



# IJSRM

INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY

An Official Publication of Human Journals



Human Journals

**Research Article**

April 2020 Vol.:15, Issue:2

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## Ecological Features of Forests of Shahdag National Park (In the Territory of Azerbaijan)



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**Submission:** 23 March 2020

**Accepted:** 30 March 2020

**Published:** 30 April 2020



HUMAN JOURNALS

[www.ijsrm.humanjournals.com](http://www.ijsrm.humanjournals.com)

**Keywords:** forest ecosystem, Shahdag National Park (Azerbaijan), vegetation, formations, associations

### ABSTRACT

Ecological assessment of flora of forest ecosystem of Shahdag National Park within the Republic of Azerbaijan have been given in the paper. 2 vegetation types mainly formatted in forest. 3 formation classes, 8 formations and 17 associations forms a forest formation class; 2 formation classes, 9 formations and 14 associations forms bushes vegetation. Although 64 trees species and 96 bushes species are the main edificators, but 1031 species of perennial grasses predominate. 39 species of lichen are represented in forest. 473 species of xerophytes, 438 species of mesophytes, 434 species of mesoxerophytes and 196 species of xeromesophytes are presented in forest flora by mixed ecological group as shown results of the study.

## INTRODUCTION

Protection and rational use of protected plants and phyto-meliorate improvement measuring on territories under influence of negative ecological, anthropogenic and zoogenic factors without studying the flora of specific areas are difficult.

Conducting floristic research is very important in terms of studying the vegetation of the region. Flora of Shahdag National Park was studied underdetermination of plant samples obtained during expeditions and analysis of research work [3, 5,10]. Also, schematic description was developed and systematic analysis was given [2]. Systematic description of 1603 species of higher plants in the flora of the Shahdag area was developed during the research. 31 spores species and 1572 seed species (12 species of gymnosperms, 1560 species of angiosperms, including 294 species of monocotyledons, 1266 species of dicotyledons) in the flora of Shahdag National Park were found [7, 8]. From these, about 40 species of higher plants, 2 species of lichens are included in the second edition of the "Red Book" of the Flora of Azerbaijan [6, 13]. Current research work is devoted to the study of bioecological features of flora biodiversity of Shahdag forest ecosystems.

## MATERIALS AND METHODOLOGY

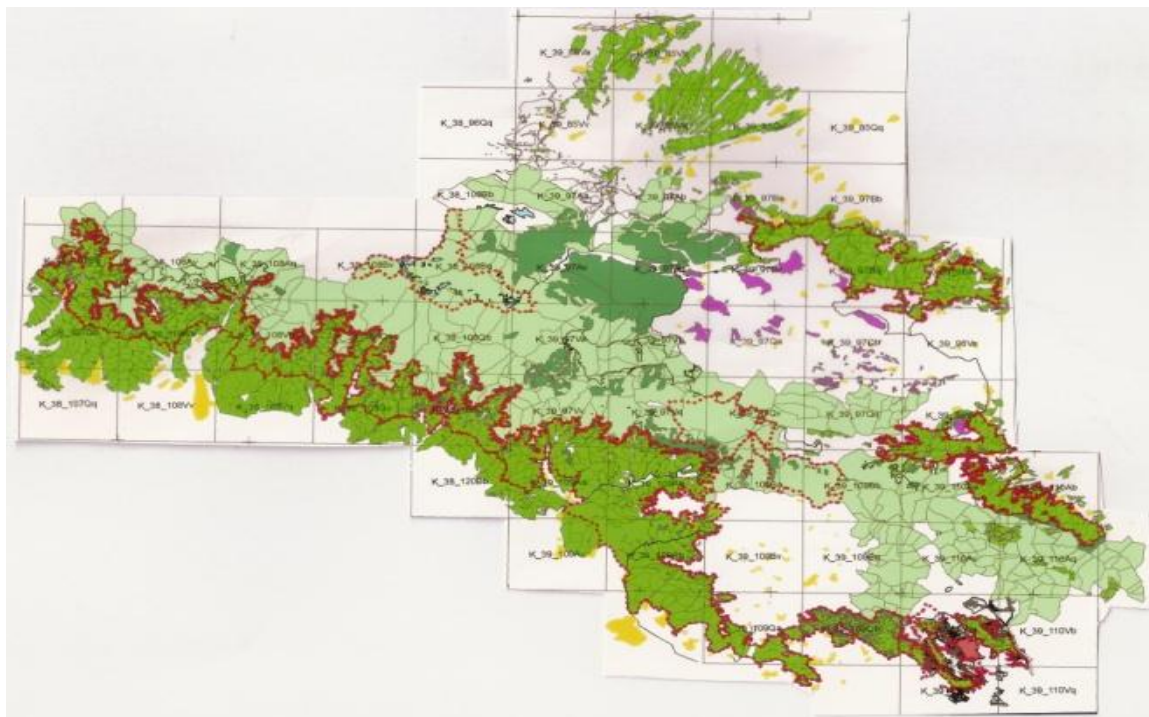
The research was carried out in the forest ecosystems of Shahdag National Park in 2017-2020 (Figure 1 Map of Shahdag forest areas).

Total area of Shahdag National Park - 130.501.5. hectares, of which about 93,980 hectares are forests. The structure of forest vegetation of Shahdag National Park [16], formations and associations [11] were studied as well as higher taxa of vegetation were identified [9]. The ecosystem of the area in modern times has been analyzed [5].

## RESULTS AND DISCUSSION

Natural forests of Shahdag National Park creates rugs ("carpet") at altitudes of 1500-2700 m above sea level. *Quercus macranthera*, *Fraxinus exelsior*, *Betula pendula*, *Crataegus meyeri*, *C. Orientalis*, *Acer ibericum*, *Pyrus caucasica*, *P. salicifolia*, *Malus orientalis*, *Salix triandra*, *S. alba*, *Populus x canescens*, *P. euphratica* (= *P.transcaucasica*), *P. tremula*, *Ulmus minor* and etc. species are encountered in these forests. Two types of vegetation (forest and bushes)

predominate in these forests. Forest vegetation is divided into 3 formation classes, 8 formations and 17 associations.



**Figure No. 1: Map of Shahdag forest areas**

The tugai forests of the region are spread in narrow strips along the river banks. *Populus x canescens*, *Ulmus minor*, *Pyrus caucasica*, *Berberis iberica*, *Tamarix meyeri*, *Rhus coriaria*, *Rubus caesius*, etc. species are widespread here. *Saliceta algae formation* is low component of tugai forests and is located mainly in narrow valleys. Willow forests from *Salix aegyptiaca*, *S. triandra*, *S. alba*, *S. excelsa*, *S. wilhelmina* and bushes forme - *S. caprea* species are represented in the park areas. The impassable *S. caprea* bushes mixes with birch and oak trees in the upper boundaries of the Shahdag forests formed pure and homogeneous bushes here. *Ulmus minor*, *Berberis vulgaris*, *Spiraea crenata*, *Cerasus avium* species are also found in the lower floors of the willows.

Tugai forests have great economic and phytocenological importance. These forests limit the overgrowth of riverbeds, prevent erosion and increase soil fertility. Tugai forests have undergone changes and their areas have become too small in result of direct human activity in recent years. These forest are in danger of extinction if the necessary measures are not taken for their protection. The classification is as follows.

Tugai forests formation class includes 3 formations and the following associations: *Salix alba*+*S. caprea*+*Salix triandra* and *Salix alba*+*Elaeagnus angustifolia*+*Tamarix meyeri*; *Populus gracilis*+*Populus euphratica*+*Populus nigra* and *Populus nigra*+*Salix triandra* associations in *Populeta gracilis* formation and *Ulmus minor*+*Populus gracilis*+*Salix alba* association predominates in *Ulmuaeta minor* formation.

3 associations - pure *Quercus macranthera*; *Quercus macranthera* + *Fraxinus exelsior* +*Acer bericum*; *Quercus macranthera*+ *Crataegus meyeri*+ *C. Orientalis* under the *Querceta macrantherae* formation of broadleaf forests class formation; 2 association - *Crataegus meyeri*+*Pyrus salicifolia*; *Crataegus caucasica*+*Malus Orientalis* + *Pyrus salicifolia*+*Quercus macranthera* in *Crataegus meyeri* formation (*Crataegueta meyeri*) and *Betula pendula*+*Sorbus greaca*; *Betula pendula*+*Quercus macranthera*+ *Fraxinus exelsior*; *Betula pendula*+*Salix caprea*+*Altherbosa* associations in *Betuleta pendulae* formation are dominats.

Rare arid forests formation class in the area flora formes by 2 formation and 4 associations: *Pyrussalicifolia*+ *P.caucasica*+ *Cotoneaster melanocarpus*+*Rosa rapinii*+*R. canina*; *Pyrus salicifolia*+ *P.caucasica*+ *Crataegus meyeri*+ *Malus orientalis*; *Pyrus salicifolia* + *Juniperus polycarpus*+*Quercus macranthera* association in *Pyrqueta salicifoliae* formation; *Celtis tournefortii*+*C. caucasica* at *Celtieta tournefortii* formation.

However, the forest cover does not end there, lichen are permanent elements and indicate of the cleanliness of forests.

Forest satellites of Shahdag forest: epiphytic lichen - *Dicranum polisetum* Sw., *Tortula subulata* Hedw.; from epigey - *Tortella tortuosa* (Hedw.) Limpr., *Phascum cuspidatum* Hedw., *Barbula unguiculata* Hedw., *Grimmia ovalis* (Hedw.) Lindb., *G. pulvinata* (Hedw.) Sm., *Racomitrium ericoides* (Web Brid. ex) Brid., *Physcomitrium pyriforme* (Hedw.) Hampe., *Pohlia cruda* (Hedw.) Lindb, *P. nutans* (Hedw.) Lindb., *Rhodobryum roseum* (Hedw.) Limpr., *Campilium chrysophyllum* (Brid.) J. Lange, *C. hispidulum* (Brid.) Mitt., *Leptodictyum riparium* (Hedw.) Warnst., *Conardia compacta* (G. Müll.) Robins., *Brachythecium albicans* (Hedw.) Schimp. in B.S.G., *B. mildeanum* Schimp. ex Milde, *B. populeum* (Hedw.) Schimp. in B.S.G.; from epilithis - *Pogonatum aloides* (Hedw.) Beauv., *Polytrichastrum alpinum* (Hedw.) G.L. Sm., *Tetraphis pellucida* Hedw., *Platyhypnidium riparioides* (Hedw.) Dix., *Orthotrichum speciosum* Ness in Sturum, *O. strangulatum* P.

Beauv, *Racomitrium microcarpon* (Hedw.) Brid., *Schistidium apocarpum* (Hedw.) Bruch ex Schimp. in B.S.G., *Tortula subulata* Hedw., *Phascum cuspidatum* Hedw., *Tortella inclinata* (Hedw. f.) Limpr., *Trichotomum crispulus* Bruch in F. Muell., *Eucladium verticillatum* (Brid.) Bruch ex Schimp. in B.S.G., *Weissia controversa* Hedw., *Encalypta ciliata* Hedw., *E. streptocarpa* Hedw., *E. vulgaris* Hedw. and *Dicranella heteromalla* (Hedw.) Schimp. These are representatives of 13 families (Table 1).

**Table No. 1: Taxonomic composition of lichen flora of Shahdag forest ecosystems**

Sr. №	Families	Genus number	Species number	Epiphyt	Epigey	Epiliths
1.	<i>Dicranaceae</i> Schimp.	1	2	1	-	1
2.	<i>Fissidentaceae</i> Schimp.	1	4	4	-	-
3.	<i>Encalyptaceae</i> Schimp.	1	3	3	-	-
4.	<i>Pottiaceae</i> Schimp.	7	7	1	1	5
5.	<i>Grimmiaceae</i> Arnott	5	5	-	3	2
6.	<i>Funariaceae</i> Schwaegr. in Willd.	1	1	-	1	-
7.	<i>Bryaceae</i> Schwaegr. in Willd.	2	3	-	3	-
8.	<i>Orthotrichaceae</i> Arnott	1	2	-	-	2
9.	<i>Amblystegiaceae</i> G. Roth	3	4	-	4	-
10.	<i>Brachytheciaceae</i> G. Roth	2	4	-	3	1
11.	<i>Hypnaceae</i> Schimp.	1	1	-	1	-
12.	<i>Tetraphidaceae</i> Schimp.	1	1	-	-	1
13.	<i>Polytrichaceae</i> Schwaegr in Willd.	1	2	-	-	2
<b>TOTAL:</b>		27	39	9	16	14

9 are epiphytes, 16 are epigeys and 14-2 are epiliths from 39 species of lichens in the Shahdag forests as shown from Table 1.

Bushes spread at altitudes of 1200-3200 m above sea level in Shahdag forests and rise to the borders of subalpine and alpine belts. *Tamarix meyeri*, *T. hohenackeri*, *Ephedra procera*, *Lonicera iberica*, *Rhamnus pallasii*, *Crataegus caucasica*, *Juniperus exselsa* subsp. *polycarpus*, *Rosa tuschetica*, *R. canina*, *Berberis vulgaris*, *Sorbus graeca*, *Cotoneaster*

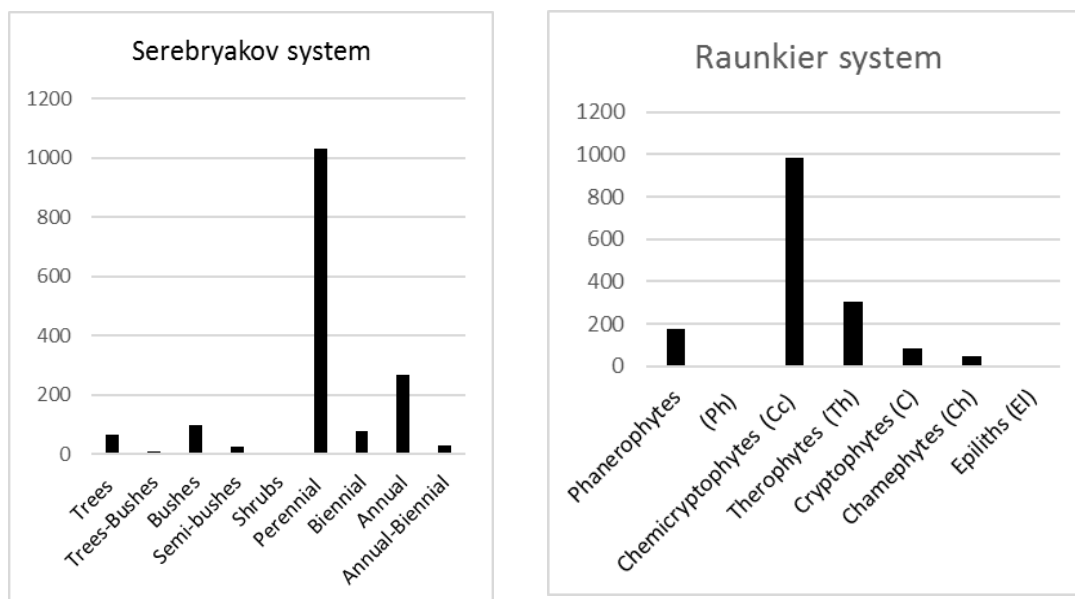
*melanocarpus* and others species are encountered here. This vegetation is divided into 2 formation class, 9 formations and 14 associations.

The evergreen bushes formation class dominates by 3 formations(*Junipereta foetidissimum*, *Ephedreta procerae* and *Tamariceta meyeri*) and 5 associations: *Juniperus foetidissimum*+*J.polycarpus*+*J.hemispheriaca*+*Astracantha microcephala*+ *Herbosa*; *Juniperus foetidissimum*+*J.polycarpus*+ *J.hemispheriaca*+*Ephedra procera*+*E. aurantica*+*Fruticosus*; (*Juniperus foetidissimum*+*J.hemispheriaca*+*J.polycarpus*+*Atrophax Spinosa*), *Ephedra procera*+*Astracantha microcephala*, *Tamarix meyeri*+*T.kotschyi*.

The deciduous bushes as formation class are distributed at the edges, around and inside of the forest and includes 6 formation (*Amygdaleta fenzlianae*, *Rhueta coriariae*, *Berberieta vulgaris*, *Cotoneasteerta melanocarpus*, *Sorbueta persicae* and *Roseta rapinii*) which formed by the following associations: *Amygdalus fenzliana*+*Atrophax spinosa*+*Rhamnus pallasii*; *Rosa canina*+*Lonicera iberica*+*Amygdalus fenzliana*; *Rhusea coriarius*; *Berberis vulgaris*+*Rosa canina*+*Acer ibericum*; *Berberis vulgaris*+*B.densiflora*+*Cotoneaste melanocarpus*+*Spiraea crenata*+*S. hypericifolia*; pure *Rosa rapinii*+*R. canina*+*R. nisami*; *Rosa rapinii*+*R. canina*+*R. nisami*+*Juniperu hemispheriaca*+*J.polycarpus*+*Crataegus meyeri*+*C. Caucasica*; *Cotoneaster melanocarpus*+*Cerasus incana*+ *C. integerrimus*+*Astracantha gudrath*+*A.insidios*; *Sorbus persica*+*S. boissieri*+*Viburnum lantana*+*Crataegus orientalis*+*C. Pseudoheterophilla*.

Determination of life forms of plants have great importance in study of ecological-phytocenological and bioecological features of forest cover.

Thus, the life forms of plants are not evenly distributed on earth. Each climate zone has own spectrum of life forms. The classification of life forms of plants according to their morphological features may reflect their adaptation to the environment in which they grow.



**Figure No. 2: Life forms of plants of Shahdag flora**

Indication of soil and ecological conditions in the flora of the studied area provide a basis for determining the indicators of life forms. From this point of view, the life forms of plant species in the area flora were classified by biomorphs based on the system of I.G. Serebyakov [1964] and by J. Raunkier [1934] (Figure 2).

The main part of the flora is represented by 986 hemicryptophytes species and 306 species of therophytes according to the Raunkier system and makeup 80.6% of the flora as shown from the figure 2. 174 species of phanerophytes, 88 species of cryptophytes, 47 species of chamefites and 2 species of epiliths are represented in the area. Perennial grasses are dominated by 1,031 species - 64.3%, monocotyledons - 266 species - 16.6%, dicotyledons - 77 species - 4.8%, bushes - 96 species, 6%, trees - 64 species - 3.9% according to the Serebyakov system.

In general, a life form is a form in which a plant (individual) exists throughout life for adaption to the external of environment. "The life form is the result of long-term adaptation to environmental conditions, expressed in the appearance of plants" according to Alekhin (1944). "Plants combine into one life form, depending on the species, form and adaptation to the environment" according to Shennikov. The dynamics of the distribution of plants in the area by ecological groups was carried out by the Shennikov methods [1962]; ecological and phytocenotic studies classified plants with different degrees of humidity, taking into account

the effects of light, heat and humidity during the season and day. The results are shown in Figure 3.

Xerophytes dominate in the flora of the region by 473 species (29.5%) as shown from the diagram. Mesophytes are represented by 438 species -27.3%, mesoxerophytes by 434 species - 27.1%, xeromesophytes by 196 species -12.2%.

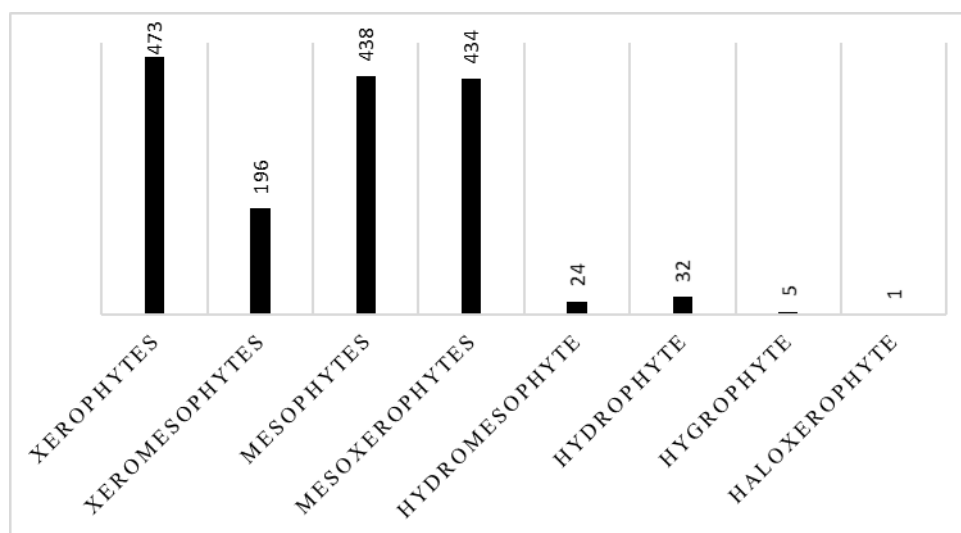


Figure No. 3: Number of species in Shahdag forest by ecological groups

## CONCLUSION

1. Although there are 1031 species of perennial grasses in Shahdag forest ecosystem, 64 species of trees and 96 species of bushes create forest background.
2. The presence of 39 species in lichens flora indicates the cleanliness of the forest.
3. The forest flora is formed from mixed ecological groups from the ecological point of view.

## REFERENCES

1. Anthropogenic disturbance of ecosystems. 2000, [http // www. sci. aha. com / ATL / ra 32 e. Htm](http://www.sci.aha.com/ATL/ra32e.htm) (in Russian)
2. Mustafayev A., Ibadullayeva S. Basic vegetation types of Shahdag National Park (Azerbaijan). SEAB 2-Symposium on EuroAsian Biodiversity. 2017 may Minsk-Belarus, p.131
3. Hacıyev V.J. Ecosystem of highland vegetation of Azerbaijan. Baku-2004, 130p. (in azerb.)
4. Hacıyev V.J. About the protection of the flora of Azerbaijan // News of AS of Azerb. series of biological sciences, 1990, No. 1, p. 3-11. (in Russian)
5. Ibadullayeva S.J. Vegetation cover of Azerbaijan. Collection of scientific works (traces) of the Botany institute ANAS. 2010, p.7-15.



6. İbadullayeva S.J., M.Shahmuradova, A.Mustafayev. Protection of Some Rare and Critically Threatened medicinal plants in the Azerbaijan flora// Journal of Biology and Life Science. ISSN 2157-6076, 2013, vol. 4 N 1. P.145-152. <http://dx.doi.org/10.5296/jbls.v4i1.2827>
7. İbadullayeva S.J., Mustafayev A.B., Shiraliyeva G.Sh. Seasonal dynamics of productivity of pastures and hayfields around Shahdag National Park // Agrarian Science-2016 (in azerb.)
8. İbadullayeva S.J., Mustafayev A.B., Shiraliyeva G.Sh. Classification of vegetation of high mountainous areas of the Greater Caucasus // News of ANAS, Biology series, Baku-2014. N-3, pp.58-65 (in azerb.)
9. Ilyinsky A.P. Higher taxonomic units in geobotany. "Sov. bot.", 1935, No. 5 pp. 112-184 (in Russian)
10. Mammadov G.Sh., Khalilov M.Y. Forests of Azerbaijan. Baku, Science, 2002, 472 P. (in azerb.)
11. Programs for geobotanical research. Compiled by a team of geobotanists / Ed. B.A. Keller, V.N. Sukacheva L. : Publishing House of the Academy of Sciences of the USSR, 1932, 248 p. (in Russian)
12. Raunker C. The life forms of plants and statistical plant geography. Clarendon Press, Oxford, 1934, p. 48-150
13. Red book of Azerbaijan Republic. Scarce and endangered mushroom species / Bakı: II publication, 2013, 673p. (in azerb.)
14. Serebryakov I.G. Life forms of higher plants and their study. In the book: Field geobotany, M., L., vol. 3, 1964, p. 530 (in Russian)
15. Shennikov A.P. Toward a Unified Natural Classification of Vegetation, Probl. of Botany. Publ. of USSR Academy of Sciences, 1962, v.6 (in Russian)
16. Yaroshenko P.D. Geobotany. M. : Education, 1969, 200 p. (in Russian)

