

## Modern State and Protection Ways of the Eldar Plain Flora

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### Abstract

*In order to protect the biodiversity, the Milli Majlis (National Assembly) of the Republic of Azerbaijan has joined the International Convention on Biological Diversity, setting goals for scientists to take measures for the restoration and reintroduction of the threatened species in areas of their natural habitat [National Reports and Strategies of the Republic of Azerbaijan, 2006]. One of the main issues is the identification of the ecosystems of rare and endemic plants for their protection and preservation. The Eldar plain, located in the western part of Azerbaijan occupies a special place for its relict, endemic and unique plant complexes.*

**Key words:** *Eldar plain, rare endemic edificator, Pinus eldaricas, xerophyte sparse forest, desert, steppe*

### INTRODUCTION

For the first time the planned research has been performed on the general flora and vegetation of the Eldar plain including the nature reserve, to develop measures for the inventory and protection of vegetation, and to preserve social and economical importance of the whole territory. Historically, forest taxation, forest structure, introduction and endemic species were studied in the Elleroyughu area of the territory. The Eldar plain was

not studied sufficiently, in spite of the extensive researches performed in Jeyranchol winter pastures. Therefore, the studied area was characterized as species-poor. Thus, geobotanical studies conducted in the Eldar plain are considered to be actual.

## **MATERIALS AND METHODS**

We performed the first planned research on the Eldar plain flora and vegetation in 2004-2017. Field surveys were carried out for 168 days, along 7 routes in the spring, summer and autumn months. Up to 380 herbarium samples were collected and submitted to the Herbarium fund of the institute of Botany of ANAS and 213 geobotanical descriptions were presented. Taxa were named based on Cherepanov [1995] and Asgarov [2005-2008; 2016]. The geobotanical method of Yarashenko [1961] was used. Phytosenosis and phytosenotic complex were named according to Yursev [1975] and Kamelin [1973], respectively. Species of life forms were analyzed according to Raunkier [1934], Serebyakov [1972] and J.Braun-Blank [1964], and the analysis of the ecological types was based on B.A.Bykov [1988] and A.P.Shennikov [1962]. During geographical analysis the type, class and group of the areal were determined according to Grossheym [1936] and Portenier [2000]. The classification of the endemism and relictness of the species was based on the works such as "The Azerbaijan flora" [1950-1961], Akhundov et al., [1978], Asgarov [2011]. Flora similarity was calculated using similarity coefficient proposed and improved by Šmidt [1980]. The main criteria in choosing similar territories were geomorphological and geological structures, some characteristics of vegetation, soil and climatic conditions [3].

## RESULTS AND DISCUSSION

The study of the Eldar plain flora and vegetation revealed 546 species belonging to 67 families and 271 genera. The *Asteraceae*, *Poaceae* and *Fabaceae* families prevail in the territory of the flora with 60, 53 and 76 species, respectively. Twenty one families have a single genus and a single species. Twenty six families have 2-5 species. Sixteen genera compose 21,6% of the general flora.

An ecobiomorphological analysis of the flora showed that perennial (234 species, 42.9%) and annual (192 species, 35,2%) grasses predominate in the area. Trees and semi-shrubs (each by 12 species, 2,2%), as well as trees or shrubs (by 5 species, 0.9%) are represented by few species. Xerophytes (261 species) and mesoxerophytes (143 species) are predominating ecological groups. Hydrophytes and hydromezophytes, composing a small part of the flora occur mainly in water-bog vegetation.

12 formations and 29 associations were identified in the Eldar plain, which contain desert, semi-desert, mountain-xerophyte, steppe, water-bog, arid sparse forest and tugay forest plant types. Desert plants predominate in the areas exposed to anthropogenic impact in border areas, whereas semi-arid and stepper plants are more common in the nature reserve areas. For the first time we identified 3 associations in arid sparse forest vegetation: *Pistacietum-Juniperosum*, *Pistacia mutica*- *Caragana grandiflora*-*Acantholimon fomini*, and *Pinus eldarica*-*Juniperus polycarpus*- *Quercus pedunculiflora*. The Eldar plain territory occupied a special place in the western part of Azerbaijan for relict, endemic and rare plant complexes. Relict plants distributed in the area are *Pinus eldarica* Medv, *Juniperus foetidissima* Willd, *Pistacia mutica* Fisch et Mey, *Punica granatum* L, *Paliurus spina – christi* Mill, *Ephedra procera* Fisch.et.C.A Mey, *Similax excelsa*, etc. Endemic plants: *Pyrus eldarica* Grossh, *Iris camillae* Grossh, *Iris sheekovnikovi* (Fomin), *Galimum eldaricum* (Grossh),

*Dichasianthus eldaricus* (Grossh.) Sojark (Grossh) *Acantolimon fomini* Kusn, *Acantholimon tenuiflorum* Boiss, *Limonium fischeri* (Trautv) Lincz, *Stachus fomini* Sosn, *Nonea flavescens* (C.A Mey), *Causinia Hohehackerii*, *Tragopogol karjagini* Kuth. Caucasian endemic plants: *Tillipa elchleri*, *Orchis-purpura*, *Iris iberica*, Hoffm, *Iris caucasica* Stev, *Astragalus macrocephalus*. Willd, *Bellevalia montana* (C.Koch). Rare species: *Diphelipaea coccinea* (Bieb) Nicolson, *Euphorbia marschalliana*, (4). Edificators and subedificators forming phytosenosis were found to consist of relict endems and rare species in a majority of plant complexes in the Eldar plain flora. *Pinus eldarica* Medv, *Juniperus foetidissima* Willd , *Pistacia mutica* Fisch et Mey, *Salsoietma nodulesa* *Tillipa elchleri*, etc.

Due to severe drought conditions in the Eldar plain xenomorphic traits of xerophytes are well developed. During extremely hot summer months the growth of xerophytes almost stops.

Abundance of elements characteristic of deserts, semi-deserts and dry steppes are usually observed in the autumn months. Based on species composition, spring elements are much more than autumn elements. There was always favorable condition for vegetative propagation of ephemerooids. Therefore, a part of the territory was used as a winter pasture. Unfavorable ecological state of the territory led to the distribution of the xerophytes of the Eldar plain flora in a wide ecological range. It should be noted that along with spore-producing higher plants such as mosses (*Tortularuralis*, *Pleurochaete squarrosa*, *Thuidium abietinum*, *hupnum cupressiforme*) and lichens (*Gladonia pocillum* Sandst, *C.foliaceae* (Huds) Will, *C.rangidiformis*. Hoffm), even shrub-like species of lichens form associations with *Pinus eldarica*. Well developed moss cover (up to 6-8 cm high) is characteristic of the territory. The total soil coverage with spore plants reaches 95%. During the recent studies xerophye species of fern, which is a spore-producing higher plant, has been

detected. *Ceterach officinarum* Willd and *Cheilanthes persica* species were identified by us for the first time. Elucidation of ecological problems, leading to the loss of species diversity, allows revealing the dynamics of the observed changes. Not only current but also past physical-geographical, and ecological conditions affected the dynamics of the vegetation of the Eldar plain. Therefore, it is more appropriate to approach the regularity of the flora and vegetation of the region from the historical point of view. There is no sufficient poleobotanical data to elucidate this problem. Many representatives of the modern natural habitat of the Eldar plain were formed in the Savannah period, while the first plain landscapes were formed during the Miocene era. Academic D.V.Hajiyev discovered remains of exotic animals, not characteristic of the modern fauna of Azerbaijan and Caucasus including typical representatives of savanna such as giraffe, elephant, ostrich, hippopotamus etc. within the rich Sarmat fauna in the area of Eldaroyughu of the Western Azerbaijan territory. In Pliocene, the modern flora and fauna species completely predominated. In the fourth period, due to the cold weather and drought the Savanna landscape was replaced by a plain and dry desert landscape. All of these were directed towards the decline in species composition of flora and fauna, which became more pronounced in the fourth period. During this period anticlinal ridges formed and developed in the Jeyranchol and Eldar plain territories. These variations in the relief and climate also affected the landscape, and the arid sparse forests were isolated by dry plains. Plains with sparse forest grasses were the dominant landscape of the Eldar plain. As an example of a dominant landscape the types of this landscapes are preserved in State Natural Reservation "Eldar Shamy" only in 400 ha area. According to L.I. Prilenko (1954), earlier pine-juniper sparse forests covered a wide area in steppes and their areal reached Gobustan and Absheron. Nowadays, remains of pine-juniper forests found in the Gobustan territory confirms this

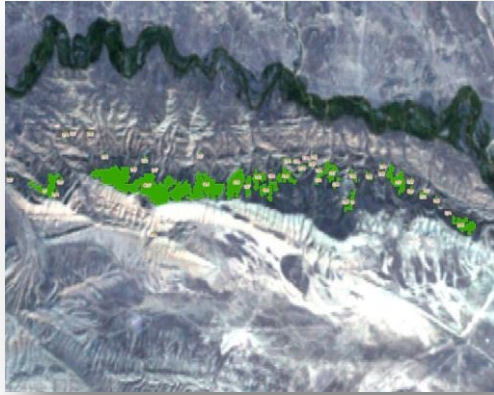
opinion. The flora of the Eldar plain was studied compared to the plains located in the territories with similar climatic conditions such as Absheron, Gobustan, Samur-Davachi, Southeastern Shirvan and Nakhichevan Autonomous Republic of Azerbaijan. The greatest similarity was found between the Eldar plain and Absheron floras (similarity coefficient was 0.48).

Only 400 hectares of the area were protected until recent years (2004). The territory was a branch of other nature reservations (Goy-Gol, Turyanchay). The surrounding areas were exposed to strong anthropogenic effects, population of adjacent villages used desert, semi-desert and steppe areas as pastures, most of the trees of the tugay forest were cut and the territory was used as a garden.

This caused the violation of ecotonous borders among arid sparse forest, tugay, semi-desert steppe landscape complexes in the nature reserve. Increasing the territory of the nature reserve up to 1686 ha, complete disappearance of the antropogenic effects (part of the territory is located on the border of Georgia-Azerbaijan) and restoration of the “ecotonic border zones” in the territory of the nature reserve, resulted in increasing species number in phetocenosis, completion of their development, stabilization of the natural complexes and increasing biomass. This is more pronounced in the arid sparse forest complex (Figure 1, 2). The results of our research confirmed the above data.



***Pinus eidarica* sprouts**



**Measurement of the Eldar pine areals from the satellite using the AutoCad program**

## **CONCLUSION**

We can conclude that succession process proceeds in steppe, arid sparse forest areas of the studied territory, whereas demutation process occurs in semi-deserts. To protect the genefund, the following measures should be taken in the parts of the territory exposed to antropogenic effects.

Buffer area of the “Eldar Shamy” State Nature Reservation should be extended and restricted zones should be established in the territories out of the nature reservation; etalon areas should be created to ensure more efficient protection of the *Dichasianthus eldaricus* (Grossh.) Sojark, *Diphelypaea coccinea* (Bieb.) Nicolson, *Iris iberica* Hoffm., *I.camillae* Grossh species; introduction and reintroduction of the rare and endangered species should be organized; regular monitorings should be organized by specialists to evaluate the state of the populations of rare plants in the territory of the nature reserve.

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