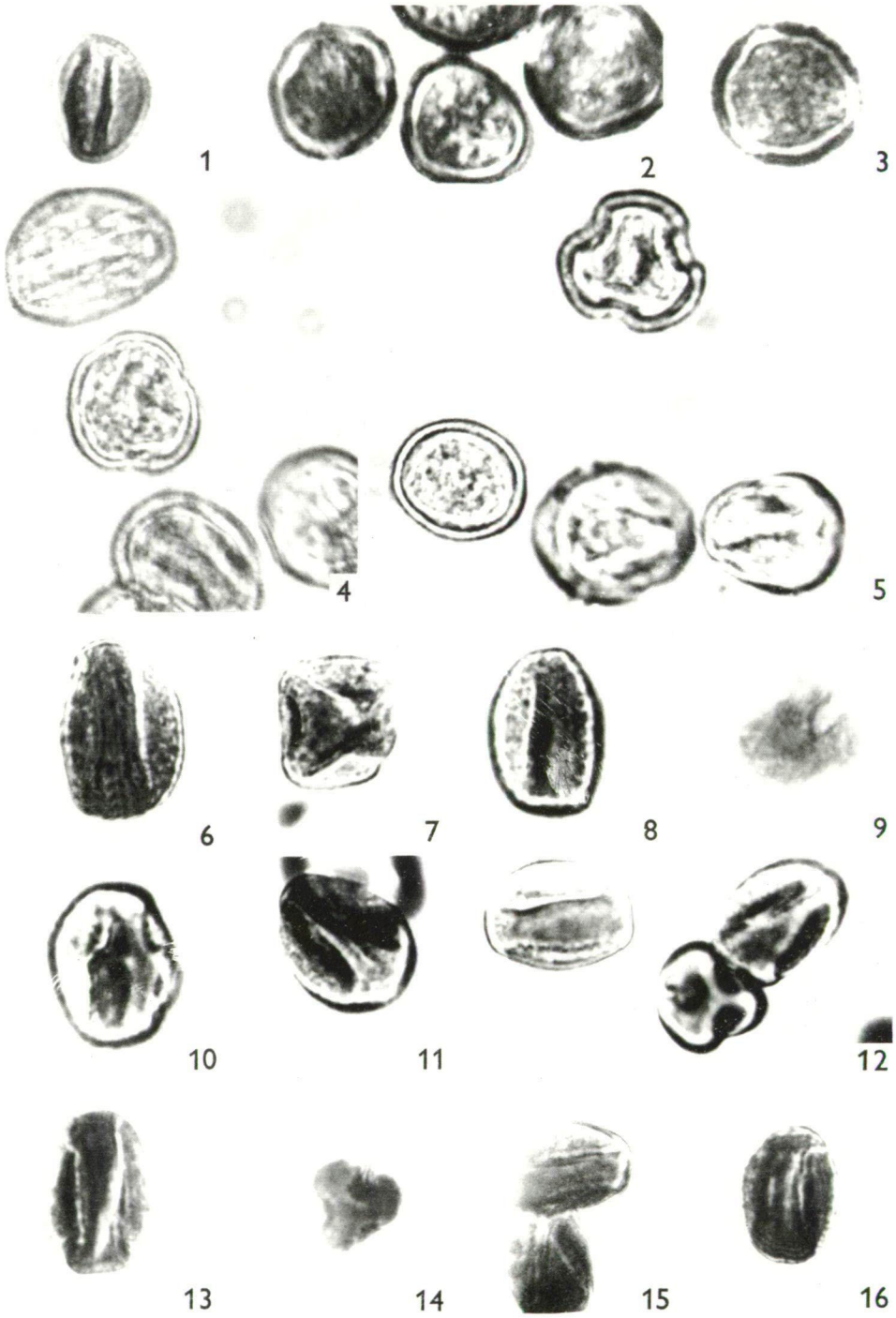
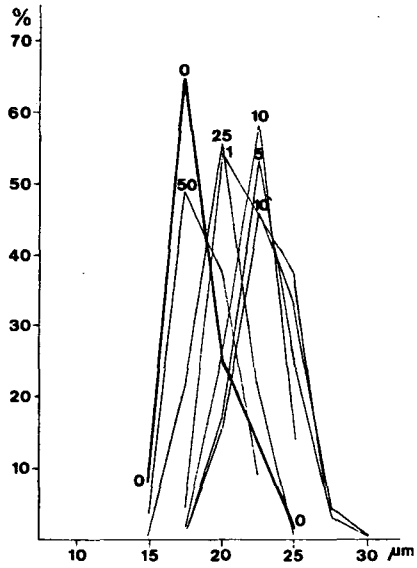
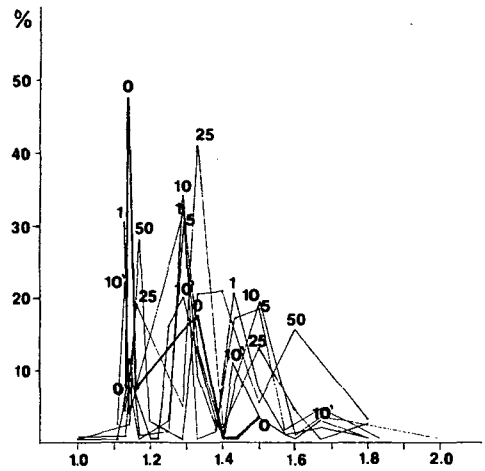


Plate 8.1.



Text-fig. 8.1.
Platanus hybrida BROT. Recent. Variation-statistical graphs of the longest size of the pollen grains.



Text-fig. 8.2.
Platanus hybrida BROT. Recent. Variation-statistical graphs of the P/E ratio of the pollen grains.

Discussion and Conclusions

The taxonomical and phylogenetical importance of this kind of pollen grains was pointed out previously. To this, following IGLESIAS et al. (1993), JATO et al. (1996), and PEHLIVAN (1995) the pollen grains of the genus *Platanus* are allergenic. This is also a supplementary reason to the combined investigation of this kind of pollen grains. Regarding the nomenclature we cite the paper of JATO et al. (1996): *Platanus hispanica* MILLER ex MUNCH (= *Platanus hybrida* BROT.).

The basic morphology of these pollen grains of *Platanus hybrida* is mostly of early character, the tricolpate germinal area, and the finely reticulate sculpture. But the nearly isodiametric symmetry is not fully concordant with the above mentioned characteristics. Taking into consideration our previous results of the high temperature effect of *Longaxones angiosperm* pollen grains the alteration of the P/E ratio is a little different than at the previously investigated species. Further experimental investigations on this pollen material are in progress.

Plate 8.1.

1–16. *Platanus hybrida* BROT. Recent.
1–3. Pollen grains without heating; 1/7-423.
4,5. Experiment No: 1/7-424, length of time: 10 min.
6,7. Experiment No: 1/7-425, length of time: 1 hr.
8,9. Experiment No: 1/7-426, length of time: 5 hrs.
10–12. Experiment No: 1/7-427, length of time: 10 hrs.
13,14. Experiment No: 1/7-428, length of time: 25 hrs.
15,16. Experiment No: 1/7-429, length of time: 50 hrs.

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