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The Genus Disanthus (Hamamelidaceae) from Sarmatian and Meotian Deposits of Georgia

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(Presented by Academy Member Abesalom Vekua)

ABSTRACT. On the territory of Georgia the fossil remains of the genus Disanthus are represented only by pollen grains from Sarmatian and Meotian deposits. Two types of grain are determined: large and small. According to morphological features the large grains are similar to the recent species *Disanthus cercidifolius* Maxim. The small grains are considered as its variation and are given under the name *D. cercidifolius* Maxim. var. *minor* Shatilova et Mchedlishvili. *© 2011 Bull. Georg. Natl. Acad. Sci.*

Key words: *pollen grains, Disanthus, Sarmatian, Meotian, Georgia.*

The Hamamelidaceae is an important family in the phylogeny of angiosperm plants [1]. This is an ancient taxon considered by many researchers [2, 3] as a link connecting Trochodendrales with the amentiferous orders Casuarinales, Urticales and Fagales. The family comprises 30 genera. Among them 12 are monotypic, of which Disanthus is considered to be most ancient [4]. At present it is a relict plant with a narrow area in Japan and China. It is a shrub growing in mountains to 1000 m above sea level [5. 6]. The genus is represented by only one species *D.cercidifolius* Maxim. and its variation *D.cercidifolius* Maxim. var.*longipes* Chang. They are considered to be geographical races – Japanese and Chinese, whose pollen differ in size [7]. However, in the work: "A Generic Atlas of Hamamelidaceous Pollens" [8] nothing is said about the existence of two races of Disanthus with different pollen grains.

On the territory of Asia the earliest fossil finds of the genus Disanthus are the macroremains of plants from Upper Cretaceous deposits (Fig.1). The leaves of *D.longipediolatus* Vas. et Abr. were described from Coniacian deposits of the Siberian Plain [9]. The species *D.niponica* Tanai was determined from Paleogene deposits of Japan. In the fossil flora of this country the genus is preserved to the Middle Miocene [10, 11].

In Europe the species *D.austriacus* Knobl. et Mai and *D.hercinicus* Knobl.et Mai were described according to macroremains from Upper Cretaceous deposits [12]. The seeds of the latter were described also from Paleocene deposits [13]. The remains of the species *D.bavaricus* Gregor are known on the territory of Europe from the Eocene to the Middle Miocene [14, 15].

The most ancient fossil palynomorphs belonging to the family Hamamelidaceae were found in Early Cretaceous. Palynologists call the fossil pollen Retitricolpites, consisting of three genera: Hamamelis L., Corylopsis Sieb.et Zucc. and Fothergilla Murr. Retitricolpites is a primitive type among angiosperms, but it is younger than Clavatipollenites - the earliest fossil pollen of this group of plants. It is supposed that the pollen of Hamamelidaceae evolved from this taxon [1].

The data on the fossil pollen of Disanthus begin from the Paleogene (Fig.1). Microphotographs of pollen grain from the Paleocene deposits of New Siberian Islands are given in the work of Kuprianova [16]. To the genus Disanthus can also be referred the grain from Oligocene deposits of

Southern Primorye, determined as "unidentified pollen" [17]. On the territory of Western Europe the pollen of Disanthus was found in Early and Middle Miocene deposits of Central Paratethys and in Spain. The genus is considered as a mega-mesothermic plant [18, 19].

In Eastern Europe from Miocene deposits of the Russian Plain and Kerch Peninsula two forms have been described: the species *D.kuprianova* Anan. and its variation - *D.kuprianova* Anan. var. *minor* Anan. The pollen grains of these forms differ mainly by sizes of equatorial diameter [9].

In Georgia the genus Disanthus is known from Sarmatian and Meotian (Upper Miocene) deposits (Fig.1).

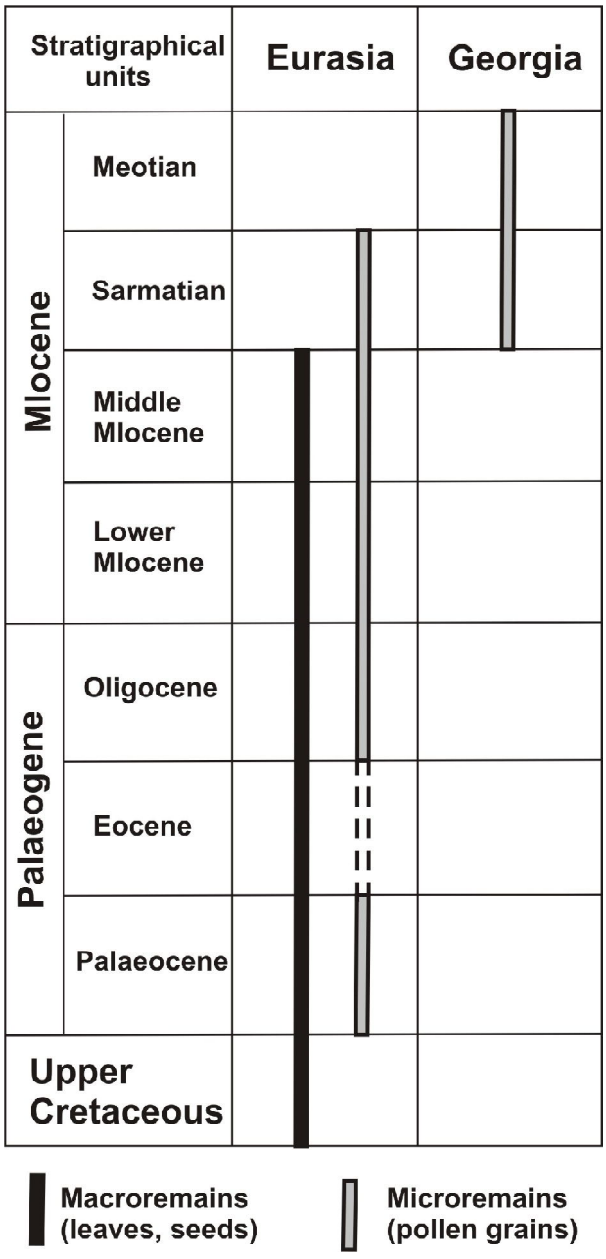

Fig. 1. The stratigraphical distribution of fossil remains of the genus Disanthus

At first pollen grains were discovered in the western part of the country and determined as *Disanthus* sp. [20, 21]. Later the analysis of new material allows to describe it as *D.*aff.*cercidifolius* Maxim. [22]. In Sarmatian deposits of Eastern Georgia two types of pollen were found: large and small. On the whole, all grains of Disanthus from Sarmatian deposits of Georgia belong to tricolpate pollen with operculum, which, in the family Hamamelidaceae, is characteristic only of this genus [1].

The great pollen grains are of 40-50ì in diameter. The colpi are wide, deep, with sharp ends (Fig.2). The operculum is wide on the equator getting narrower towards the pole. Exine is 1.5-2.0ì, reticulate. There are visible separate bacula on the operculum surface.

We compared the large pollen of Disanthus with the fossil species *D.kuprianova* Anan. [9] and recent *D.cercidifolius* [7]. Our form reveals the greatest similarity with recent species, especially it concerns the grains from Eastern Georgia (Fig.2, photo 1). The pollen from Western Georgia (Fig.2, photos 2, 3) are distinguished both by greater sizes of equatorial diameter and operculum, which in some grains occupy nearly the whole width of colpi. Besides, on grains from Western Georgia the sculpture is thinner. Such differences between the pollen grains of recent Disanthus are within the limits of specific variability [7, 9].

On the basis of the above data and on the nearly similar morphology of recent and fossil pollen of Disanthus described from different localities, the large type of grains we referred to species *D.cercidifolius* Maxim. In Sarmatian it was distributed on the territory of Western and Eastern Georgia. In the Meotian *D.cercidifolius* was preserved only in Western Georgia.

The small pollen grains of Disanthus are 19-20ì in diameter (Fig.2, photos 4-8). By other features they are similar both to recent and fossil species and to their variations. Also attention should be paid to the fact of limited distribution of the small pollen, concentrated mainly in Upper Sarmatian deposits of Eastern Georgia. Taking these data into consideration we distinguished them under the name *D.cercidifolius* Maxim. var. *minor* Shatilova et Mchedlishvili.

The Late Sarmatian was the time when as a result of orogenic movements the Transcaucasian depression transformed into dry land with two different regions. In the West the isolated province of the so-called Colchis refugium originated - with warm and humid climate, promoting the development of rich subtropical flora. In the East the process of xerophytisation began. The area of forest reduced and big territories were covered with woodless areas, the main components of which were herbs

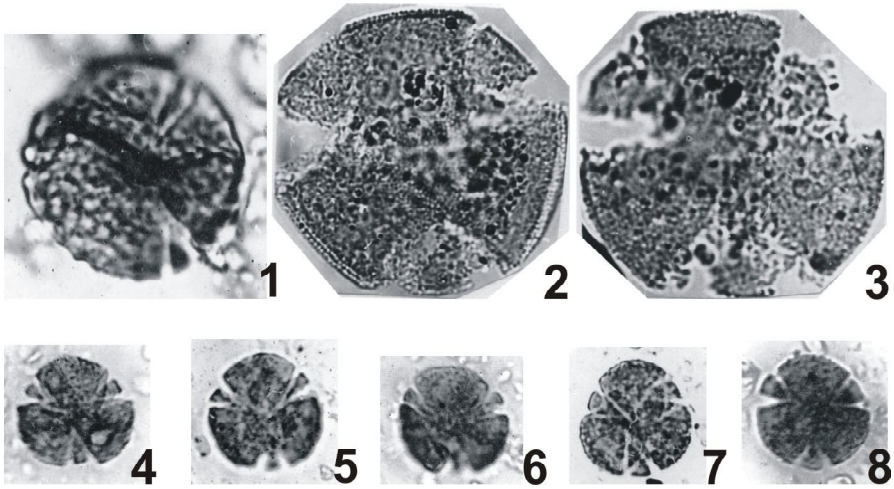

Fig. 2. The fossil pollen grains of Disanthus from Sarmatian and Meotian deposits of Georgia: 1 – *D.cercidifolius* from Sarmatian deposits of Eastern Georgia; 2 – *D.cercidifolius* from Sarmatian deposits of Western Georgia; 3- *Disanthus cercidifolius* from Meotian deposits of Western Georgia; 4-8 - *D.cercidifolius* var.*minor* from Sarmatian deposits of Eastern Georgia.

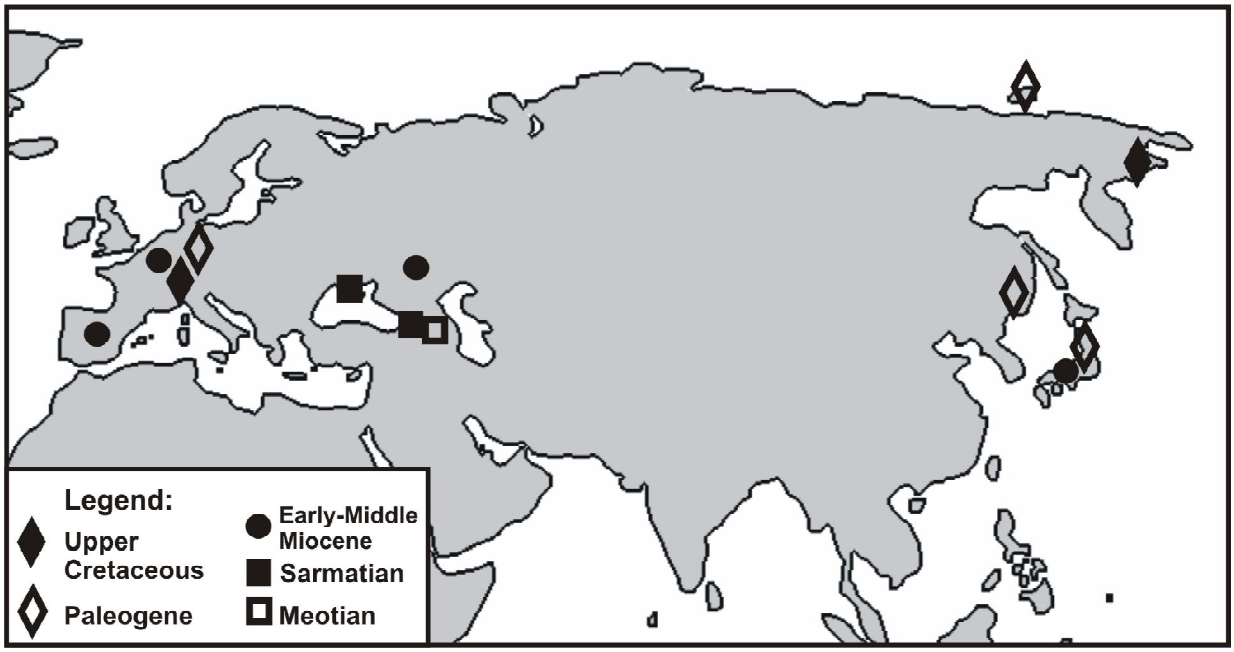

Fig. 3. Distribution of fossil remains of the genus Disanthus in Eurasia

and shrubs. Among the shrubs there probably was Disanthus, which produced small pollen grains, being the result of dry climate conditions unfavorable for this genus.

So, the analysis of literary materials and own data allows to trace the history of the genus Disanthus. On the territory of Eurasia it appeared in the Upper Cretaceous. In the Paleogene, Early and Middle Miocene the genus reached the highest development. In younger deposits Disanthus was preserved in the south regions of Eastern Europe and in the Transcaucasus (Fig. 3).

In the Sarmatian on the territory of Georgia Disanthus was represented by the species *D.cercidifolius* Maxim. and its variation, which developed in conditions of the unfavorable dry climate of Eastern Georgia in the Late Sarmatian.

In the Meotian *D.cercidifolius* is known only on the territory of Western Georgia. Together with other subtropical forms it became extinct from the composition of Colchis flora on the boundary of the Meotian and Pontian, when the first sharp change of climate connected with the decrease of humidity and temperature took place [23].

პალეობიოლოგია

გვარი Disanthus (Hamamelidaceae) საქართველოს სარმატული და მეოტური ნალექებიდან

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საქართველოს ტერიტორიაზე გვარი Disanthus-ის ნამარხი ნაშთები წარმოდგენილია მხოლოდ მტვრის მარცვლების სახით სარმატული და მეოტური ნალექებიდან. განსაზღვრულია ორი ტიპის მარცვლები: დიდი და მცირე ზომის. დიდი ზომის მარცვლები მორფოლოგიური თვისებების მიხედვით მიეკუთვნება თანამედროვე სახეობას - *Disanthus cercidifolius* Maxim. პატარა ზომის მარცვლები განიხილება როგორც აღნიშნული სახეობის გეოგრაფიული ვარიაცია და მოცემულია შემდეგი სახელწოდებით - *D.cercidifolius* Maxim. var. *minor* Shatilova et Mchedlishvili.

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