

PALYNOLOGIC INVESTIGATION ON COALS OF THE UPPER PANNONIAN I

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Introduction

Chief geologist, LÁSZLÓ VÖLGYI, has sent to our Institute some coal samples from borings on different territories and levels for paleobotanical investigation. One of the samples contained also fusic, suitable for anatomic investigation. Prof. Dr. P. GREGUSS determined it as to belong to *Alnoxydon* (oral communication). He gave me some of the amorphous coal samples for palynological investigation. I would especially like to express my thanks to him for supplying me with this material.

Material and Method

The following coal samples proved to be suitable for pollen analytical investigation:

1. Túrkeve 2nd boring, 1309—1314 m
2. Emőd 1st boring, 420—425 m
3. Szerep 1st boring, 1010—1015 m

Preparations were made of 1 g of material. The method used was that of DELCOURT, MULLENDERS & PIERAT (2) known as „attaque à l'acide nitrique”, followed by an aftertreatment with HF.

Because of the limited space of the periodical I will publish the qualitative results later on; now I shall discuss only the quantitative results.

Results

The results of the quantitative investigation are summed up in figure 1.

The sample from Túrkeve indicates a plant assemblage preferring wet ecology. This is confirmed by the presence of cl. *Nymphaeaceae*, by the very considerable quantity of *Taxodiaceae-Cupressaceae* pollen grains, to a certain extent by the high percentage of *Gramineae*, and the also notable quantity of *Salix* pollen. The proximity of an open water surface is also supported by the

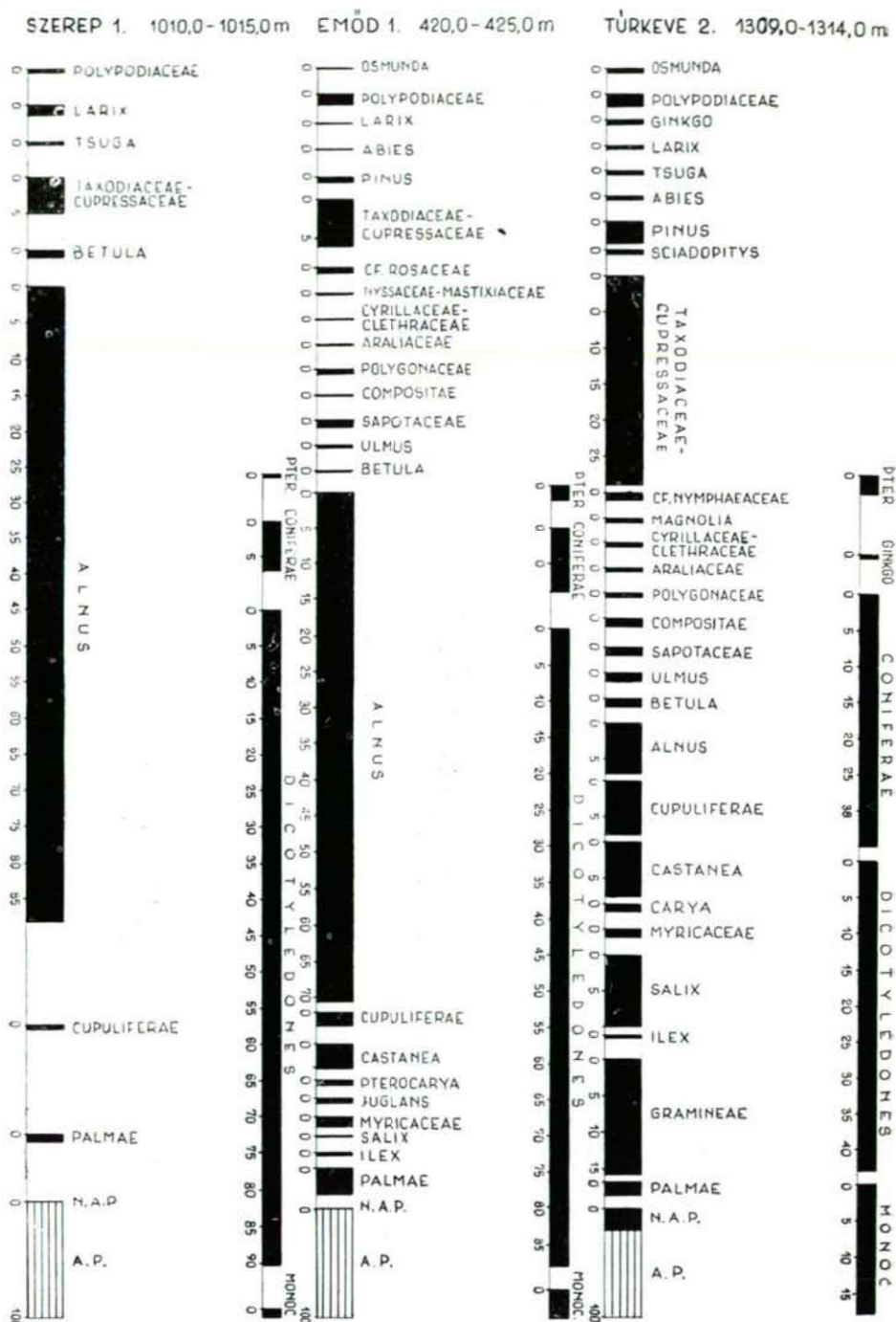


Figure 1. Pollenspectra of the investigated samples.

relatively big quantity of allochthonous pollen grains, the quantities of *Pinus*, *Cupuliferae* (*Castanea*), which are also not to be neglected.

The pollen spectra of the samples from Emőd and Szerep are identical, so they can be discussed together. These samples are devoid of cf. *Nymphaeaceae* and *Gramineae*, *Taxodiaceae-Cupressaceae* are represented by a very moderate quantity, the amount of allochthonous pollen grains is also quite minimal. The *Alnus* genus is represented by a dominating quantity, which denotes a wood preferring still damp but less wet ecological conditions than the former. The quantity of *Alnus* pollen supports the xylotomic results of GREGUSS.

Discussion

From a paleobotanical point of view the results of the pollen investigations on all the samples point to a different facies of an identical plant assemblage. The alternations in the flora, caused by changing ecologic factors, can be reconstructed as follows:

1. Deep swamp. It has to be supposed because many moments support the proximity of an open water surface, though microplankton organisms could not be observed.

2. Shallow swamp. One constituent of it is cf. *Nymphaeaceae*; but it is not impossible that also *Gramineae* has formed a part of the vegetation to a certain extent, especially near the shore.

3. *Taxodiaceae-Cupressaceae* swamp wood. Based on the investigations of E. NAGY (8) we can possibly speak of a *Taxodium* wood in the Upper Pannonian.

4. Transition zone. After the *Taxodium* wood a *Salix* wood appears but not in dominating quantity.

5. *Alnus*, probably grove.

The above discussed zonation is shown in outline in figure 2. All these statements agree with the results of E. NAGY (8) achieved through the monographic work on the Upper Pannonian brown coals of *Mátraalja*, located in the so-called flat land part, which E. NAGY (8) divided into moor or swamp wood and moist wood on the shore.

The plant assemblages contributing to the coals of the Upper Pannonian give, compared with the vegetation of the other Hungarian coal strata, the following results:

I have treated the problem of the Lower Eocene floras in detail in an other paper, so here I want only to state that trees of a tropical or subtropical flora contributed to these coal strata. But the significance of *Taxodiaceae-Cupressaceae* as cooperative factors can also not be neglected.

Based on the statements of E. KRIVÁN-HUTTER (6) the flora of the Middle Eocene points to more temperate climatic conditions than those of the Lower Eocene, and the vegetation quantitatively differs from the Lower Eocene flora, viz. the quantity of *Palmae* decreases. The floras of the Upper Oligocene (5) are according to our present knowledge similar to the vegetation of which the

Miocene coal strata have been formed, there is a strong increase in the quantity of *Taxodiaceae-Cupressaceae*. Concerning the Miocene swamp types (3, 4, 9, 10) the *Myricaceae* zone which follows after the *Taxodiaceae-Cupressaceae* zone may be accompanied by a more significant quantity of *Cyrtaceae-Clethraceae*, sometimes the latter can possibly appear as an independent zone, resp. *Betulaceae* (cf. *Betula*) may play a similar role. The appearance of the *Alnus* swamp wood has been proved by MAÁ CZ & SIMONCSICS (7) in the Helvetian of Borsod-Pereces, too, so the *Alnus* wood may appear also in the Miocene in such quantities as to build up coal strata.

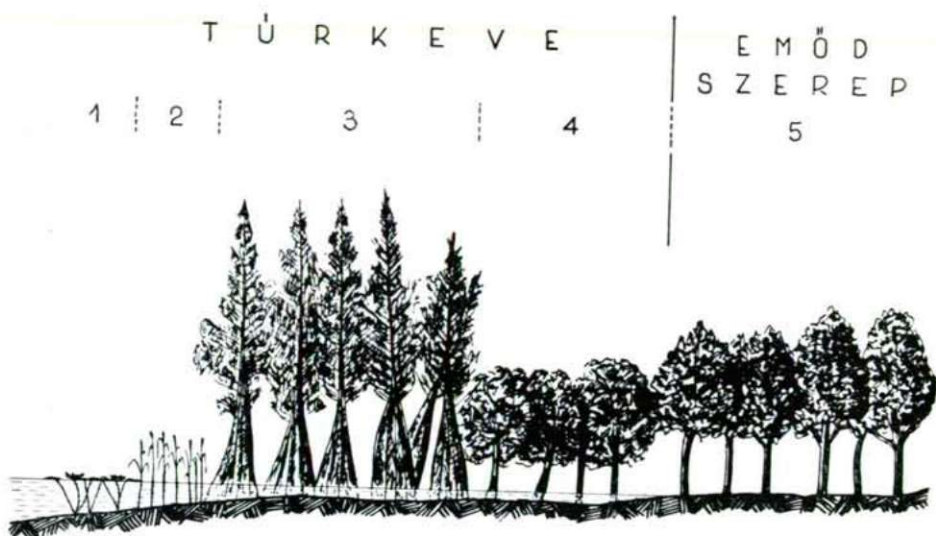


Figure 2 Reconstruction outline of the plants that contributed to the coal strata of the Upper Pannonian. 1. Deep swamp, 2. Shallow swamp, 3. *Taxodiaceae-Cupressaceae* swamp wood, 4. *Taxodiaceae-Cupressaceae*, *Salix*, *Alnus* transition zone, 5. *Alnus* swamp wood.

In our present knowledge the floras of the Tertiary coal strata are all analogous in that respect that all of them begin with a *Taxodiaceae-Cupressaceae* swamp wood. Differences are to be observed only in the following zones: the tropical and subtropical elements are decreasing, the quantities of pollen of plants, indicating a more temperate climate, are increasing. We must refer here to ANDREÁNSZKY'S (1) statement, that water plants and in some degree moor or swamp plants are not as good climate-indicators as land plants are, and that the values of temperature and also the variations of temperature have much less influence on the vegetation, and this influence is felt by the plants more indistinctly and belated. Thus the results of the palynological investigations on autochthonous plants which form these coal deposit stratas will need a certain correction from paleoclimatological as well as from the stratigraphical point of view.

Summary

The investigated brown coals point to a flora of a moderate but warm climate. The swamp on which the coal strata have been formed can be divided into: deep swamp, shallow swamp, *Taxodiaceae-Cupressaceae* swamp wood, *Taxodiaceae-Cupressaceae*, *Salix*, *Alnus* transition zone, *Alnus* swamp, probably grove.

The stated results agree in the essentials with those of E. NAGY (8), demonstrated on the Upper Pannonian of Mátraalja.

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