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Palynological analysis of the deposit Fosso Bianco, Central Italy

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Т. Димитрова - Палинологический анализ обнажения Fosso Bianco, Центральная часть Италии. Результаты палинологического исследования обнажения Фосо Бианко получены на основании 23 образцов глинистых пород. Среди палинологических комплексов преобладают представители лесных ценоз. Палинологические данные основываются на уже известных результатах для этого региона в Центральной Италии. Результаты подтверждают ранее определенный возраст этих отложений плиоцен-плейстоцена.

Abstract. The palynological analysis of the Fosso Bianco section is based on the data obtained from 23 samples. Most of the samples contain polydominant and very rarely monodominant forest components. The palynological documentation is based on a classification of some well known paleoflora groups. The comparative characteristics of the pollen spectra is based mainly on the data of the boundary Pliocene/Pleistocene in Central Italy.

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Introduction

The palynological analysis of the outcrop Fosso Bianco lithologically described by Conti-Girotti (1977, Fig. 1) is based on the data obtained from 23 samples. The data derived from the section in the interval of 1-4 m from the surface. Sample No 1 was taken from the uppermost part of the section and sample No 23 indicates the oldest age discovered. A transition sequence between samples No 17 and 18 was established (17=18). The processing of all samples as well as the listing of the single specimens consists of perishable glycerin preparations. The amount of the examined material proved to be insufficient to permit a precise listing of the needed 500 pollen grains. The presence of only single taxa in samples No 4, 5, 6, 12, 17, 18 and 20 led to their elimination by the graphic representation (Fig. 2). All other samples contain a minimum of 100 pollen grains, on the basis of which a proportion in the spore spectrum was estimated.

Paleofloristic groups and spectra

In summary, the composition of the fossil microflora, obtained from all the samples and derived from the section, can be characterized by the predominance of forest components which in some cases compose up to 86% of the spore spectrum. Most samples contain polydominant forests and very rarely monodominant forests, i.e. sample No). The forest coenosis contains thermophillic and mesophyllic elements. The taxa which could be classified as arctotertiary (A) and paleotropical (P) geoflora are of great interest. The palynological documentation is based on a classification of the following paleofloristic groups:

1) Warm-temperate and temperate climates flora: *Liquidambar*, Fagaceae (Castanea - type), *Carya, Juglans, Rhus, Reevesia* and *Engelhardtia*. The last two genera are common representatives of the Tertiary flora.

2) Taxodiaceae group: warm temperate zone

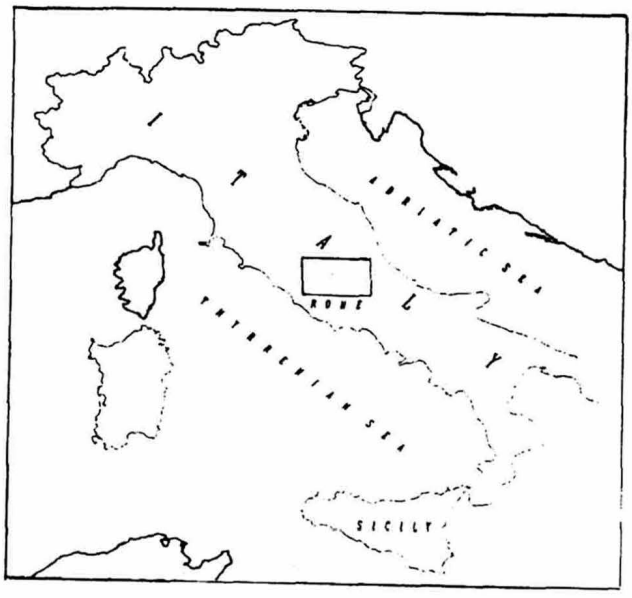

Fig. 1. Geographic position of research materials

elements including Gymnospermae of the archaic type: *Podocarpites, Taxodium*-type, *Sciadopitys, Sequoia*-type.

3) Pinaceae (excluding *Abies - Picea*): *Pinus diploxilon* - type, *Pinus haploxilon* - type, *Cedrus, Tsuga.*

4) Mountain elements such as *Picea, Abies, Fagus* and *Betula.*

5) Other arboreal plants: *Alnus, Salix, Populus,* Taxaceae plus indeterminate and/or indeterminable pollen grains.

6) None - arboreal plants (NAP)

Some of the following intervals can be used as examples:

In samples No 1-3 the dominant taxa belong to groups 2 and 3;

In samples No 7-11 there is a considerable increase of the taxonomical spectra of the taxa from groups 4 and 5;

Sample No 16 is dominated by the presence of group 3;

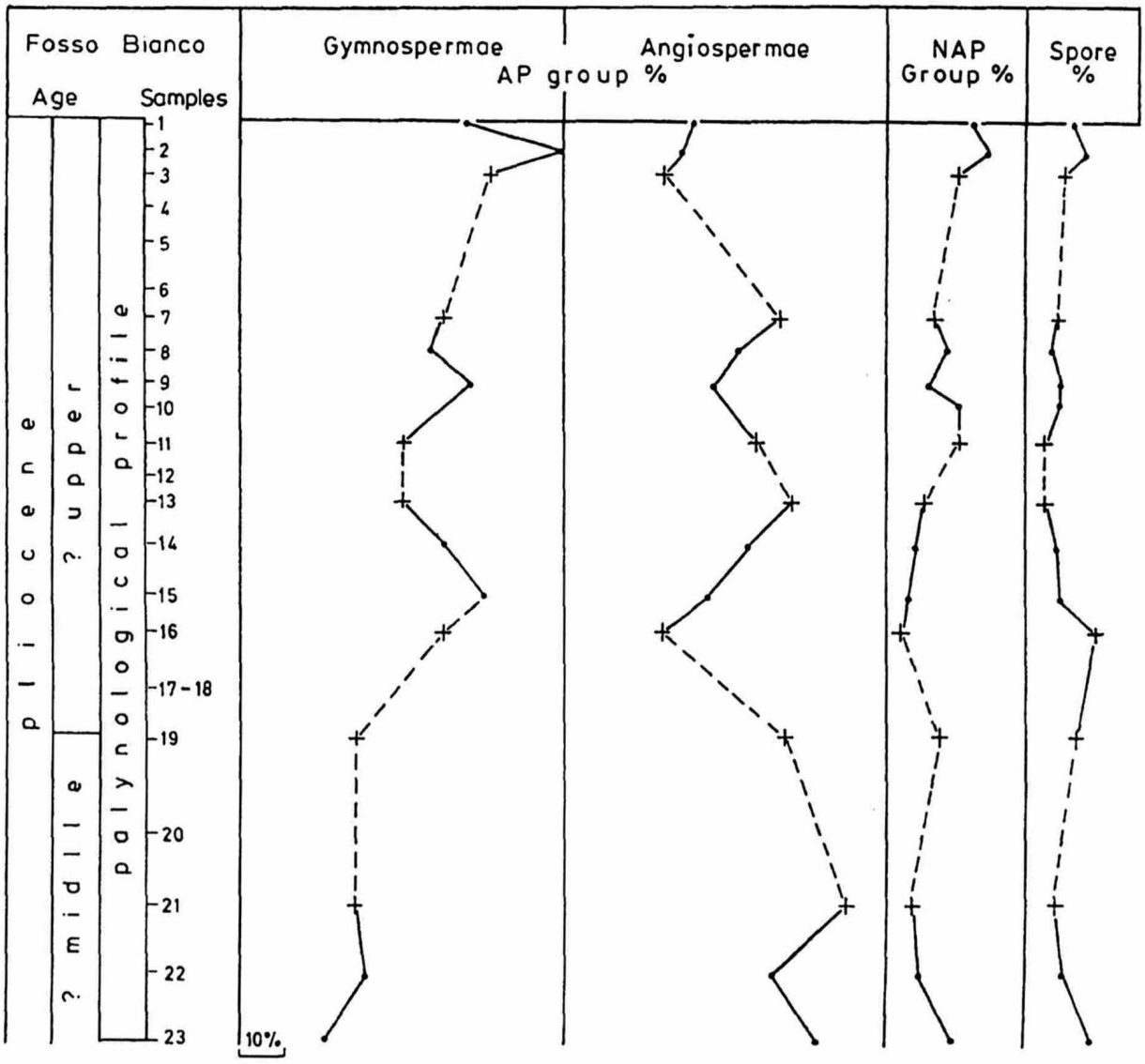

Fig. 2. Pollen diagram and proportion of the plant groups in the spore spectra in the section Fosso Bianco

In samples No 17 and 18 in particular, dominant for the spectrum is also group 1;

In group 6 the plants identified from the samples do not exceed 17%;

The paleoflora examined has the following components: Podocarpites, *Picea, Cedrus, Abies, Pinus* (Haploxylon - type), *Pinus* (Diploxylon - type), *Tsuga*, Taxodiaceae, *Taxodium, Sequoia*, Cupressaceae, *Sciadopitis*, Fagaceae (Castanea - type), *Fagus, Quercus*, Juglandaceae (Juglans - type), *Pterocarya, Carya, Engelhardtia*, Betulaceae (Betula - type), *Alnus, Alnaster, Myrica, Ulmus, Zelkova, Liquidambar, Acer, Tilia, Platanus, Fraxinus, Cinnamonum*, Oleaceae, Myrtaceae, Moraceae, Ericaceae, Caprifoliaceae, Sapotaceae, *Rhus, Ilex, Ephedra, Cornus, Ginkgo, Reevesia*, Cyperaceae, Umbeliferae, Compositae, *Artemisia, Lonicera*, Geraniaceae, *Eleagnus*, Polypodiaceae, *Osmunda*, Cyatheaceae, Schizaeaceae, *Lygodium, Selaginella, Lycopodium*, Algae, Sphagnum.

According to the diagram which represents the components of pollen grains and the proportion of the wood and herb in each sample, there are 2 major spore-pollen spectra to be distinguished: Spectrum 1 includes the samples No 1-16 and Spectrum 2 - the samples No 19-23. Sample No 19 requires a special observation as its floristic composition contains common components of the family of the Fagaceae and Juglandaceae.

The palynological documentation of Spectrum 1 clearly shows the predominance of Gymnospermae from groups 2 and 3: Pinaceae, *Cedrus, Tsuga, Taxodium*- type, Podocarpites, *Sequoia*. In samples No 7 and 8 the maximum presence of *Cedrus* and Taxodiaceae reaches 12%.

From the group of the xerophitic plants, *Ephedra*, Chenopodiaceae and *Artemisia* are most common. From the group of shrub *Elaeagnus* occurs very often. An exception is sample No 13 where the proportional ammount of *Zelkova, Carya, Carpinus* and *Quercus* is generally higher. The genus *Ilex* is also a common component of the spectrum.

Among the representatives of Taxodiaceae occur the thermophillic taxa *Glyptostrobus* and *Sciadopitys*. From the group of the Angiospermae the most common for Spectrum 1 are the representatives of thermophillic and evergreen plants: Fagaceae (*Quercus*-type), Juglandaceae, Betulaceae. The presence of some Tertiary forms such as *Engelhardtia* and *Reevesia* (samples No 7 and 8) was reported. In sample No 14 there is a proportional ammounts of *Ulmus, Acer*, Capirfoliaceae, Ericaceae, Oleaceae and *Liquidambar*.

Spectrum 2 is characterized by the predominance of the following deciduous plants: Fagaceae (Fagus - type), *Quercus, Castanea*, Juglandaceae, *Carya, Pterocarya, Engelhardtia, Alnus, Alnaster*, Betulaceae, *Ulmus, Corylus, Zelkova, Eleagnus, Ilex*. Interesting for observation are the samples which are characterized by Spectrum 2 where Fagaceae and *Alnus* are in inverse proportion. Fagaceae (Castanea-type) appears very often. Dominant for Gymnospermae of the AP group are Pinaceae and Taxodiaceae-Cupressaceae, where the proportional amount of *Taxodium* is much lower than the in spore-pollen Spectrum 1. Although their occurrence is almost insignificant, there are also *Ginkgo*, Palmae, Moraceae, and from the herb - Sapotaceae. From all the species found Filicales occur most often.

Interpretation of the results

On the basis of the established proportion between the different types of pollen and mainly between the groups AP, NAP and spores from each sample and as a general result obtained from the two tentatively distinguished spectra, the following regularities can be mentioned:

1) The group of the coniferous plants is dominated by Pinaceae but with a noticable presence of Taxodiaceae.

2) There is a great diversity of species in the group of Angiospermae.

3) Single taxa of the group of Oleaceae were found.

4) Juglandaceae dominates in the group of Angiospermae.

5) There are specimens of relic forms *Cedrus* such as *Engelhardtia* and *Reevesia*.

6) The presence of the pollen of *Taxodium* is proportionally higher in Spectrum 1.

7) Only in Spectrum 2 there is a common occurrence of *Alnus*.

8) There is pollen of subtropical plants such as *Ilex* and *Rhus*.

9) The genus *Ginkgo* can be found only in Spectrum 2.

10) The Tertiary elements included in both spectra are from the Taxodiaceae grouping, *Myrica*, Palmae, and the tropical-subtropical group, Sapotaceae, triporate Juglandaceae - type, tricolpate and tricolporate Fagaceae - type, Moraceae and also *Reevesia*.

The unproportional distribution of the species and pollen groups in each sample can be explained with the specific conditions influencing the vegetation being subjected under concrete climatic and living conditions as well as the change of relief. The presence of *Cedrus* in the sediments proves a diverse relief. The pollen of *Taxodium* indicates the existence of swamps of a subtropical type. The presence of *Alnus* in

Spectrum 2 suggests the existence of lakes. The subtropical plants and the Tertiary relic forms such as *Reevesia* and *Engelhardtia* determinate the climatic conditions as subtropical to temperate. All the regularities listed above and especially the content of genera of Taxodiaceae in both spectra makes possible the comparison between the miospore assemblages of the locality Fosso Bianco and the data obtained by Follieri (1977) for Central Italy and by Frank (1969) on and the palynostratigraphy of Vico.

Conclusions

The two spore-pollen spectra represented diagrammatically in Fig. 2 show a regularity particularly in the wood group. The visual interpretation of the data clearly indicates the importance of the groups of the thermophillic and mesothermophillic elements. Special attention was paid to the amount of Taxodiaceae. Of greatest importance is the presence of *Reevesia*, which was found also in the Tertiary sediments in Bulgaria (Petrov, Drazheva - Stamatova, 1972). The comparative characteristics of the pollen spectra is based mainly on the data compiled by Bertoldi, Thunell (1989) for the boundary between Pliocene/Pleistocene and the climatic changes in the southern and middle part of the Mediterranean region. According to Follieri (1977), the Taxodiaceae group occurs in the whole Upper Pliocene, which also occurs in the deposit Fosso Bianco. Forest coenosis derived from samples 21-23 shows the change of the climatic conditions under which the vegetation developed representing a warm and humid climate. The presence of the Tertiary relic forms indicates the boundary between the Pliocene and the Pleistocene, closer to the Middle Pliocene age. The assumptions made, concerning the age, however, are only conditional as they are based on incomplete palynological data due to the insufficient amount of material available for palynological studies.

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PLATE I

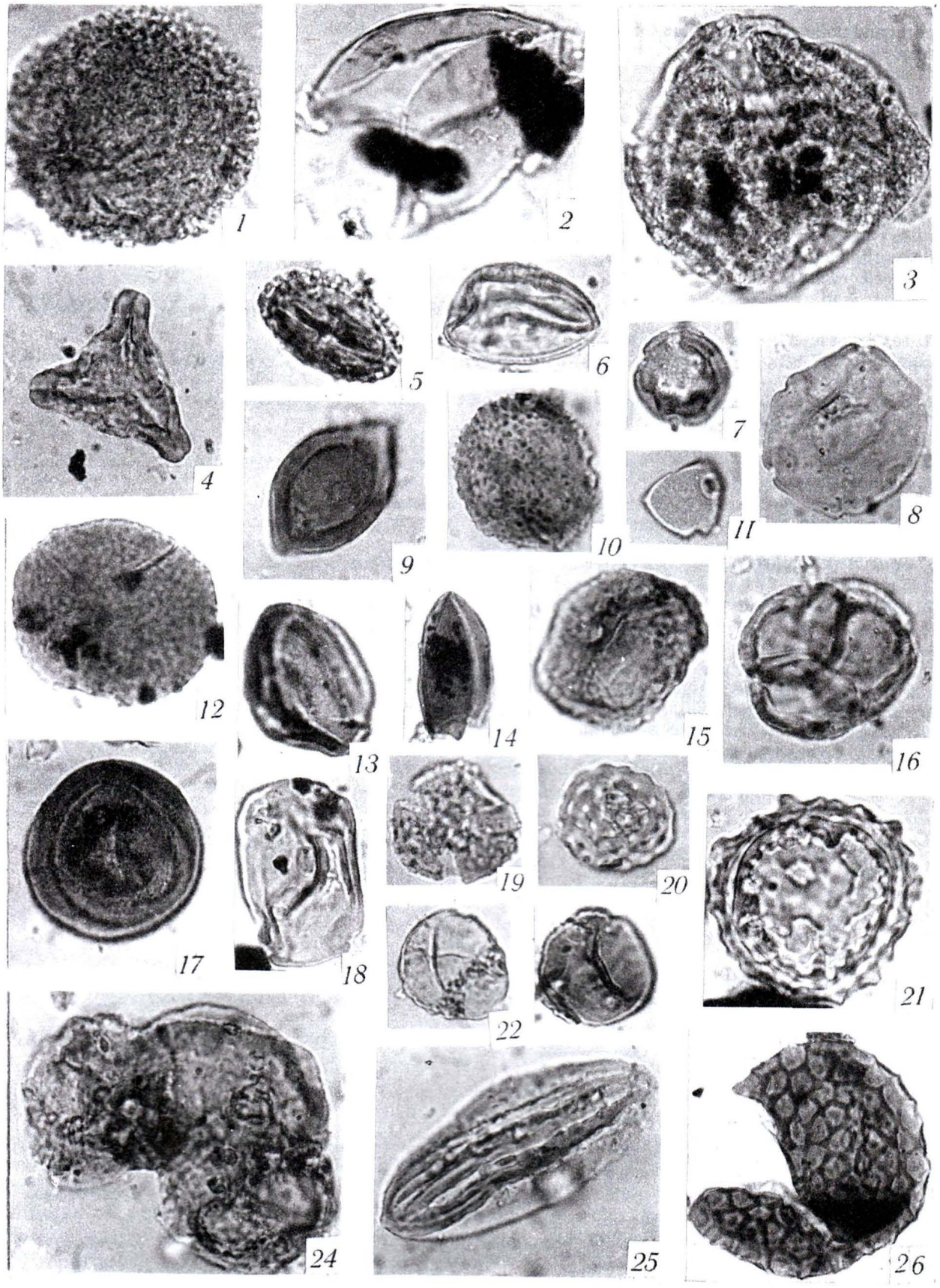

PLATE I

Spores and pollen grains from the section Fosso Bianco. All figures × 1000.
Sample 8
1. *Tsuga* sp.
2. *Taxodium* sp.
3. *Cedrus* sp.
4. *Elaeagnus* sp.
5. *Ilex* sp.
6. *Eucommia* sp.
7. *Liquidambar* sp.
8. *Pterocarya* sp.
9. *Itea* type
10. Caprifoliaceae
11. *Engelhardtia* sp.
12. *Quercus* sp.
13. Fagaceae
14. Taxodiaceae
Samples 19, 21
15. *Zelkova* sp.
16. Ericaceae
17. Spec. indet. (Gymnospermae)
18. *Reevesia* type
19. *Cornus* type
20. Chenopodiaceae
21. Filicales
22. Juglandaceae
23. *Carya* sp.
24. *Pinus*, type Diploxylon
25. *Ephedra* sp.
26. *Lycopodium* type