

IN SITU AND EX SITU CONSERVATION OF RARE AND ENDANGERED GEOPHYTES OF THE HIRKAN NATIONAL PARK (AZERBAIJAN)

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Abstract: The Hirkan National Park consists of natural region of Talish Mountains characterized with their unique natural complex. This research was carried out from 2004 to 2007 in order to study the floristic and taxonomical composition of geophytes, elaborate optimal measures of biosafety and their sustainable use. According to floristic composition of the National Park it is a valuable forest which includes 150 endemic species of trees and bushes out of 435 species of trees and bushes. As a result of researches for the first time were found that more than 15 geophyte species are endemic plants of Caucasus or Azerbaijan. Some geophyte species are *Allium lenkoranicum* Misch. ex Grossh., *A. talyschense* Misch. ex Grossh., *Bellevalia fominii* Woronow, *Ornithogalum hyrcanum* Grossh., *Fritillaria grandiflora* Grossh., *Crocus caspius* Fisch. & C. A. Mey., *Iris helena* (C. Koch) C. Koch, *Himantoglossum formosum* (Stev.) C. Koch, *Ophrys oestriifera* M. Bieb., etc. among many others. Isolation of a geographical position of Talish, which vegetation differ a variety of life forms, allows considering geophytes as a group of independent bioecological value. 92 species of geophytes identified and registered in the Hirkan National Park is grouped into 21 families and 46 genera, including 33 rare and endangered species, of which 11 species are included into the “Red Data Book” of Azerbaijan.

Keywords: Hirkan National Park, plant conservation, rare species, geophytes, tuber, rhizome, Central Botanical Garden.

Introduction

The richness of Talish flora is a leader not only in Azerbaijan, as well as botanical and geographical regions of the Caucasus. It is located in the extreme South-eastern part of the country. In the West, Talish Mountains is bordered by Iran Republic, and in the East with the Caspian Sea. Flora of the region and its genetic fund has incorporated the remnants of the flora of various geological eras, especially the Tertiary period and emerged as a result of long historical development. Isolation of a geographical position of Talish, which vegetation differs in a variety of life forms, allows considering geophytes as a group of independent bioecological value. So, this study was carried out to determine the geophytic flora of Talish region in Azerbaijan, and to observe the conditions of the endemic and/or rare geophyte populations.

During the last decade man's impact on natural ecosystems started rapidly to grow and seriously to threat natural equilibrium in ecosystems. When habitats of a rare and/or endemic species are damaged and/or fragmented by mismanagement and various other human activities (intensive urbanization, over exploitation of natural resources,

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development of tourism), distribution ranges, population sizes, and genetic variability of the species will be reduced and its members will become vulnerable to extinction at a faster rate than others. Due to that, special attention should be paid on investigation of threatened taxa.

It was necessary to count the best way of storage of genetic resources of plants preservation *in situ*. Example of such activity is the organization of natural reserve Hirkan in Azerbaijan. The Hirkan National Park was established in 2004 on the basis of the Hirkan State Reserve which it superseded, on a surface area of 29,760 hectares (297.6 km²), it was enlarged in 2008 to 42,797 hectares (427.97 km²) (Fig. 1). The main purpose of establishment of the National Park is complex preservation of nature of this area, protection of relict and endemic plants of Tertiary period and characteristic flora and fauna types, which were not affected by Pliocene and Pleistocene glaciations and included into the *Red Book* of Azerbaijan Republic (1989), monitoring of environment, awareness of the public and also creation of favorable conditions for researches, tourism and recreation.

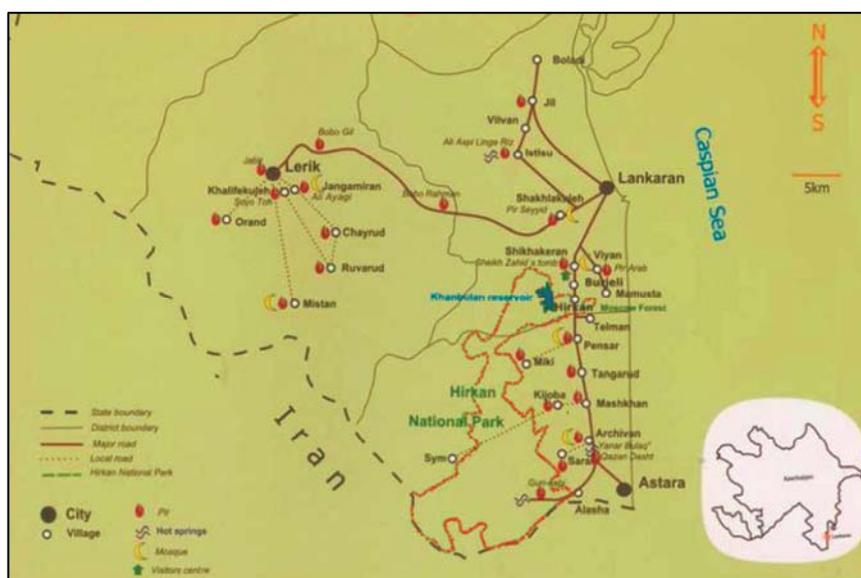


Fig. 1. The Talish region (Azerbaijan) map
The Hirkan National Park borders - indicated in red color

The ecosystem of the Hirkan National Park belongs to the Caspian Hyrcanian (Hirkan) mixed forests ecoregion, an area of lush deciduous broadleaved lowland and mountain forests (subtropical and temperate rainforests) that completely cover the Talish Mountains and partially cover the Lenkoran Lowland. One of the main characteristics of subtropical forests of Lenkoran zone where Hirkan National Park is located is well preservation of Hirkan type forests and wide spread of many endemic, rare trees, bushes and herbs here [HACIYEV & al. 1979]. Botanical expeditions during last 50 years and numerous herbariums collected by world botanists over 19-20 century, written by scientists cited in the list of literature especially “Flora of Azerbaijan” in 8 volumes [KARYAGIN,

1950-1961] and “Conspectus of Caucasian geophytes” [IBADLI, 2005] published in collaboration with assistants gave us the general view of region vegetation (Tab. 1) [YUSIFOV & HACIYEV, 2004; SAFAROV, 2010].

Tab. 1. The plant composition of Hirkan National Park (Azerbaijan)

Plant groups	Family	Genus	Species
Bryophyta and Pteridophyta	15	19	25
Pinophyta (Gymnospermae)	4	8	10
Magnoliophyta (Angiospermae)	113	536	1169
including Magnoliatae (dicots)	89	429	951
Liliatae (monocots)	24	107	218
Geophytes	21	46	92

Materials and methods

Our field investigation began in 2004. With the fulfillment of the work in connection with a theme, HACIYEV & al. (1979) and IBADLI (2004) researches were used. Nomenclature of taxa is according to KARYAGIN & al. (1950-1961), IBADLI (2004), IBADLI (2005) and CZEREPANOV (1995). The identification was also checked in herbaria of the Botanical Institute of Baku (BAK). The specimens were deposited in the Botanical Institute, Herbarium Fund. The list of taxa was arranged according to “The Flora of Azerbaijan” [KARYAGIN, 1950-1961] and IBADLI (2004, 2005), with the species name, locality, habitat, properties, and altitude identified.

On the basis of this information and the corresponding literature [IBADLI, 2005; KARYAGIN, 1950-1961], received as a result of the research, geophytes plants, on the basis of types of underground storage organs were grouped as: bulbous, tubers, roots, rhizomes and corms. The endemic species were determinate according to AHUNDOV (1973) and MUSAYEV (2005). For each species, a certain category is applied to, being accompanied by their threaten degree due to IUCN Red List Categories [Red Data Book, 1989].

The following category abbreviations are used in the text: BAK (Herbarium Fund of Botanical Institute of Azerbaijan National Academy of Sciences, Baku, Azerbaijan), IUCN (International Union for Conservation of Nature – Red List Categories and Criteria), CR (critically endangered), EN (endangered), VU (vulnerable), CBG (Central Botanical Garden).

Results and discussion

The study area covers the protected area called Hirkan. Herbarium specimen and also sowing materials those relating to the geophyte species of the different family, which were identified in the Hirkan National Park, were collected basically in the spring and the autumn during the period of 2004-2007, photographs were taken and areas of distribution are specified [FARZALIYEV & al. 2007; SALIMOV, 2008].

As a result of the field studies, 92 species of geophytes identified by us and registered in the Hirkan National Park is grouped into 21 families and 46 genera [SALIMOV, 2008], including 33 rare and endangered species, of which 11 species are entered in the “Red Data Book” of Azerbaijan (Fig. 2A, B & 3A, B) [Red Data Book,

1989]. The distribution of species according to families in the study area was categorized and listed. The families which include the largest number of species are as follows: Orchidaceae (26 spp.), Hyacinthaceae (11 spp.), Alliaceae (9 spp.), Iridaceae (8 spp.) Asparagaceae (5 spp.). Families which possess less than 5 species constitute 64.13% from the floristic fund of the Hirkan National Park [SALIMOV, 2008].



Fig. 2. Exposition of *Galanthus caspius* (Rupr.) Grossh. *in situ* (A) and in the CBG (B)



Fig. 3. Exposition of *Limodorum abortivum* (L.) Sw. *in situ* (A) and in the CBG (B)

In the research area more than 15 geophyte species are endemic plants of Caucasus or Azerbaijan. Some geophyte species are: *Allium lenkoranicum* Misch. ex Grossh., *Allium talyschense* Misch. ex Grossh., *Bellevalia fominii* Woronow, *Ornithogalum hyrcanum* Grossh., *Fritillaria grandiflora* Grossh., *Crocus caspius* Fisch. & C. A. Mey., *Iris helena*

(C. Koch) C. Koch, *Himantoglossum formosum* (Stev.) C. Koch, *Ophrys oestrifera* M. Bieb., etc. among many others.

In flora of the Hirkan National Park 19 rare geophyte species, representing 3.3% of floristic fund of named area, the following classification according IUCN categories was relieved [IUCN, 2003]:

– Critically endangered (CR): 3 species: *Ornithogalum hyrcanum* Grossh., *Fritillaria grandiflora* Grossh., *Cephalanthera longifolia* (L.) Fritsch.

– Endangered (EN): 5 species: *Crocus caspius* Fisch. & C. A. Mey., *Lilium ledebourii* (Baker) Boiss., *Cephalanthera rubra* (L.) Rich., *Himantoglossum formosum* (Stev.) C. Koch, *Limodorum abortivum* (L.) Sw.

– Vulnerable (VU): 11 species: *Bellevalia fominii* Woronow, *Allium paradoxum* (M. Bieb.) G. Don fil., *Galanthus caspius* (Rupr.) Grossh., *Sternbergia fischeriana* (Herb.) M. Roem., *Puschkinia scilloides* Adams, *Scilla caucasica* Miscz., *Iris helena* (C. Koch) C. Koch, *I. pseudacorus* L., *Crocus speciosus* M. Bieb., *Anacamptis pyramidalis* (L.) Rich., *Cyclamen elegans* Boiss. & Bushe.

As noted above, *in situ* conservation refers to conservation of biodiversity in populations growing in their place of origin. However, the organization of reserves is connected with significant, frequently insuperable difficulties in the present period. Besides even in working reserves are subject to extreme influences of natural factors and anthropogenic impacts therefore it is not excluded separate forms. All of these cause necessity of preservation plants, including endemic and relict, rare and endangered geophyte species of Talish region registered in the Hirkan National Park *ex situ* – in collections. On the other hand, multilateral research activity frequently demands presence of a material easily accessible and in enough quantities that also can be provided only with its preservation in living collections. *Ex situ* conservation is the method predominately used in agriculture. Arboreta and botanical gardens are also *ex situ* collections, but generally have only few individuals to be useful for conserving rare and/or endemic plants.

One of the main tendencies of Central Botanical Garden of Azerbaijan are based on the selection of prospective species of plants, their introduction and study, aimed at gardening Baku City. It is also a way of conservation rare and endangered species, studying introduction and climate adaptation of decorative, medicinal, ether-oiled and other plants in order to enrich raw-material bases of plant resources. Among these groups geophytes play an important role [FARZALIYEV & al. 2006; IBADLI & al. 2006]. However, due to research data, geophytes consist of 4.25% of the flora of Azerbaijan. So, Talish floristic exposition makes a great importance in CBG [FARZALIYEV & al. 2007]. About 30 endemic and relict plants, especially trees, bushes and geophytes species have been planted here (Fig. 4).



Fig. 4. Exposition of tulips in the CBG

Culture conditions, as a rule, positively operate on the general habitus of plants, accelerating the ontogenesis. Thus, a comprehensive study of morphological and ecological and biological characteristics, economic-important signs, the development of methods and techniques of reproduction of protected geophytes in a culture will help address the issue of rational use and conservation of rare and endangered species as *in situ* and *ex situ* collections.

Conclusions

- Special and detailed floristic studies related with geophytes were never conducted in the Lenkoran-Lerik regions.
- Our researches were carried out within 2004-2007 years, as a result of the field studies.
- For the first time, 92 geophytes species were identified and registered in the Hirkan National Park and grouped into 21 families and 46 genera.
- 33 rare and endangered species, of which 11 geophyte species are entered in the “Red Data Book” of Azerbaijan.
- In the surveyed area, more than 15 geophyte species are endemics to Caucasus or Azerbaijan floras.
- On the basis of our researches, actions for protection and restoration were determined, and practical recommendations are offered.

References

- AHUNDOV Q. 1973. *Azərbaycanın endem florası*. PhD thesis, Botanik Enstitüsü. Bakı.
- CZEREPAKOV S. 1995. *Vascular plants of Russia and adjacent states (the former USSR)*. Sankt Petersburg: Cambridge University Press, 992 pp.
- FARZALIYEV V. S., IBADLI O. V., SALIMOV R. A. & SAFAROV H. M. 2007. Conservation of Talish and its exposition at Azerbaijan Central Botanical Garden / Poster presentation on 3-rd Global Botanical Gardens conf. China: 4 p. (http://www.bgci.org/files/Wuhan/Poster_Conserving/FARZALIYEV-VS-POSTER.pdf).
- FARZALIYEV V., IBADLI O. & GULIYEVA S. 2006. The role of Central Botanical Garden in the enrichment and protection of the plant resources of Azerbaijan. *BGCI's 6th International Congress on Education in Botanic Gardens*. Oxford, 4 pp.
- HACIYEV V., GULIYEVA K. H. & VAHABOV Z. 1979. *Flora and vegetation of Talish uplands*. Bakı: Science Press, 149 pp.
- IBADLI O. 2004. *Kafkasyanın geofitleri ve onların Apserona introduksiyonu*. PhD thesis, Botanik Enstitüsü. Bakı.
- IBADLI O. 2005. *Conspectus of Caucasian geophytes Bakı*. Azerbaijan, Bakı: Tural Press, 64 pp.
- IBADLI O., DADASHOVA L., SALIMOV R. & MAMMADOVA I. 2006. A role of the Central Botanical Gardens at the preservation of rare and endangered geophytes species, *International Botanical Conference*, Bakı, Azerbaijan. **1**: 120-123.
- KARYAGIN I. (ed.). 1950-1961. *Flora of Azerbaijan*. Bakı: Academy of Sciences ASSR Press. I-VIII vol.
- MUSAYEV S. 2005. Azərbaycan florasının endemik türlerinin təftisi. *Azərbaycan İlimlər Akademisi Haberləri Bioloji İlimlər serisi*. **1-2**: 46-49.
- SAFAROV H. 2010. *Hirkan Milli Parkının florası və bitki örtüsü*. PhD thesis, Botanik Enstitüsü. Bakı.
- SALIMOV R. A. 2008. Some geophytes determined around the Lenkoran and Lerik (Azerbaijan) region. *EurAsian Journal of Biosciences*. **2**(11): 91-101 (www.ejobios.com).
- YUSIFOV E. & HACIYEV V. 2004. *Hirkan biosphere reservation*. Bakı: El-Alliance Press, 167 pp.
- *** 1989. “Red Data Book” of Azerbaijan SSR. Bakı: Elm Press: pp. 255-543.
- *** 2003. IUCN. Guidelines for Application of IUCN Red List Categories and Criteria version 3.1. IUCN Species Survival Commission. IUCN Gland, Switzerland and Cambridge. UK. ii +26 pp.