7. HIGH TEMPERATURE EFFECT ON THE POLLEN GRAINS OF PSEUDOTSUGA MENZIESII (MIRB.) FRANCO

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Abstract

Results of LM morphology of the fresh and secondary altered pollen grains by means of the high temperature effect are presented in this paper. Within the secondary altered forms there are also monosulcate pollen grains.

Key words: Palynology, recent, *Pseudotsuga menziesii*, high temperature effect.

Introduction

The review of the "large inaperturate" fossil pollen grains was compiled by BORBOLA (1997). As it was presented for the botanical affinity in the first publications the *Larix* genus was established. Later, THOMSON and PFLUG (1953), KRUTZSCH (1971) mentioned the *Pseudotsuga* genus in this respect, as well.

Similarity in the LM morphology of the pollen grains of the recent *Larix* and *Pseudotsuga* species was pointed out in several publications, cf. ERDTMAN (1954, first edition 1934). But M. VAN CAMPO (1947a) concerning *Pseudotsuga douglasii* pollen grains pointed out the following; p. 5: "ne porte aucune trace de calotte". The fragility of these pollen grains was also emphasized in her paper. At the phylogenetical lineages of the recent *gymnosperm* pollen grains the *Larix* and *Pseudotsuga* together were mentioned as the most evolved type (M. VAN CAMPO, 1947b).

GULLVAG (1966) published TEM data of the *Pseudotsuga taxifolia* too. The exine ultrastructure of this species differs from those of *Larix decidua*. It is interesting that the exine ultrastructure of *Pseudotsuga taxifolia* is very similar to that of *Balmeiopsis limbatus* (BALME 1957) ARCHANGELSKY 1977 (KEDVES and PÁRDUTZ, 1974, KEDVES, 1994) and *Araucariacites hungaricus* DEÁK 1964 (KEDVES, 1985, 1994). The latter mentioned fossil forms represent early Mesozoic inaperturate pollen type.

In this way the combined experimental investigation of the pollen grains of the *Pseudotsuga* genus seems to be important. This paper is the first part within this research program.

Materials and Methods

The investigations material was collected by Á. ERDŐDI on 18.04.1996. Locality: Botanical Garden of the Department of Botany of J. A. University. The experiments were started on 21.04.1996. Temperature: 200°C, length of time and numbers of experiments are as follows: 0': 1/7-410, 10': 1/7-411, $1^{hr.}$: 1/7-412, $5^{hrs.}$: 1/7-413, $10^{hrs.}$: 1/7-414, $25^{hrs.}$: 1/7-415, $50^{hrs.}$: 1/7-416. The slides for light-microscopical investigations were mounted in glycerine-jelly hydrated at 39.6%. 200 specimens of each sample were qualitatively and quantitatively investigated. The pictures were taken with an objective Carl Zeiss Jena, GF Planachromat HI 100x/1.25/0.17-A.

Results

QUALITATIVE DATA

The observations on the fresh pollen grains of this species (Plate 7.1., figs. 1,2) support the results of M. VAN CAMPO (1947a), namely the fragility of the exine of these pollen grains. This pollen morphological characteristic feature results in several forms. The nuclei and the nucleoli are also well shown in our pictures. After 10' of heating (Plate 7.1., fig. 3) the protoplasm of the pollen grain contracts and/or the intine is swollen. In this way, the central nucleus is relatively very large. After $1^{hr.}$ of heating, the polar character of the pollen grains is also well shown in contrast to the fresh pollen grains. Monosulcate secondary forms also appeared after $5^{hrs.}$ of heating (Plate 7.1., fig. 4). The secondary forms after $25^{hrs.}$ of heating are similar to the above mentioned ones. After $50^{hrs.}$ of heating several non-spherical forms appeared secondariliy.

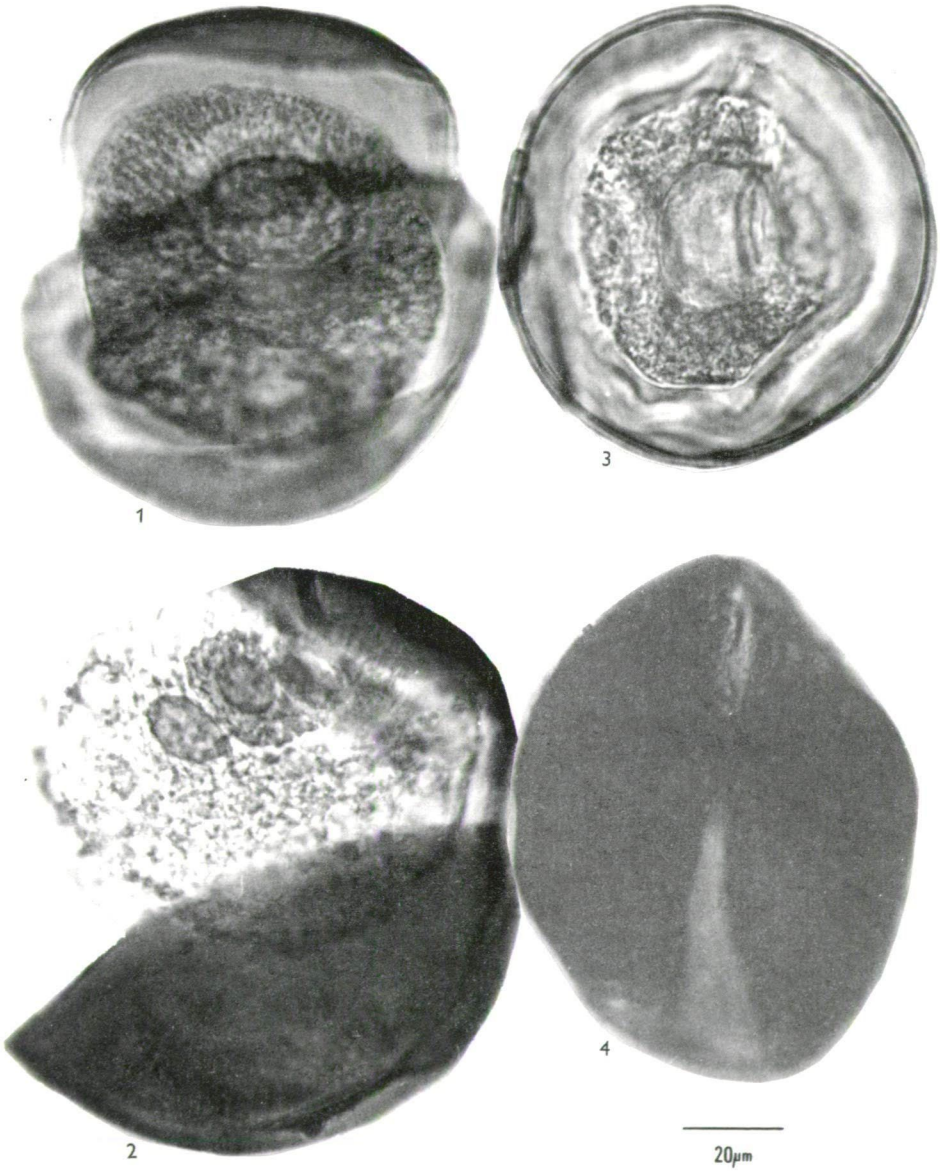
QUANTITATIVE DATA
(Text-figs. 7.1., 7.2.)

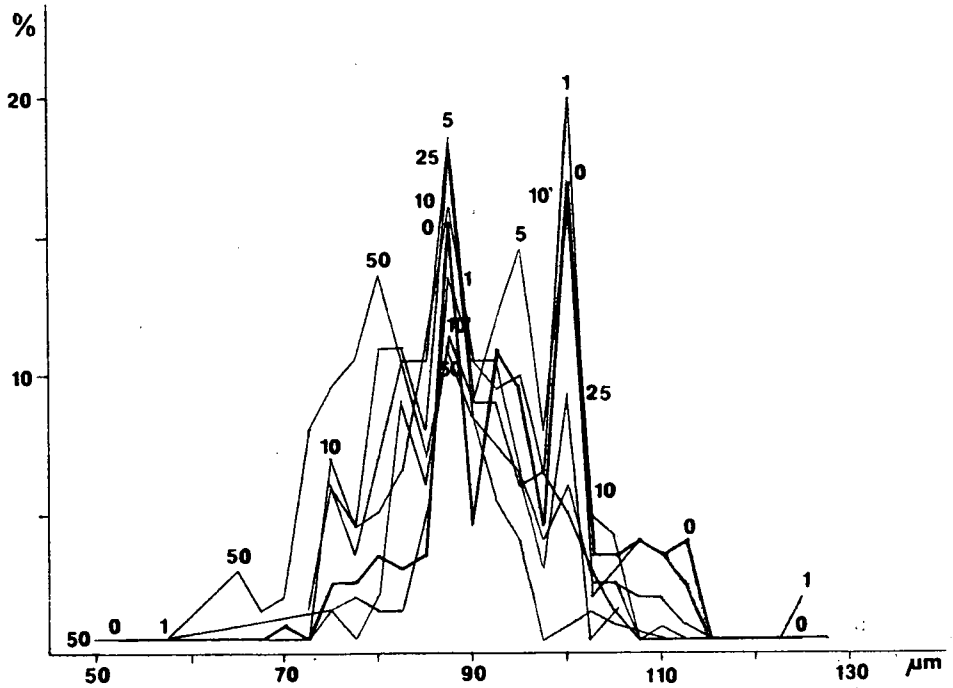
1. The pollen grains without heating are more or less spherical. Diameter: 52.5–122.5 μm, L/S ratio: 1.0–1.8. Dominant diameter: 87.5–100.0 μm, dominant ratio: 1.0–1.2.

2. After 10' of heating the diameter of the pollen grains have not increased in contrast to our previous general establishments. Diameter: 67.5–125.0 μm, L/S ratio: 1.0–1.5. Dominant diameter: 82.5–100.0 μm, dominant ratio: 1.0–1.2. Pollen grains of circular amb are more numerous than at the previously mentioned ones.

Plate 7.1.

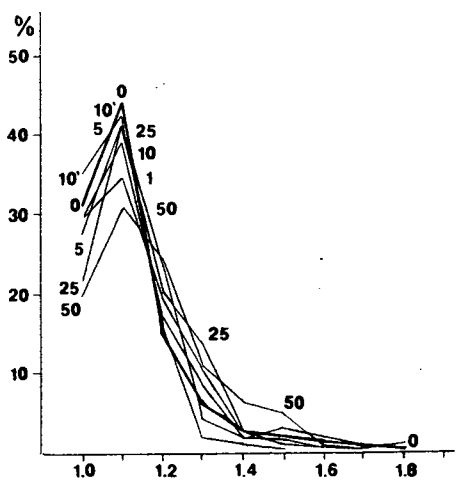
1–4. *Pseudotsuga menziesii* (MIRB.) FRANCO, Recent.
1,2. Pollen grains without heating; 1/7-410.
3. Experiment No: 1/7-411, length of time: 10 min.
4. Experiment No: 1/7-415, length of time: 25 hrs.


1
2
3
4
20μm



Text-fig. 7.1.

Pseudotsuga menziesii (MIRB.) FRANCO, Recent. Variation-statistical graphs of the longest size of the pollen grains.



Text-fig. 7.2.

Pseudotsuga menziesii (MIRB.) FRANCO, Recent. Variation-statistical graphs of the L/S ratio of the pollen grains.

3. After $1^{hr.}$ the variation-statistical graph is very similar to that of the fresh pollen grains. The number of the spherical forms decreased. Diameter: 57.5–125.0 μm, L/S ratio: 1.0–1.7. Dominant diameter: 87.5–100.0 μm, dominant ratio: 1.0–1.3.

4. After $5^{hrs.}$ of heating the contraction started. Diameter: 72.5–115.0 μm, L/S ratio: 1.0–1.6. Dominant diameter: 80.0–97.5 μm, dominant ratio: 1.0–1.2.

5. After $10^{hrs.}$ of heating, the diameter: 72.5–127.5 μm, L/S ratio: 1.0–1.8. Dominant diameter: 75.0–100.0 μm, dominant ratio: 1.0–1.3.

6. After $25^{hrs.}$ of heating. Diameter: 72.5–120.0 μm, L/S ratio: 1.0–1.6. Dominant diameter: 75.0–100.0 μm, dominant ratio: 1.0–1.3. The quantity of the spherical forms decreased in contrast to the previous ones.

7. After $50^{hrs.}$ of heating. Diameter: 50.0–115.0 μm, L/S ratio: 1.0–1.8. Dominant diameter: 70.0–95.0 μm, dominant ratio: 1.0–1.5. The contraction of the pollen grains is very definite. The number of the non-spherical forms increased.

Discussion and Conclusions

In comparison to the results on the pollen grains of *Larix decidua* (BORBOLA, 1997) there are remarkable differences. For example the secondary monosulcate forms can be emphasized.

Hopingly the presented data will also be useful in the researches of the fossil forms.

Further experimental investigations are necessary, including the TEM method.

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