PALAEOBOTANICAL RESEARCHES IN THE WESTERN PART OF ROMANIA

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ABSTRACT

The paper presents a synthesis of the palaeobotanical researches from the western part of Romania, mainly Transilvania. The researches refer to the last 25 years namely to the Early Eocene -Late Pleistocene interval. Herein are discussed the respective floras and their succession as interpreted from a palaeoclimatic point of view after the method of the entire margined leaves percentage.

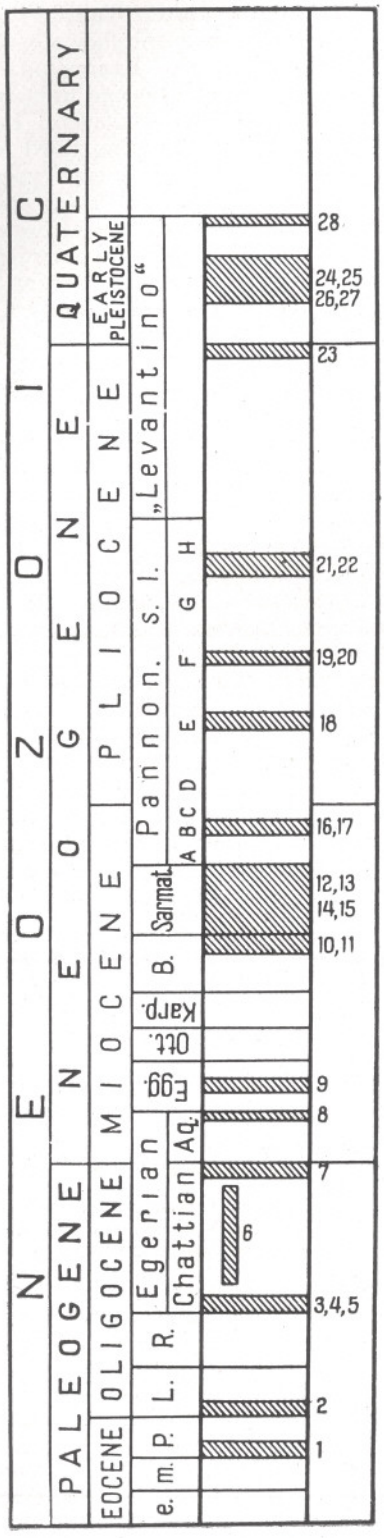
THE palaeobotanical researches effectuated in the Romanian regions from the inner parts of the Carpathians during the last 25 years led to discovery of several and well-preserved fossil floras. They belong to the Tertiary and cover, with an almost uninterrupted succession, the Early Eocene-Late Pleistocene interval. During this long period of time the following floras have been especially revealed: the Late Eocene one from Gîrbou, the Late Oligocene floras from Almas, Surduc and from Jiu Valley, the Early Miocene floras from Corus and Hida, the Miocene floras (Sarmatian) from several points, the Pannonian floras from Cornitel, Valea Neagra in the lower part, Delureni and Sarmasag in the middle and Chiuzbaia and Baița in the upper part of it. Finally to be noticed are the Rumanian's flora from Borsec add some Early Pleistocene floras from different outcrops. We shall try a brief characterization of the floras under discussion.

The flora from Gîrbou is situated at the base of the Early Eocene. It includes the vegetation of several biotops, its essential characteristic being the presence, in a great number, of xerophytic elements. In addition to these there are representatives of a mesophytic vegetation as well as some types of mangroves.

The flora from Almas is situated at the boundary of Middle Oligocene-Upper Oligocene. It is widely characterized by the presence in a great quantity of *Castanopsis*, *Dryophyllum* and *Quercus-Lithocarpus* that represent 35% of the whole vegetation. Thus they surpass by far the Lauraceae (6%), the Sapotaceae and the palms (4%). The flora still presents an undoubtful archaic character, but the presence, be it scarce, of the Rhamnaceae, Taxodiaceae and Juglandaceae is still a sign of an incipient change of content.

The flora from Surduc is from the late part of the Upper Oligocene. It presents, as compared to the preceding one, a very much modified biocoenosis, in which primarily noticeable is the appreciable reduction of the role of the exotic Fagaceae to 10%. On the other hand the role of the Lauraceae grows to 20%. In the end, the Juglandaceae (5%), Betulaceae (4%) and Ulmaceae appear as representatives of the first wave of the invasion of Turgaic elements. As a specific of the flora we must underline the presence of some xerophytic and mesophytic elements, representatives of a climate with a minimum of winter precipitation.

The flora from the Jiu Valley is assigned to the Upper Oligocene, respectively to the whole Chattian. This vegetation is either of peat bog or of regions temporarily flooded, or it is a question of some hilly vegetation. In the first case one may distinguish, on the basis of the studied remains, several types of marshy forests, from the one with *Taxodium* and *Glyptostrobus* to the dry peat bog with *Sequoia* and *Sabal*. The vegetation of the temporarily flooded regions consisted of *Acer tricuspidatum*, *Alnus nostratum*, *Quercus neriifolia* and *Carya* sp. As for the vegetation of the hillocks, it is prevalently composed of Lauraceae — *Laurophyllum* and



TEXT-FIG. 1

Daphnogene, Myricaceae, together with the Calamus-type palms, then *Lygodium*, *Blechnum* and *Smilax*.

The flora from Corus is situated in the last part of the Egerien (Upper Aquitan). It is composed of the representatives of certain biotops out of which the process of sedimentation has selected a certain material. From the point of view of composition it is remarkable with the Lauraceae going up to 22% while there is total disappearance of the exotic Fagaceae. But on the other hand there is the presence of *Pinus, Ulmus, Juglans, Liquidambar, Nyssa, Acer, Cornus*, which permits us to assert that in this flora the composition is considerably modified as compared to the earlier ones. The studied flora seems to be the result of an admixture of elements, on the one hand from boggy regions and on the other from a subtropical forest of Lauraceae.

The flora from Tihau is of the Eggenburgien age and differs very much from the former one through the fact that the association consist of Juglandaceae, Aceraceae, Ulmaceae, Betulaceae, Fagaceae, rare Lauraceae and Leguminosae. On the whole it presents strong comparison with the North American Atlantic flora.

The flora of the Badenien is more sporadically known, especially through fossil woods.

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TEXT-FIG. 1 — Geological succession of the fossil floras in the Western Part of Romania. **P**-Priabonian, **L**-Lattorfian, **R**-Ruppelian, **Aq**-Aquitanian, **Egg**-Eggenburg, **Ott**-Ottnangian, **Karp**-Karpatian, **B**-Badenian. **1,** Gîrbou (Petrescu *et al.*, 1976). **2,** Mera (Petrescu *et al.*, 1967). **3,** Almasu (Petrescu, 1968). **4, 5,** Clit, Jac (Petrescu, 1971). **6,** Jiu Valley (Givulescu, 1973). **7,** Surduc (Petrescu, 1967, 1968, 1969). **8,** Corus (Givulescu, 1968, 1969, 1970). **9,** Tihau (Petrescu, 1969). **10,** Pîncota (Givulescu, 1969). **11,** Fossil woods. **12,** Daia-Sacadat (Givulescu, 1975). **13,** Cavnic (Givulescu, 1971). **14,** Fizes (Givulescu & Nicorici, 1960). **15,** Luncsoara (Givulescu, 1951). **16,** Cornitel (Givulescu, 1957, 1976). **17,** Valea Neagra (Givulescu, 1962, 1975). **18,** Delureni (Givulescu, 1961, 1975). **19,** Sarmasag (Givulescu, 1964). **20,** Derna (Maxim & Petrescu, 1968). **21,** Baita (Givulescu & Rüffle, 1971). **22,** Chiuzbaia (Givulescu, 1969, 1973). **23,** Borsec (Pop, 1936). **24,** Baraolt (Petrescu, 1969). **25,** Biborteni (Givulescu, 1971). **26,** Miclusoara (Maxim & Petrescu, 1966). **27,** Bodos (Staub, 1881). **28,** Doboseni (Givulescu & Vasilescu, 1969, 1970).

The following taxa have been reported: *Taxodioxylon taxodii* Goth., *Piceoxylon* sp., *Alnoxylon* f.n., *Juglandoxylon* sp., *Pterocaryoxylon pannonicum* Müll. St. & Mädel, *Quercoxylon auriferum* Petr., *Quercoxylon* sp., *Laurinoxylon* sp. 1, 2, 3, *Laurinoxylon* cf. *muellerstolli* Mädel, *Perseoxylon* cf. *aromaticum* Fel., *Magnolioxylon transilvanicum* Nagy & Mîrza, *Magnolioxylon* sp., *Liquidambaroxylon speciosum* Felix, *Cornoxylon romanicum* Petr., *Platanoxylon porosum* (Felix) Petr., *Icacinoxylon* sp.

The floras of the early Sarmatian, although numerous enough, do not offer us a proper and sufficiently characteristic image of the level in discussion. In other words they do not reflect at all the aspect of the warm and dry climate characteristic for this interval of time in the Paratethys.

The floras of the Pannonian are very well known on an almost uninterrupted succession. We do not intend to discuss them separately. We have to deal with mixed forests of mesophytic type, rich in elements that flourished in the regions of hillocks at different heights and expositions. The best known are those from Delureni and Chiuzbaia, the former one because it has been studied from a palynological, cuticular and megascopic points of view; the latter also because of the same reasons, to which we must add the fact that it has been the object of more than 15 years' collection of material.

The floras from Cornitel, Valea Neagra and Delureni, though palaeontologically certified as belonging to the Pannonian, still present very important Miocene influences. In the first two still appear several Leguminosae, *Daphnogene*; in the third one, that of Delureni, there are several types of *Laurophyllum, Laurophyllites, Ocotea, Engelhardtia*, but there are also present *Sequoia, Glyptostrobus, Salix, Zelkova, Liquidambar, Castanea* and *Quercus*. An important and common characteristic of these floras is the absence of the roburoid oak trees. The progress from these floras to that of Chiuzbaia is obvious. This flora that comprises 182 taxa is now almost entirely deprived of Leguminosae and Lauraceae, but it is very rich in roburoid oaks. It is the representative of a *Fagus-Quercus-Carya-Carpinus-Zelkova* type forest with many bushes and *Vitis*. As palaeobotanical scarcities we cite: *Eucommia* cf. *ulmoides, Asimina browni, Cyclocarya cyclocarpa, Adiantum* cf. *reniforme* and *Pyrolaeanthus pseudosecundus*.

The flora from Borsec is situated in the upper part of the Rumanian (terminal Pliocene). It is of the same type as that from Chiuzbaia, differing from this in two aspects: the number of the roburoid *Quercus* is smaller and the number of Leguminosae with Miocene affinities is quite increased. It seems that this vegetation had a special, more conservative, character: it is less

TABLE 1

	Locality	Leaves		Climate
		Total	Entire (%)	
28*	Doboseni	14	16, 6	Cool temperate seasonally dry
27	Bodos	37	16, 2	,, ,, ,,
23	Borsec	55	30, 9	Warm temperate seasonally dry
22	Chiuzbaia	112	32, 15	,, ,, ,,
21	Baita	20	45	Warm temperate moist
18	Delureni	36	63, 3	Warm temperate wet
17	Valea Neagra	98	52, 03	Warm temperate moist
16	Cornitel	51	43, 2	,, ,, ,,
12	Daia-Sacadat	16	62, 2	Warm temperate wet
9	Tihau	20	55	Warm temperate rain
8	Corus	30	70	Tropical seasonally dry
7	Surduc	49	63, 2	,, ,, ,,
4, 5	Clit, Jac	31	58, 06	,, ,, ,,
3	Almas	27	62, 9	,, ,, ,,
1	Girbou	42	61, 91	,, ,, ,,

*See also Text-fig.1.

evolved than it should be as for the geological level in which it is found.

The floras of the Early Pleistocene are rich and variously represented, their modernisation going on from case to case. Taking as a criterion the percentage of North-American-Atlantic phytogeographic elements, we shall notice that in the flora from Miclusoara we still have 12% such elements, while in that of Doboseni this element has totally disappeared. We consider that this flora can be placed at the upper part of the Early Pleistocene. As a curiosity we should like to underline the presence of *Banisteriaecarpum giganteum* and *Buettneriophyllum tiliaefolium* down to the Early Pleistocene.

In the end of the above mentioned considerations we should like to present a less investigated aspect of this succession of vegetation. We mean the percentage of entire margined leaves and the climatic aspect that is inferred. We consider that the succession under discussion is very well suited for such a study and interpretation. The results are presented in Table 1, where we have also included the climates under discussion after Dilcher (1973).

REFERENCES

DILCHER, D. D. (1973). A paleoclimatic interpretation of the Eocene floras of Southeastern North America. Vegetation and vegetational history of Northern Latin America. Amsterdam.

GIVULESCU, R. (1960). Die fossile Flora Rumäniens. *Ber. geol. Ges. D.D.R.*, **5**, **4**.

GIVULESCU, R. (1966). Die fossile Flora Rumäniens-erste Ergänzung. *Ber. Deutsch. Ges. Geol. Wiss. A.*, **11**, **3**.

GIVULESCU, R. (1973, 1974). Die fossile Florä Rumäniens, zweite Ergänzung. *Z. Geol. Wiss.*, **1**, **8** & **2**, **2**.