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QUERCUS GIVULESCUI SP. NOV. (FAGACEAE) IN THE FOSSIL FLORA FROM CHIUZBAIA, MARAMUREŞ COUNTY, ROMANIA

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Abstract: The fossil plants assemblages from Chiuzbaia are located in the north part of the Baia Mare, on the southern slope of Igniş Mountain, at 800 m altitude. This fossil flora is of Pannonian age. The sample fossil material comes from the diatomite outcropping of the Izvorul Plopilor creek (fossil point F). *Quercus givulescui* (*Fagaceae*) represent new species for the Chiuzbaia fossil flora. It's a simple leaf, with an elliptic form, almost complete, well preserved with lamina and a normal petiole. It is a leaf with a lobed margin. The venation type is simple, craspedodromous. It's the biggest fossil leaf found at Chiuzbaia till present (98.85 cm^2, mesophyll). In the Pannonian domain, based on the K-Ar ages, the fossil flora from Chiuzbaia, can be included between the Sarmatian fossil flora from Felsötárkány and Pannonian fossil flora from Tiszapalkonya and Dozmat (Hungary). *Quercus givulescui* has a good resemblance with the current species *Quercus cataneaefolia*. It's a medium height tree that vegetates both in riparian forests and in mesophytic forests. *Quercus givulescui* has the name of the Romanian paleobotanist R. Givulescu, who had studied the Miocene fossil flora from Chiuzbaia for more than 20 years.

Key words: *Quercus givulescui, Fagaceae*, fossil plants, Central Paratethys, Pannonian, Chiuzbaia, Romania.

1. INTRODUCTION

The fossil plants assemblages from Chiuzbaia are situated in the Maramureş County, in the North-West part of Transylvania. The richest flora is in the Central Paratethys, concerning the number of genera and families and the number of new species for the fossil flora of Romania and Europe. From the point of view of its richness, it has no equivalent in the Paratethys fossil floras, being more comparable to the rich Neogene floras of Willershausen and Oehningen from Germany.

The most important studies of fossil flora from Chiuzbaia have been made by Givulescu between 1963 and 1990, when he published a series of works. Previous studies have been made by Staub (1885), Polonic & Polonic (1963), and later studies by Macovei (1995, 1996, 1998, and 2006).

2. GEOGRAPHIC AND GEOLOGIC SETTINGS

Chiuzbaia is situated near the City of Baia Mare (Fig. 1). Fossil plants assemblages are located in the north part of the region, on the southern slope of Igniş Mountain, at 800 m altitude.

Figure 1. Location of Chiuzbaia on the map of Romania

The region consists of lava flow, necks and volcanic breccias. Above the lava flows and under the upper volcanic breccias, appear intercalations made up of an alternation of finer or rougher tuffs and more or less compacted or even slightly metamorphosed diatomite, which contains an impressive number of fossil plants.

3. AGE

No animal fossils exist that would be able to date the diatomite in question. The K-Ar ages, obtained on the whole segment of Gutai Mountains (Pécskay et al. 1994, 1995) shows us the complexes of andesite of Chiuzbaia – Baia Sprie, 10.9 – 10.1 M.a. If we take into consideration the lake, where the diatomite has been deposited with impressions of leaves, contemporary with the volcanic activity, it would mean that fossil plants have the Pannonian age. This age seems to be confirmed also by the presence of typical azonal association of pannonian swamp with *Alnus cecropiaefolia*, *Alnus guadini*, *Glyptostrobus europaeus, Byttneriophyllum tiliifolium* and *Osmunda parschlugiana.* We can find this association in Hungary, at Tiszapalkonya and Dozmat (Erdei et al. 2007).

4. THE SAMPLE DESCRIPTION

The sample fossil material results from the diatomite outcropping of the Izvorul Plopilor creek, marked by Givulescu in 1990, under the name of fossil point F. Today the sample can be found in the geology laboratory of the North University of Baia Mare.

4.1. Systematics

Order **FAGALES**
Family **Fagaceae**
Genus **Quercus** Linné 1753
Species ***Quercus givulescui*** Macovei 2011
Plate I. Fig. 1 and Fig. 2.

Holotype: Plate I, Fig.1. inventory no.116, geology laboratory of the North University of Baia Mare.

Paratypes: Plate II, Fig. 1 and Fig.2.

Age: Pannonian.

Type locality: Chiuzbaia, Maramureş County, Romania.

Etymology: dedicated to professor R. Givulescu.

4.2. Description

- Leaf shape

It's a simple leaf, with an elliptic form, almost a whole, well preserved with lamina and a normal petiole.

Lamina: it's a symmetrical lamina, with symmetrical base. The length-width ratio is 2.1:1.

Apex: it's acute; it has an angle of $< 90^0$.

Base: it's acute; it has an angle of $< 90^0$

- Form of leaf margin

It is a leaf with a lobed margin (9 lobes were identified, from which three are integral). Each lobe develops quite symmetrical towards the secondary vein. The lobes have a triangular with acute apical angle, straighten towards out or readily sloping upside. Sinuses are rounded and not very depth and opened at 62^0. Apical side and basal side are convex.

- Types of venation

It's simple, craspedodromous. The primary vein is obvious, lightly curved in the lower third inferiority and with a slight tendency to the angle. The secondary veins are acute ($< 80^0$), moderates, having an angle of divergence of 62^0, that decrease toward the angle, alterns, rights and almost parallels. It can be distinguished a number of 12 secondary veins, without notable deviations. The tertiary veins can't be determined.

- Leaf's biometry

Lenght: 20.5 cm
Width: 8.5 cm
Height of the maximum width: 12 cm
Angle's lenght: 2cm
Angle's thickness: 3.9 cm
Sinus' depth: 1.2 cm
Lobe's lenght: 1.1 cm
Surface: 98.85 cm^2, mesophyll.

It's the biggest fossil leaf found at Chiuzbaia, till present. This aspect is crucial if we consider that in the fossils layer, the mesophyll leaves percentage is only 9,08%, compared to notophyll leaves – 27,82% and the microphyll leaves – 61,3% (Givulescu, 1990).

5. DISCUSSION

In the Pannonian domain, based on the K-Ar ages, the fossil flora from Chiuzbaia can be included between the Sarmatian fossil flora from Felsötárkány and Pannonian fossil flora from Tiszapalkonya and Dozmat (Hungary). The flora of Felsötárkány represents a transitional type to the younger Pannonian floras (including characteristic elements of both Sarmatian and Pannonian flora, Erdei et al. 2007). In the fossil flora from Chiuzbaia we observe a dominance of *Quercus* species similar to that recorded in the Sarmatian volcanic assemblages. Among *Quercus* species from Chiuzbaia and this we can see remains of the thermophilous or "exotic" elements like *Quercus drymeja/Q. mediterranea* with fewer elements of the *Lauraceae* and *Daphnogene*.

Common to many Pannonian fossil floras is the presence of monotonous azonal association (swamps) of *Glyptostrobus europaeus, Alnus cecropiifolia* and *Byttneriophyllum tiliaefolium* (e.g. Dozmat, Tiszapakolnya, Rudabánya, Erdei et al. 2007, and Chiuzbaia).

PLATE I

Figure 1.

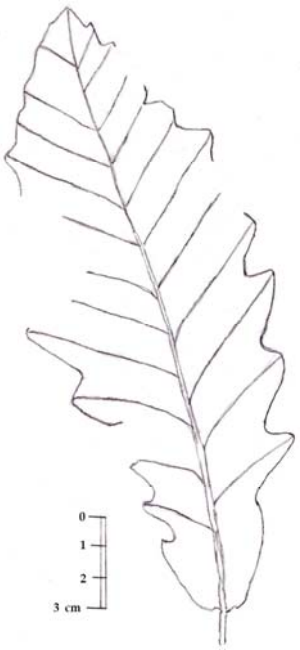

Figure 2.

PLATE II

Figure 1.

Figure 2.

On this idea contrary to other Pannonian floras where swampy areas increased, which provided unfavorable conditions for de expansion of mesophytic forests, this type of forest is well represented at Chiuzbaia (mixed mesophytic forests with *Fagus, Quercus, Acer, Carpinus, Carya*). The existence of areas allowing extension at mesophytic forests is more likely the result of palaeogeographyc conditions.

Compared with Pliocene floras at Gérce and Pula (Hungary) we observe the absence of *Quercus pseudorobur* from fossil flora assemblage at Chiuzbaia. It's also interesting the comparison of entire leaves margin (Gérce 29%, Pula 21%, Hably & Kovaček, 1998 and the Chiuzbaia 30,95%, Macovei & Givulescu, 2006).

In the Tertiary Forests of Transylvania *Quercus* species are present in three morphotypes (Givulescu, 1997). First is the lauroid morphotype having the entire leaves margin, e.g. *Quercus neriifolia* (missing in Chiuzbaia). Second morphotype includes *Quercus* with serrated leaves margin, e.g. *Q. mediterranea/Q.drymeja, Q. cf. granditentata, and Q.*

pontica. Third morphotype is represented by *Quercus* with lobate leaves margin. *Qercus givulescui* besides *Q. cerris, Q. kodorica, Q. macrantheroides, Q. kovátsi, Q. praeprinus, Q. baikovskaiae, Q. irregularis, Q. ignisensis* and *Q. muehlenbergi* are a part of the third group.

6. PALAEOECOLOGY

Palaeoecological conditions of *Quercus givulescui,* as all the fossil plant assemblage from Chiuzbaia, can be identified by the ecological requirements of the current correspondence species. *Quercus givulescui* has a good resemblance with the actual species *Quercus cataneaefolia*, described by Meyer, in 1831. This species of oak lives in the southern and south-eastern part of the Caspic region, Iran, Caucaz and in the mountains of Algeria. It's a medium height tree that vegetates both in riparian forests and in mesophytic forests.

The riparian forest from Chiuzbaia was made (besides *Quercus givulescui*) of these elements: *Quercus baikovskaiae*, *Q. praeprinus*, *Liquidambar eoropaea, Alnus guadinii, Populus latior, P. gigantea, Junglans acuminata, Carya serraefolia, Betula papyrifera, Fraxinus cf. pennsylvanica, Aesculus sp.*

Quercus cataneaefolia is characteristic for the vegetation on the Talysh Mountain (southern coast of the Caspian Sea, Republic of Azerbaijan) and it consists of *humid oak forests,* rich in relic and endemic species (McGinley, 2007). This area is characterized by warm, humid summers and cool winters (Cfa or Cwa, Köppen climate classification).

7. CONCLUSIONS

Quercus givulescui has its name from the Romanian paleobotanist R. Givulescu. The sample fossil material results from the diatomite layer of the Izvorul Plopilor creek. It's a simple leaf, with an elliptic form, almost complete, well preserved, with lamina and a normal petiole. It is a leave with a lobed margin. (9 lobes were identified from which three are integral). It's the biggest fossil leave, found at Chiuzbaia, till present (mesophyll). *Quercus givulescui* has a good resemblance with the current species *Quercus cataneaefolia*, Meyer 1831. It's a medium height tree that vegetates both in riparian forests and in mesophytic forests.

Quercus givulescui (Macovei 2011), along with *Quercus ignisensis* (Givulescu 1970) and *Quercus irregularis* (Givulescu 1979) represent new species for the Chiuzbaia fossil flora assemblage.

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