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RESULTS OF THE PALEOBOTANICAL RESEARCHES AT THE TERRITORY OF THE NAKHCHIVAN AUTONOMOUS REPUBLIC OF AZERBAIJAN

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ИТОГИ ПАЛЕОБОТАНИЧЕСКИХ ИССЛЕДОВАНИЙ ТЕРРИТОРИИ НАХЧЫВАНСКОЙ АВТОНОМНОЙ РЕСПУБЛИКИ АЗЕРБАЙДЖАНА

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Abstract. The article indicates the results of paleobotanical research in the territory of the Nakhchivan Autonomous Republic of Azerbaijan. Materials for fossil plants in the territory Nakhchivan Autonomous Republic show that the development of the Mesophytic era covers the Permian, Triassic, Jurassic, Cretaceous, during which existed Neomesophyte and Palaeomesophyte flora. Cenophytic era covers Paleogene, Neogene and Quaternary period. Flora of Nakhchivan Autonomous Republic relates to Mesophytic and Cenophytic era. Modern vegetation of the region is dominated by open and semi-open coenosis i.e. rather primitive in its phytocenotic essence. These xerophilous coenosis have deep ancient roots of its origin. Flowering flora originated on the globe in the first half of the Cretaceous period. The oldest plant residues, which are known in Nakhchivan Autonomous Republic, refer to the end of the Cretaceous period. Found that modern flora and vegetation of their origin, above all, connected with the ancient Iranian, mainly Asia Minor or North Iranian flora penetrated here with Tertiary and being penetrated at the moment. From the more important temperate eastern slopes of the Lesser Caucasus in the Tertiary period, the study area was fenced off by the high perched Kongur-Alangez mountains and Zangezur.

Аннотация. Представлены результаты палеоботанических исследований на территории Нахчыванской Автономной Республики Азербайджана. Материалы по ископаемым растениям на территории Нахчыванской Автономной Республики показывают, что развитие мезофитовой эры охватывает пермь, триас, юру, мел, в которой существовали неомезофитовая и палеомезофитовая флоры. Кайнофитовая эра охватывает палеоген, неоген и четвертичный период. Флора растительного мира Нахчыванской Автономной Республики относится к мезофитовой и кайнофитовой эрам. В современной растительности данного региона преобладают открытые и полуоткрытые ценозы, т. е. довольно примитивные по

своей фитоценотической сущности. Эти ксерофильные ценозы имеют глубокие древние корни своего происхождения. Цветковая флора возникла на земном шаре в первой половине мелового периода. Наиболее древние растительные остатки, которые известны в Нахчыванской Автономной Республике, относятся к концу мелового периода. Установлено, что современная флора, а также растительность своим происхождением, прежде всего, связана с древней иранской, преимущественно североиранской или малоазиатской флорой, проникавшей сюда с третичного периода и проникающей в настоящее время. От более влажных умеренных восточных склонов Малого Кавказа уже в третичный период исследуемый регион был отгорожен взгромоздившимися высочайшими горами Конгур-Алангеца и Зангезура.

Keywords: Nakhchivan Autonomous Republic, Mesophytic era, Cenophytic era, plant residues, flora, fossil plants.

Ключевые слова: Нахчыванская автономная республика, мезофитовая эра, кайнофитовая эра, растительные остатки, флора, ископаемым растения.

The Nakhchivan Autonomous Republic differs from other physical-geographical regions of Azerbaijan in its sharply continental climate. The main factors shaping the climate of the region are the abundance of solar radiation, the complexity of atmospheric circulation and the wide variety of relief. The rich xerophytic flora of the Nakhchivan Autonomous Republic has historically developed and was formed in close genetic connection with the flora of the Mediterranean Sea, Western Asia and Iran. Continental, sharply continental climate and high volatility in Nakhchivan does not exist in Azerbaijan and in general in the Caucasus [1], therefore, more than half of the flora of this region is xerophytic plant species [2].

As a result of floristic studies carried out in recent years, it turned out that in the modern biodiversity of the flora of the Nakhchivan Autonomous Republic, higher spore plants, gymnosperms and angiosperms are represented by 160 families, 910 genera and 3021 species [3].

The issues of the study of fossil plants of the Nakhchivan Autonomous Republic were engaged many prominent scientists, such as [4-18], and others. They found that modern flora and vegetation of the Nakhchivan Autonomous Republic was formed under the influence of natural history, environmental and anthropogenic factors after the long evolutionary path of development. Found the most ancient plant remains date from the late Cretaceous period. Location of some interesting representatives of the fossil floras of Nakhchivan Autonomous Republic *Sequoia reichenbachi* (Heer, 1868), *Brachyphyllum araxanum* I. Pal., *Populus hyrcanica* I. Pal., *Pteris pennaeformis* Heer, *Zelkova araxina* Palib., *Parrotia fagifolia* (Goeppert) Heer, *Pisonia eocenica* Ettingsh., *Eugenia bogatschhevii* Palib., *Palibinia nachitschevanica* Kassum., *Cinnamomum lanceolatum* Ung. are Daridag, Duzdag, Avush, Kultepe etc. The phylogenetic scheme indicates that the lower plants (Thallophyta) developed from primary colorless heterotrophic organisms (Bacteria, Fungi, Myxomycetes, Lichenes, Cyanophyta, Rhodophyta, Pyrrophyta, Euglenophyta, Chlorophyta, Charophyta, Chrysophyta, Xanthophyta, Phaeophyta, Bacillariophyta).

The development of higher plants (Telomophyta) A. N. Krishtofovich divides into four eras: Thalassophytic (sea flora), Palaeophytic, Mesophytic and Cenophytic [11, 12, 19].

Thalassophytic era of development of plants covers the whole Pre-Cambrian, Cambrian, Ordovician and Silurian part, during which there phycomycophytic flora (flora of bacteria, algae and fungi). Palaeophytic era covers part of the Silurian, Devonian, Carboniferous period, during which there were existing Anthracophytic and Psilophytales flora, in which there was

Palaeocenophytic flora. Available materials for fossil plants in the territory Nakhchivan Autonomous Republic show that the development of the Mesophytic era covers the Permian, Triassic, Jurassic, Cretaceous, during which existed Neomesophyte and Palaeomesophyte flora. Cenophytic era covers Paleogene, Neogene and Quaternary period. Flora of Nakhchivan Autonomous Republic relates to Mesophytic and Cenophytic era. Modern vegetation of the region is dominated by open and semi-open coenosis i.e. rather primitive in its phytocenotic essence. These xerophilous coenosis have deep ancient roots of its origin. Flowering flora originated on the globe in the first half of the Cretaceous period.

The oldest plant residues, which are known in Nakhchivan Autonomous Republic, refer to the end of the Cretaceous period. For the Upper Cretaceous period in Nakhchivan Autonomous Republic plant remains found by N. I. Yakovlev near to Avush village of Daralageze in Sharur region and were treated by I.V. Palibin [5-7]. Finding the Cretaceous deposits in the region indicates that the Cretaceous period modern South Caucasus does not constitute a continuous water basin, but that there existed more or less considerable size of the islands. At this point, the following balances were found: *Sequoia reichenbachii* (Heer, 1868), *Brachyphyllum araxanum* I. Pal., *Araucaria sp.*, *Protodammara angusta* I. Pal., *Populus hyrcanica* I. Pal., *Dryanora jakovlevi* I. Pal., *Platanus velenovskyana* Krasser. The *Sequoia* genus with many kinds of very characteristic of Cretaceous at all (*S. reichenbachii* (Heer, 1868)).

One of the most common types, *Brachyphyllum*, conifer with not yet established position in the system, is very characteristic of the Cretaceous flora. *Platanus* is one of the oldest forms of bipartite, *Populus* — known even from the Lower Cretaceous.

It originated in the high latitudes and spread to the south. At the end of the Mesozoic era (Cretaceous) Southern Transcaucasia was an island (or islands of the system), lapped by the waters of the vast space of the ancient Tethys.

Land of the Southern Caucasus was associated with a vast continent of Asia Minor, the Balkan Peninsula and Central Europe. The vegetation of the local land was of a peculiar character of the forest vegetation, dramatically different from today's forests and especially from modern xerophilous coenosis edge. According to I. V. Palibin [6, 7], in the river basin of Araz, at the Eastern Arpachay river and its tributaries, there was a forest-type vegetation. In addition to Plane Trees (*Platanus velenovskyana* Krasser) there also indicated the remains of broadleaf species poplar (*Populus hyrcanica* I. Pal.) and shrubs *Dryanora jakovlevi* I. Pal. As well as several species of conifers, already endangered in the Cretaceous *Brachyphyllum araxanum* I. Pal., *Araucaria sp.*, *Protodammara angusta* I. Pal. and in addition, it is very common in the Cretaceous of the Old and New Worlds *Sequoia* (*Sequoia reichenbachii* (Heer, 1868)).

Information about Eocene flora are reflected in some the geological works for Alindzhachay (Daridag) location of fossil plants. A. N. Krishtofovich [11] for Julfa indicates two fossil plants fan-leaved palms: *Pteris pennaeformis* Heer and *Osmunda sp.* In 1934, the Geology Sector of Azerbaijan Branch of the Academy of Sciences of USSR, found Eocene rich flora in the Daridag mountain. In this flora were numerous palms, ferns and magnolias. With the onset of the Tertiary period there was a great change of physiographic conditions on the continents. Consequently, there comes a new change of vegetation, the extinction of ancient and new forms.

A stretch of water of the Tethys washed the islands of Caucasus, stretching far to the east and west. In these circumstances, on land developed vegetation composition close to vegetation of warm humid countries. Thus, the plant remains of that time, found in the territory Nakhchivan Autonomous Republic dramatically different from modern xerophilous plants.

The Eocene sediments of Daridag mountain, contain prints of fan palms, and in the same location found by I. V. Palibin [5-7] *Blechnum braunii* Ett., *Pteris oeningensis* Heer, *Sabal*

haeringiana (Heer) Ung., *Podocarpus eocenica* Ung., *Cinnamomum lanceolatum* Ung., *C. sezannense* Watt, *C. scheuchzeri* Heer, *C. rossmaesleri* Heer, *Zelkova araxina* Palib., *Pisonia eocenica* Ettingsh., *Mirka Myrica hakeaeifolia* (Ung.) Staub., *Ziziphus ungeri* Heer, *Eugenia bogatschhevii* Palib. One can imagine the splendor and uniqueness of the forest vegetation of the Eocene. Lush vegetation, which has much in common with tropical vegetation such as the neighboring islands of the Main Caucasian, covered with spots and Caucasus Minor islands. In 1934, an employee of Botany sector of Azerbaijan Branch of the Academy of Sciences of USSR L. I. Prilipko found *Taxodioxyton distichum* Merckl., in the Oligocene sediments of Kechaldag near the lake Ganligel of Shahbuz area which was determined by A. V. Yarmolenko [10].

In 1934-1936 V. V. Bogachev and K. N. Paffengoltz discovered leaf imprints in Daridag mountain in dense gray tuff sandstone Oligocene [2, 4, 9]. Material collected by these researchers, has been transferred for processing by I.V. Palibin, who identified and described the following types of fossil plants from this collection: *Pteris oeningensis* Heer, *Blechnum braunii* Ett., *Podocarpus eocenica* Ung., *Panicum miocenicum* Ett., *Sabal haeringiana* (Heer) Ung., *Myrica hakeaeifolia* (Ung.) Staub., *Zelkova araxina* Palib., *Cinnamomum scheuchzeri* Heer, *C. sezannense* Watt, *C. polymorphum* (A. Br.) Heer, *C. lanceolatum* Ung., *Eugenia bogatschhevii* Palib., *Pisonia eocenica* Ettingsh., *Banisteria haeringiana* Ett., *Leucothoe protogea* Schrimper, *Aralia cordifolia* Sap., *Ziziphus ungeri* Heer. In the Caucasus, the fossils of palm trees belong to the representatives of the *Sabal*, *Trachycarpus*, *Livistona* and *Chamaerops* genera. The Tertiary floras of the Caucasus, this genus is represented by Oligocene and Miocene species, where the species were found first in the Autonomous Republic in the neighborhood of Julfa (Daridag). In 1947, near Julfa A. N. Krishtofovich discovered and described also print of falunian fan palm and fern: *Pteris pennaeformis* Heer, *Osmunda* sp. [11].

In 1950 in greenish-gray sandy clays of upper Miocene deposits in the surroundings of Karabağlar village, Sh. A. Azizbayov [1] found imprints of leaves belonging to the family Leguminosae. In 1957 an expedition trip was made to the area of location of the fossil flora of Daridag mountain where V. V. Bogachev in 1934 and K. N. Paffengoltz in 1936 (Paffengoltz, 1940) made collections. As a result, it was found out that there is not only the sandstones contain fossils of plants: they are also found in mudstones and tuff breccias. Power flora containing species reaches 10 m were determined from: *Pteris oeningensis* Heer, *Blechnum braunii* Ett., *Sabal haeringiana* (Heer) Ung., *Zelkova araxina* Palib., *Quercus neriifolia* (Heer) A. Br., *Persea speciosa* Heer, *Cinnamomum rotusum* Fisch., *C. scheuchzeri* Heer, *C. sezannense* Watt, *C. lanceolatum* Ung., *C. rossmaesleri* Heer, *Eugenia bogatschhevii* Palib., *Pisonia eocenica* Ettingsh., *Banisteria haeringiana* Ett., *Leuca* Ett., *Leucothoe protogea* Schrimper, *Rhamnus dechenii* Neb., *Ziziphus ungeri* Heer, *Gleditsia* sp., *Dalbergia* sp., *Aralia cordifolia* Sap., *Folium indet.* In the early Miocene Tethys significantly decreased, retreated, leaving bared an extensive land anterior-Asian continent [15].

It first joined the South Caucasus, and later with the Main Caucasus and has been subject to rapid processes of secondary mountain building, characteristic of the Miocene epoch. Lesser Caucasus Mountains were separated by Sarmatian Sea from the main mountains. As a result, land formed closed seas. Extensive land lying to the south of the Caucasus Isthmus, according to A. A. Grossheim [8] should be the scene of the formation of xerophilous flora, as well as the creation of conditions of continental climate with distinct seasonal changes.

Iranian xerophilous flora center was one of the earliest occurring much later than Central Asian (Mongolian). The southern end of the Lesser Caucasus, associated with extensive land and opened a wide path of penetration xerophilous elements with older xerophilous centers in Central Asia and Asia Minor, and others. This flora is quickly replaced Eocene and Oligocene flora and the

entire southern part of the Lesser Caucasus, creating new xerophytic formations.

Species included in the local ancient vegetation of the island, under the influence of changed conditions become processed, creating new forms and endemic species adapted to local conditions, as well as newcomers, particularly testing conditions for an almost closed basin, partially reshape steel. Found during expeditions of the salt pans (Duzdag) plant fossils have enabled formation of some idea of later Sarmatian flora of Nakhchivan.

Among the fossil material is able to establish species found for the first time as part of the flora: *Chamaecyparis sp.*, *Thuja sp.*, *Castanea gigas* (Goepp.) Iljinskaja, *Quercus sp.*, *Myrica vindobonensis* (Ettingsh.) Heer, *Tamarix sp.*, *Populus populina* (Brongn.) E. Knobloch., *Salix sp.*, *Acer trautvetteri* Medw., *A. velutinum* Boiss., *Zelkova carpinifolia* (Pall.) K. Koch, *Fagus orientalis* Lipsky., *Quercus castaneifolia* C. A. Mey., *Buxus sempervirens* L., *Pistacia lentiscus* L., *Gleditsia knorrii* (Heer) Hantke. Found genus *Chamaecyparis sp.* as fossils are rare. This is the first discovery of Miocene deposits of the Caucasus. The most interesting finding in this list is *Castanea gigas* and especially *Acer velutinum*, indicating to great similarity of the Hirkan forest flora.

Thus, the modern flora and vegetation of their origin, above all, connected with the ancient Iranian, mainly Asia Minor or North Iranian flora penetrated here with Tertiary and being penetrated at the moment. From the more important temperate eastern slopes of the Lesser Caucasus in the Tertiary period, the study area was fenced off by the high perched mountains Kongur-Alangez and Zangezur. In this regard, the influence of the surrounding areas on the composition of the vegetation was much weaker. Along with the old-established, although primitive in structure, xerophilous phytocenosis middle and upper mountain belt in the region, there are low-lying strip and younger groups. Some low-lying area of the strip is not immediately freed from the ancient water bodies preserved in the form of fragmented small pools. As they dry in the liberated areas of saline gradually formed a kind of halophytic plant communities. These small pools of drying treatment under the influence of climatic and tectonic processes, in turn, become small centers of formation phytocenosis, which include those frequent endemic species.

In 1936 M. M. Iljin found in the surroundings of Nakhchivan a number of interesting new species of the families Chenopodiaceae — *Anabasis eugeniae* Iljin, *Salsola tamamschjanae* Iljin, *S. takhtadshjanii* Iljin, that are currently yet endemic flora of Nakhchivan Autonomous Republic [20].

The alpine vegetation from the Tertiary period also bore the imprint of a large aridness of the region and different poverty alpine flora, compared with other areas of the Lesser and Greater Caucasus. Vegetable biocenoses already formed respectively characteristics of the region and were mainly characteristic to alpine steppes. Composition of phytocenosis formed from the elements of more mesophilic phytocenosis neighboring highlands of the Lesser Caucasus and part of the Main Caucasian ridge, but, in addition, developed local forms. High mountain region strip across a range of conditions so dramatically different from the conditions of the middle mountain belt of neighboring, more humid areas of the Lesser Caucasus, in particular, from the northern and north-eastern slopes of the Zangezur and Kongur Alangez that could be occupied mainly phytocenosis type xerophilous southern areas of northern Iran. More mild and temperate climate of the Tertiary period in the mountainous part contributed to the development of larger and large forest patches than in the present. In the salt-formation the remains of the following were found near Nakhchivan: *Cistus*, *Alnus*, *Acer (Palatanus)*, *Crataegus*, *Prunus avium pliocenicum* Bogatsch., *Pyrus salicifolia*, *Ostrya paleocarpinifolia* Bogatsch. related to the Pliocene age. Of these, *Pyrus oxyprion*, *P. salicifolia*, *Prunus divaricata*, *Acer ibericum* the same kind of more or less closely related species are now major components of shrub forests, and Garigou and forests of Nakhchivan Autonomous Republic.

In the Tertiary period, the xeromorphic forests-bushes lowered a few below, and then either

destroyed, or because of changed habitat conditions climbed higher into the mountains. Thus, already in the past nature of Nakhchivan Autonomous Republic had family roots with neighboring Iran, the Persian, Anatolian nature, as well as with other southern xerophilous centers. The upper part of the mountain and high-mountain strip was largely influenced by the vegetation of the Lesser and Greater Caucasus. The influence of the Quaternary period in the Lesser Caucasus and, in particular, on Zangezur and Alangez is little known. If the toe of glaciers took place, it was very weak. Effect of changed climate and local glaciers lead first of all, to change of the boundaries of vegetation zones. The boundaries of these is lowered and raised according to the new glaciations. Ice Age established in the Tertiary formations has not made a significant change. The most notable changes were subjected to high-formation, enriched in its composition in the quaternary period, elements of Caucasian and the northern boreal flora.

An analysis of fossil and modern floral relations in the Caucasus isthmus allows to set a deep organic relationship of Caucasian flora with the northern flora. In all regions of the Caucasus, including in Nakhchivan Autonomous Republic value of boreal element is very high, so almost half of the Caucasian endemic species has its roots in the boreal flora. From the Cretaceous genera of northern origin *Populus*, *Platanus* were in the flora of the Caucasus as an impurity to a common tropical or subtropical composition. A clear factor is the presence in the Upper Cretaceous of poplar and sycamore and the Oligocene genus of *Prunus*, in the early Miocene *Pinus* and *Castanea*. The Sarmatian remains of the northern and tropical elements are distributed almost equally, but still the general character of the flora is tropical or subtropical. From Sarmatian known for following arcto-tertiary (Turgai) genera: *Abies*, *Pinus*, *Pyrus*, *Carpinus*, *Salix*, *Juglans*, *Ulmus*, *Picea*, *Planera* (*Zelkova*), *Crataegus*, *Ostrya* and species: *Prunus avium pliocenicum* Bogatsch, *Pyrus salicifolia*, *Populus populina* (Brongn.) E. Knobloch., *Salix* sp., *Acer trautvetteri* Medw., *A. velutinum* Boiss., *Zelkova carpinifolia* (Pall.) C. Koch, *Fagus orientalis* Lipsky.

A. A. Grossheim [8] considers that favorable conditions for the formation and dispersal of xerophilous flora in the South Caucasus have come since the time of the Sarmatian Sea, and even earlier, when the South Caucasus, the Caucasus and later merged with the vast land, located to the south. All the above relates to only a mesophilic flora.

Thus, the modern flora and vegetation of Nakhchivan Autonomous Republic was formed under the influence of natural history, environmental and anthropogenic factors, having a long evolutionary path of development. Below are some interesting representatives of the location of fossil floras of Nakhchivan Autonomous Republic said in the Catalogue of fossil plants of the Caucasus, under edition of. A. A. Kolakovskiy [20]: *Ziziphus unegri* Heer, Lower Oligocene (Nakhchivan; Daridag) *Ziziphus ziziphoides* (Ung.) Heer, *Zelkova araxina* Palib. Lower Oligocene (Nakhchivan; Daridag) *Trachycarpus rhapifolia* (Sterub.) Takht, *Sabal haeringiana* (Ung.) Heer. Lower Oligocene (Nakhchivan; Daridag); *Ribes* sp. aff., *R. alpinum* L. Miocene, Sarmatian (Nakhchivan); *Pyrus* sp. aff., *P. communis* L. Miocene, Sarmatian (Nakhchivan); *Pisonia eocenica* Ett. Lower Oligocene (Nakhchivan; Daridag), *Pistacia* cf. *mutica* E. et M; *Parrotia fagifolia* Palib. Miocene, Sarmatian (Nakhchivan), *Padus* — Rosaceae; *Palibinia nachiczevanica* Kassum. Sarmatian, Miocene, (between Hinjab and Karabaglar villages), *Panicum miocenicum* Ett. Lower Oligocene (Nakhchivan; Daridag), *Myrica hakeaefolia* (Ung.) Scap. Lower Oligocene (Nakhchivan; Daridag), *Leucothoe protogea* Schimper, *Andromedia protogaea* Unger. Lower Oligocene (Nakhchivan; Daridag), *Cinnamomum polymorphum* Heer. Lower Oligocene (Nakhchivan; Daridag), *Cinnamomum lanceolatum* Heer. Lower Oligocene (Nakhchivan; Daridag), *Cinnamomum scheuchzeri* Heer. Oligocene (Nakhchivan; Daridag), *Cinnamomum sezannense* Watt. Oligocene (Nakhchivan; Daridag), *Eugenia bogatschhevii* Palibin. Lower Oligocene (Nakhchivan; Daridag), *Cerasus avium* (L.) Moench. *pliocenica*. Tun – *Prunus avium pliocenica*; *Buxus sempervirens-*

fossilis Engl. Tun – *Buxus sempervirens* L. *fossilis* Engelhardt et Kinkel. Miocene, Sarmatian (Nakhchivan) *Banistera haeringiana* Ett. Tun – *Ettingshausen*. Lower Oligocene (Nakhchivan; Daridag), *Aralia cordifolia* Sap. Lower Oligocene (Nakhchivan; Daridag).

The studies revealed that the remains of different past eras found by the paleobotanists (Cretaceous, Miocene, Sarmatian, Pliocene, Oligocene, Oligocene to Lower etc.), many species of flowering plants, having long historical evolutionary path, reached to our days.

An example is below mentioned plant species: *Pyrus salicifolia*, *P. communis*, *P. oxyprion*, *Parrotia persica*, *Quercus macranthera*, *Q. castaneifolia*, *Pistacia mutica*, *Ceracus avium*, *Acer trautvetteri*, *Anabasis eugeniae*, *Salsola tamamschjanae*, *S. takhtadshjanii*, *Prunus divaricata*, *Acer ibericum*, *Juglans regia*, *Comarum palustre*, *Menyanthes trifoliata*, *Galium uliginosum*, *Scilla atropatana*, *Thlaspi rostratum*, *Peltaropsis grossheimii*, *Dorema glabrum*, *Artemisia scoparia*, *A. scoparioides*, *Bienertia cycloptera* and etc. Currently, they are rare, endangered, endemic, relict species of flora of Nakhchivan Autonomous Republic that require strict protection and recovery [21-23].

However, the flora of Nakhchivan Autonomous Republic was not purely Hyrcanian in the late Sarmatian. In all likelihood, above the zone of the Tertiary Hyrcanian forest there was a belt of coniferous forests of fir and pine which are currently absent in the forests of Talish. Unfortunately, the scarcity and poor preservation of fossil material do not allow us to define the species of pine and fir. But the collection contains excellent prints of *Glyptostrobus europaeus* which suggests the existence of a swamp forest at that time. If we add *Glyptostrobus* to the picture of a modern lowland swampy Hyrcanian forest with alder and lapina, then we will get a probable landscape of the lowland late Sarmatian forest of Nakhchivan Autonomous Republic.

The picture of the flora of Nakhchivan Autonomous Republic in the late Sarmatian is complicated by the discovery of a magnificent imprint of a *Pistacia lentiscus* leaf. The discovery of this typical Mediterranean species so far from the eastern border of its modern range (Kayseri and Hatay vilayets in Turkey) is of great historical and floristic interest. Of course, the discovery of one of the characteristic elements of the Mediterranean maquis does not mean that maquis vegetation was developed on the territory of Nakhchivan Autonomous Republic.

Thus, in a limited area of the accumulation basin there existed a coniferous forest, a deciduous forest of the Hyrcanian type and perhaps, vegetation of the Mediterranean type. This indicates a fairly large ruggedness of the relief and a significant diversity of environmental conditions.

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