

Phytocenosis involved with foetid juniper (*Juniperus Foetidissima*) on the territory of Paradash in the Nakhchivan autonomous republic

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Abstract

The article presents the role and phytocenological features of the Foetid juniper (*Juniperus foetidissima*) species in the sparse juniper forest of Paradash in the Julfa region. According to the used literature and our researches, plants with bare seeds in the Nakhchivan Autonomous Republic are represented by 2 departments, 2 varieties, 3 rows, 3 families, 7 genera and 13 species, 7 of which are related to the cultural flora. According to research in sparse juniper forests in the Paradash area, there were not found spices belongin to Pinaceae Adans. Family, but 2 spices of *Juniperus* L. genera of Cupressaceae S.F. Gray family, and only one spice named *Ephedra procera* Fisch. et C.A. Mey. Belonging to the *Ephedraceae* Dumort family were determined. the dominant species of the tree tier is *Juniperus foetidissima* Willd., and the subdominant species is *Pyrus salicifolia* Pall. - whenever *Juniperus polycarpus* C. Koch, together with the willow-leaved pear are multi-fruited species of juniper. Counting of the height indicators according to the steps and determination of the trunk diameter of the Juniper tree on the territory of Paradash were given in the counting tables. All formations and associations of phytocenosis in a rocky biotope were discovered and presented.

Keywords: Rare juniper forest, plant group, test area, formation, dominant species, association

Introduction

One of the most important problems facing florists in our time is to organize protection of phytocenoses by studying the modern flora and vegetation of the region, studying the changes that have occurred there and the main reasons of these changes, as well as investigate them. It is extremely important for the international community to study the flora and vegetation of the region, the structure of the phytocenoses formed by them, the causes of the threat of extinction of plant species for various reasons, and the degradation of phytocenoses. The world community is seriously concerned about the ways to eliminate it, and a number of measures are being taken in countries to prevent these problems.

Recently, along with ecological, anthropogenic and zoogenic impacts on nature, global climate anomalies have been added, which have already begun to cause serious consequences in many countries. Therefore, the study of the phytocenological features of the rare juniper forest of Paradash is relevant from the point of view of developing a strategy for protecting existing plant groups in the region, especially rare ones. According to the study, it was found that plants with bare-seeded plants in the Nakhchivan Autonomous Republic have the following classification spectrum:

Divisio: Pinophyta

Classis: Pinopsida

Ordo: Pinales

Familia: Pinaceae Adans.

1. Genus: Pinus L

1(1) Pinus kochiana Klotzsch

2(2) *Pinus sylvestris L.

2. Genus: Cedrus L.

3(1) *Cedrus libanica L.

Ordo: Cupressales

Familia: Cupressaceae S.F. Gray

1. Genus: Cupressus (Tourn) L.

4(1) *Cupressus arizonica Greene

2. Genus: Platycladus Spach [Biota (D.Don) Endl.]

5(1) *Platycladus orientalis (L.) Franco [Thuja orientalis L. Biota orientalis (L.) Endl.]

3. Genus: Thuja (L.) Tourn.

6(1) *Thuja occidentalis L.

4. Genus: Juniperus L.

7(1) Juniperus communis L.

- J. c. var. saxatilis Pall. [J. c. subsp. oblonga (Bieb.) Galushko]

- J. c. var. communis [J. c. subsp. hemisphaerica (J. et C. Presl) Nym.]

8(2) Juniperus foetidissima Willd.

9(3) Juniperus polycarpus C.Koch

- J. p. var. polycarpus

10(4) *J. sabina L.

11(5) *Juniperus virginiana L.

- J. v. f. glauca Knight

Divisio: Gnetophyta

Classis: Ephedropsida

Ordo: Ephedrales

Familia: Ephedraceae Dumort.

1. Genus: Ephedra L.

12(1) Ephedra aurantiaca Takht. et Pachom.

13(2) Ephedra procera Fisch. et C.A. Mey.

So, according to the used literature and us researches, plants with bare seeds in the Nakhchivan Autonomous Republic are represented by 2 departments, 2 varieties, 3 rows, 3 families, 7 genera and 13 species, 7 of which are related to the cultural flora. Foetid juniper (*Juniperus foetidissima*) species play a subdominant and sometimes dominant role in the rare juniper forests characteristic of the autonomous republic. A Koch pine - *Pinus kochiana* Klotzsch was discovered by us on the territory of the Shahbuz State Nature Reserve.

Materials and Methods

The research work with gymnosperms in the Nakhchivan Autonomous Republic was generalized on the basis of materials collected during periodic expeditions to areas from the Sadarak region to Soyugdagh of the Ordubad region, in 2018-2020s. Paradash was selected in the Julfa area to clarify the common features of the rare juniper forests typical for the area. As the object of study was taken *Juniperus foetidissima* Willd. - Foetid juniper, which inhabits on the territory beginning from the mid-mountain zone of the autonomous republic to the high-mountain zone 850-3000 meters above the sea level. This type acts as an edifier in the field of study. In the course of the study, the phenology of flora and vegetation, geobotanical classification were studied on the basis of the method of Beideman I.N. [5], Voronova A.G. [6], Shennikova A.P. [13] and others [9, 10]. In a systematic study the the following materials were taken as a basis - Флора Азербайджана (Flora of Azerbaijan) [12], Конспект флоры Кавказа (Abstract on the flora of the Caucasus) [8], Imkhanitskaya N.N. [7], Talibov T.H., Valisoy A.N. [1], Talibov T.H., Ibragimov A.M. [4] and Christenhush M.J. and others [14]. The height and distance between the trees were measured using Tomshco TM-1000A, a special laser device (3-1000M). Rare species, their protection and effective use are mentioned in the literature [2, 3, 11, 15].

Results and its Discussion

Evergreen species of juniper can be observed even in winter, and the rare forests that they form, along with other positive features give additional beauty to this area. A Foetid juniper is a tree of 5-6 meters high with a dioicous, sometimes monoicous, bad-smelling, pyramidal or dome-shaped umbrella, or a bush with an oval umbrella of 1.5-3 meters high. Under favorable conditions, the height of the trees can be about 15-16 meters. The bark of the trunk is gray, the bark of young branches is grayish-red. It has four-faced branches, arcade, curved and thick. The leaves of the second branch are 1.5-2 mm long, dark green in color, prickly, ovoid or pikavoid, the reverse side is convex. The upper half of the leaves is located more or less far from the stem. Male flowers have round and whole scales. Fruits are spherical or ovoid. Unripe fruits are blue, then turn brown. Ripe fruits are dark brown or almost black with a bluish spot. Across the fruit its width is 12-15 mm, and the width of slightly dried fruit is 9-12 mm. The tips of the scales on ripe fruits are practically invisible. It may have 1-3 seeds of light chestnut colour, lignified. The lower branches of Foetid Juniper (*Juniperus foetidissima*) that come in contact with the ground often have long, needle-shaped leaves,

usually green, dark green, or bluish green. They differ from ordinary scaly leaves in their shape and size. Such coniferous leaves are usually found on all branches of young plants, but later they are replaced by scaly leaves. Coniferous leaves also form on the young shoots.

The study was conducted in the Paradash area of the Ordubad State Nature Reserve in the Julfa region. A rare juniper forest is located in this zone at an altitude of 850-2000 m and covers a large rocky zone. Here, Foetid juniper mixes with other trees and shrubs to form groups. In an autonomous republic with a sharply continental climate, juniper species successfully adapt to areas with hard rocks and weak soil cover. The Foetid juniper - *Juniperus foetidissima* Willd. is included in the Red Books of the Republic of Azerbaijan with the status *Near Threatened* - NT [3] and in the Red Books of the Nakhchivan Autonomous Republic with the status *Critically Endangered* - CR A4acd [2]. Over the past 20 years in the Autonomous Republic, deforestation has been minimized since all residential areas were fully provided with gas and electricity. From this point of view, the process of self-renewal of juniper continues successfully. Another factor is the ongoing war, which, along with other negative features, led to a decrease in anthropogenic pressure in the border areas, which affects the intensity of restoration of forest shrub biotopes in this area.

Juniperus foetidissima Willd, belonging to the genus of *Juniperus* L., was studied in the vegetation of the Paradash regions in the Julfa region from late May to late October. Forest bushes in the form of small spans inside the studied area rise to the borders of the region. A test site has been selected in the area to collect more accurate data.

Paradash test field is located in a rocky, sparse shrub area at the foot between Goydagh and Ilandagh in the Julfa area. These forests are used both as summer and winter pastures. Due to the fact that the forest is used as pasture, several juniper trees felled and dried by shepherd could be found on this area. The selected territory is mainly a rare juniper forest, which is characteristic for the autonomous republic and is formed due to the predominance of Foetid juniper species (map 1).

Here, the dominant species of the tree tier is *Juniperus foetidissima* Willd., and the subdominant species is *Pyrus salicifolia* Pall. - whenever *Juniperus polycarpus* C. Koch, together with the willow-leaved pear are a Multi-fruited species of juniper. The thickness of tree trunks belonging to the dominant species in the test area was calculated according to the Kraft classification. First, trees were selected at the corners of an imaginary square, then trees on the connecting line of these points, and then trees on the diagonal of the square and their diameters were measured. In this case, the measurement was carried out with a measuring fork at a height of 1.3 m from the ground. The measurement results are entered in the counting table according to the Kraft classification. This classification allows us to study the effect of intraspecific competition and micro-conditions on development of the trees of the same aged, growth of their umbrella and trunk thickness. You can distinguish 5 classes at the same level. Trees that dominate the first class and have a well-developed umbrella; the umbrella of the second class is less developed than the first, the umbrella of the third class grows under the umbrella of

trees of class I and II, the fourth class lags behind in growth in height, and the fifth class includes dry, withered and very poorly developed trees.

In the table, the number of Foetid juniper trees in the test zone was calculated and estimated by variety, and the diameter of the tree trunks was measured and the average diameter was found. In this test zone, the tree with the

smallest diameter is 8 cm and the tree with the largest diameter is 44 cm. To find the average diameter, the thickness steps of the trunk were multiplied by the number of trees, and the diameters were added and divided by the number of trees. Thus, the average diameter is 27.4 cm. Due to its rare forest cover, trees are mainly found in classes II and III, but trees of classes I and V are also found (Table 1).

Table 1: Determining the diameter of trunk of Foetid Juniper in the Paradash area

Steps of the thickness of the trunk/sm	Number of trees	Sum of diameters
8	9	72
12	10	120
16	7	112
20	15	300
24	10	240
28	27	756
32	35	1120
36	20	720
40	6	240
44	4	176
Total	143	3856

To find the average diameter, the sum of the diameters is divided by the total number of trees:

Average diameter 3856: 143 = 26.97 cm

In the test zone, the height indicators according to the steps of the multi-fruited juniper are entered in the counting table (Table 2).

Table 2: Counting table of the Foetid Juniper according to the height indicators

Steps	Foetid Juniper					Sum	Height, m
	Class I	Class II	Class III	Class IV	Class V		
8				6	3	9	1,5;1,6;1,8
12				9	1	10	2,0;2,4;2,6
16				6	1	7	2,8;2,9;3,0
20			2	11	2	15	3,2;3,4;3,6
24			9	1		10	3,8;3,9;4,0
28		5	16	6		27	4,2;4,5;4,6
32		4	26	5		35	5,0;5,5;5,7
36		3	15	2		20	5,8;5,9;6,0
40	1	3	2			6	6,2;6,4;6,6
44		3	1			4	7,0;7,1;7,3

To determine the average height of the trees, the height of three trees at each step of the thickness was measured and entered in the graph. The height of the trees was determined by a laser apparatus depending on the distance from the top till the seat and the remaining angle between them (height in a right triangle). In addition, the thickness step is indicated on the abscissa axis, and the height of the trees is indicated on the ordinate axis in the Decart coordinate system. A curve obtained from a combination of intersection points divides the elevation points into two parts. The average height was found for this curve and the average diameter.

The number of trees allows us to determine the quantitative relationship between species in the phytocenoses. In this case, the total number of trees in the field is taken to be ten. Based on this indicator, the proportion of each tree is determined. In the test area, 143 junipers and 15 pears were found. In the *Junipereta* formation, the tree layer formula can be shown as follows: 9Ard, 1Arm. It should be noted that in the preparation of this formula, the predominant species is indicated in the first row, species with a number of 2-5% with a "+" sign and species with a number of less than 2% with the word "one". The density of the forest is 0.3. Although the average age of the trees is 119, there are

many trees in this forest that reach a height of 12-14 m, a trunk diameter of 40-44 cm and ages 250 years (Map 1).

In these areas such species as *Juniperus foetidissima* Willd., *Juniperus polycarpus* C.Koch, *Ephedra procera*, *Pyrus salicifolia* Pall., *Berberis vulgaris* L., *Quercus macranthera* Fisch., *Astracantha microcephala* Podlech, *Onobrychis cornuta* (L.) Desv. act as key elements of groupings. Mixing such shrubs as *Crataegus monogyna* Jacq., *Pistacia mutica* C.A. Mey., *Acer campestre* L., *Rosa canina* L., *Spiraea hypericifolia* L. into the composition qualitatively enriches the composition of the groupings. In the forest-edge sediments and shrubby territory with more xeromorphic and weaker grass, in groups formed by such shrubs as *Spiraea crenata* L., *Viburnum montana* L. vā *Cotoneaster integerrimus* Medik., especially in rocky and sandy areas, along with species such as *Astragalus odoratus* Lam. were also found such herbs as *Helichrusum plicatum*, *Xeranthemum squarrosum* Boiss., *Chardinia orientalis* O.Kuntze, *Scorzonera latifolia* DC., *Silene bupleuroides* L., *Centaurea squarrosa* Willd.

TYPE: Forest-shrub vegetation: Formations and associations formed by evergreen shrubs

Formation class: Evergreen shrubs

Formation: *Junipereta foetidissimae*

Assosiation: *Juniperus foetidissima* + *Pyrus salicifolia* + *Juniperus polycarpos* + *Rosa canina* + *Rhamnus pallasii* + *Rubus ibericus* + *Ciematis orientalis* + *Astracantha microcephala* + *Centaurea behen* + *Peganum harmala* + *Allium akaka* + *İris lycotis* + *Tulipa florenskyi* + *Herbosa*

Formation: *Ephedra aurantiaca*

Assosiation: *Ephedra aurantiaca* + *Juniperus foetidissima* + *Pyrus salicifolia* + *Pyrus caucasica* + *Atrophaxis spinosa* + *Rosa rapinii* + *Zygophyllum fabago* + *Astracantha karyaginii* + *Rheum ribes* + *Michauxia laevigata* + *Verbascum pramidatum* + *Campanula tridentata* + *Allium rubellum* + *İris caucasica* + *Muscari tenuiflorum* + *Ceterach officinarum* + *Herbosa*

Formation class: Shrubs that drop their leaves

Formation: *Querceta macrantherae*

Assosiation: *Quercus macranthera* + *Amygdalus fenzliana* + *Juniperus foetidissima* + *Crataegus pentagyna* + *Pyrus salicifolia* + *Rhamnus pallasii* + *Rosa canina* + *Capparis spinosa* + *Spiraea hypericifolia* + *Viburnum montana* + *Astracantha karyaginii* + *İris elegantissima* + *Alopecurus textilis* + *Agropyron pectinatum*

Formation: *Berberieta vulgarae*

Assosiation: *Berberis vulgaris* + *Crataegus meyeri* + *Juniperus polycarpos* + *Amygdalus fenzliana* + *Cotoneaster saxatilis* + *Pyrus acutiserrata* + *Rosa canina* L. + *Cerasus incana* + *Spiraea crenata* + *Zygophyllum fabago* + *Rosa azerbaijanica* + *Halimodendron halodendron* + *Astragalus szovitsii* + *Asparagus persicus* + *Hypericum scabrum* + *İris imbricata* + *Herbosa*

Formation: *Pistacieta muticae*

Assosiation: *Pistacia mutica* + *Sorbus persica* + *Juniperus foetidissima* + *Crataegus orientalis* + *Acer campestre* + *Viburnum lantana* + *Acantholimon caryophyllaceum* + *Michauxia laevigata* + *Astragalus regelii* + *Cephalaria nachiczevanica* + *Ranunculus sceleratus* + *Gentiana crusiata* + *Onobrychis bungei* + *Alchemilla amicta*

Assosiation: *Pistacieta muticae* + *Juniperus polycarpos* + *Amygdaleta fenzlianae* + *Acer campestre* + *Rhamnus pallasii* + *Cotoneaster melanocarpus* + *Atrophaxis spinosa* + *Rosa rapini* + *Ciematis vitalba* + *Qundelia tournifortii* + *Astragalus lagurus* + *Astracantha karyaginii* + *Euphorbia marschalliana* + *Hypericum perforatum* + *Fritillaria kurdica* + *Scilla caucasica* + *Herbosa*

Formation: *Malueta orientalea*

Assosiation: *Malus orientalis* + *Prunus divaricata* + *Juniperus polycarpos* + *Pyrus salicifolia* + *Rosa corymbifera* + *Crataegus orientalis* + *Crataegus monogyna* + *Lonicera iberica* + *Cotoneaster microcarpa* + *Viburnum lantana* + *Cerasus mahaleb* + *Allium rubellum* + *Tulipa julia* + *Ranunculus napellifolius* + *Glaucium elegans* + *Artemisia absinthium* + *Stipa capillata* + *Aegilops cylindrica*

Assosiation: *Sorbus persica* + *Cotoneaster saxatilis* + *Juniperus polycarpos* + *Crataegus pentadyna* + *Spiraea hypericifolia* + *Daphne transcaucasica* + *Astracantha karyaginii* + *Althea officinalis* + *Origanum vulgare* + *Ranunculus oxyspermus* + *Trifolium pratense* + *Senecio paucifolius* + *Thymus collinus* + *Stachys lavandulifolia* + *Prangos acaulis* + *Pyrethrum punctatum* + *Erophila verna* + *Stipa barbata* + *Aegilops triuncialis*

Results and Its Discussion

As a result of studying the flora of the Paradash sparse juniper forest ecosystem of the Julfa district, the age characteristics, the degree of rarity of the juniper trees in the region and the role they played in the phytocenosis were determined. The juniper sparse forest ecosystem is dominated mainly by sparse forests, mesophytic grasses-sod-mixed grasslands formed after the forest, representatives of clay and grain grasses that make up the abundance here. Grain and mixed meadows grown out of the forest includes the territory beginning from *Brizetum media* meadows and plain at an altitude of 1000-2000 m. till subalpine meadows of *Dactyletum glomeratae* meadows. On the investigated territory the sparse forests of Foetid Juniper - *J. foetidissima* Willd and multifruited juniper - *Juniperus polycarpos* C.Koch were noted in the form of little groupings. The forest bushes, which exist in the form of little groupings, rise to the borders of the subalpine zone of the area. The study shows that the Foetid Juniper is extremely poorly recovered in the experimental field. Consequently, due to the presence of the reserve in these areas, the anthropogenic impact should be reduced and by using seeds collected in the Botanical Garden of the Institute of Bioresources of the Nakhchivan branch of ANAS should be reintroduced into these areas.

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