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# The features of ferns for their moisture demand and life form including in the flora of Nakhchivan Autonomous Republic Azerbaijan

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**Abstract**
The article provides information about moisture demand and life forms of fern species, which spread in the flora of Nakhchivan Autonom Republic. It was noted that a class, 2 series, 6 families and 15 species including 11 genera of ferns spreading in the territory for humidity insistence, divided 4 ecological group (xerophyte, mesoxerophyte, mesophyte, mesohygrophyte), also it was identified that ferns divided 3 groups for their light demand (loving shade, resistant to shade and loving light). The article provides information about division 2 group of fronds of ferns for their existence durability (being green in summer and being green in winter) and life form divide 3 group for morphological structure of rhizomes (long rhizomatous, short rhizomatous and lawn maker).

**Keywords:** xerophytes**,** nakhchivan autonomous republic, ferns, mesoxerophytes, mesophyte, mesohygrophyte, litofils

## Introduction
The ferns are demanding for humid ecotypes, because one of the most important factor is moisture, which influenced their growth and breed, development of spore, and gametophyte is implementing only in the water surrounding. The ferns come across generally in the arctic and mild climate condition, a few part of ferns come across dry and hot climate conditions. The oldest species of ferns grow in the humid climate zones of New Zealand; on the other hand, Pteridoflora is developing very weakly in continental (cold) places. Some of fern species come across in the stony, rocky and high mountainous places in the area of Nakhchivan Autonomous Republic. The ferns are can be divided 4 ecological groups for their living form and humidity necessity, which spread in the flora of Nakhchivan Autonomous Republic: Xerophyte, Mesoxerophyte, Mesophyte and Mesohygrophyte.

## Material and Method
The ferns are demanding for humid ecotypes, because one of the most important factor is moisture, which influenced their growth and breed, development of spore, and gametophyte is implementing only in the water surrounding. The ferns come across generally in the arctic and mild climate condition, a few part of ferns come across dry and hot climate conditions. The oldest species of ferns grow in the humid climate zones of New Zealand; on the other hand, Pteridoflora is developing very weakly in continental (cold) places. Some of fern species come across in the stony, rocky and high mountainous places in the area of Nakhchivan Autonomous Republic. The ferns are can be divided 4 ecological groups for their living form and humidity necessity, which spread in the flora of Nakhchivan Autonomous Republic: Xerophyte, Mesoxerophyte, Mesophyte and Mesohygrophyte.

## Experimental Part
Xerophytes: two species [*Cheilanthes persica* (Bory) Mett. *Cheilanthes pteridioides* (Reichard) C.Chr.] of ferns are including this group, which spread in the flora. These species grow up on the naked rocks fewer humid places. The structure of fronds have adapted to less necessity moisture and surface covered with hard, special cover and under side surrounded with thick hairs. In unsuitable condition the palms of fronds create pulp. The species including xerophyte group basically come across in rocky-gravelly slopes of less humid mountainous areas.

Mesoxerophytes: the species including this ecological group come across in shady places of rocks and open aridity areas. There are 2 species [*Notholaena marantae* (L.) Br., *Asplenium septentrionale* (L.) Hoffm.] of ferns including this group in the flora of Nakhchivan Autonomous Republic. These species grow in less humid areas. The fronds of ferns adapted environment which including mesoxerophyte group, so their surface of fronds are leather-like, few cilium and curled for less evaporation. These species grow comparatively hot and sometimes aridity areas of Nakhchivan Autonomous Republic.

Mesophyte: 10 species [*Asplenium trichomanes* L., *Asplenium adiantum-nigrum* L., *Ceterach officinarum* Willd. *Cystopteris fragalis* (L.) Bernh., *Adiantum capillus-veneris* L., *Dryopteris filix-mas* (L.) Schott, *Polystichum lonchitis* (L.) Roth, *Athyrium distentifolium* Tausch ex Opiz., *Polystichum aculeatum* (L.) Roth., *Polypodium vulgare* L.] of ferns are including this group which spreat in the flora of area. The plants including in this group mainly grow in humid places of mountainous, rocky areas.

Mesohygrophyte: A species included in this group that, this species come across in the 3000 m altitude from sea level in Alpine zone in the area of Autonomous Republic.

Majority of ferns spread in the flora of being typical mountainous country Nakhchivan Autonomous Republic grow in stony, rock or in rock cracks, being the first pioneer plants of rocks are related Litofils group [*Cheilanthes persica* (Bory) Mett., *Cheilanthes pteridioides* (Reichard) C.Chr., *Notholaena marantae* (L.) Br., *Adiantum capillus-veneris* L., *Asplenium septentrionale* (L.) Hoffm. *Ceterach officinarum* Willd., *Polystichum lonchitis* (L.) Roth, *Cystopteris fragalis* (L.)

Bernh.], stimulating their division and formation of soil [4, s. 707-711; 9, s. 37-113].

The ferns mainly grow in the shady areas, according to our studies and the informations of literature it is clear that, the ferns are different for need of light. The ferns are can be divided into three main groups due to need of light: fond of shade, resistant to shade and fond of light.

Fond of shade. The species including this groups mainly grow in the dense forests, they are very poorly developed. Lighting of cenozes take place in deforestation time that leads to the destruction of fond of shade ferns. Some species can be include to meadow plants group for their features, it has been noted according to carried out researches in Far East by Judovoy (1967) and Stepanov (1981), but then they grow in the forest or forest-shrubbery cenozes second grade fond of light bush tiers. Two species of ferns [*Polystichum aculeatum (L.) Roth. Dryopterisfilix-mas (L.) Schott*.] can be include this group in the flora of Nakhchivan Autonomous Republic. A.I. Shmakov noted that fond of shade ferns mainly grow under coniferous trees as sparse form.

Resistant to shade: Nine species of ferns include in this group, which spread in area. The representatives of this group are can be come across in open areas (in grades, in meadows, in open rocks) and they develop well in here. The fronds structure of species [*Polypodium vulgare L., Adiantum capillus-veneris L., Asplenium adiantum-nigrum L., Asplenium septentrionale (L.) Hoffm., Asplenium trichomanes L., Athyrium distentifolium Tausch ex Opiz., Cystopteris fragilis (L.) Bernh., Polystichum lonchitis (L.) Roth., Botrychium lunaria (L.) Swartz in Schrad., Journ.*] including in resistant to shade group of ferns has been adapted to environment completely.

Fond of light: Some xeromorf features appeared in structure of fronds of ferns including this group in the flora of Nakhchivan Autonomous Republic. The number of stigmas had been decreased on the underside of the frond, surface covered with hairs, wax, scales. 4 species [*Cheilanthes persica* (Bory) Mett., *Cheilanthes pteridioides* (Reichard) C.Chr., Notholaena marantae (L.) Br., Ceterach officinarum Willd.] of ferns had been included this group which spread in the flora of area.

İ.Q. Serebryakov [6, s. 146-205] generally have given the special classification concerning life form of flowering plants, but special information have not given in here. Afterwards A.P. Xoxryakov [11, s. 251-264] had prepared evolution of ferns and involved principles of life form in carrying investigations. This classification provides information about mainly perennial parts of ferns. Afterwards the classification of life forms, description of bimorphs and the structure of sporophytes of ferns according to separate species or general groups had been represented in works of some researchers.

The Russian researcher A. Shmakov [7, s. 82-87] noted that this is not classification of life form of ferns, this is noted as morphological classification. But geographical distribution of ferns geographical–ecological features and morphological structure are not reflected completely. Firstly noted morphological structure of rhizomes when speak life forms of ferns. They divided 3 groups for life form: long rhizomatous grasses, short rhizomatous grasses and lawn maker grasses. The grass shaped ferns were divideds 2 groups for their living durability of fronds by A. Shmakov: being green in summer and being green in winter. Thus, the life form of ferns divide 3 groups for morphological structure of rhizomes: long rhizomatous, short rhizomatous and lawn maker.

Lawmakers: the ferns including this group mainly grow in rocky areas and abreast with unsuitable environment condition, basically they come across in the north and high mountainous areas. The life form of these ferns do not differ when they change their growth places. The fronds of ferns including lawn maker group are green in summer [*Cheilanthes persica* (Bory) Mett. *Cheilanthes pteridioides* (Reichard) C.Chr., *Notholaena marantae* (L.) Br., *Asplenium septentrionale* (L.) Hoffm., *Ceterach officinarum* Willd., *Cystopteris fragilis* (L.) Bernh.], but in some of species which grow in south zones the fronds are green in winter [Asplenium adiantum-nigrum L., Asplenium trichomanes L.].

Short rhizomatous: this group covers bigger part of ferns. The species including families (*Dryopteridaceae, Botrychiaceae, Woodsiaceae*) spread in this group mainly grow in woody areas, but some species of *Botrychiaceae* family grow in mountainous areas. The fronds of species including short rhizomatous group mainly are green in summer. Exception the species of *Polystichum* genus the ferns, which include this group, are green in summer.

Long rhizomatous: forest, rock, water-marshes, rarely epiphyte species included this group. The species including this group spread in North and South areal. *Polypodium vulgare* included *Polypodium* genus have spread high mountainous zone. The fronds of species including long rhizomatous group of ferns mainly are green in winter, the fronds of species are green in summer, which grow only forest and water-marshes areas.

The diversity of surface parts noted when ferns analyzed for season variability. The life period is limited with vegetation time in fronds of majority of ferns, but in some species, the life period of surface parts is more. Thus, ferns divided 2 groups for phenoritmotype: being green in summer and being green in winter.

Being green forms in winter: the life period of fronds of ferns including this group more than one year, thought it was cold in autumn the fronds are constant. Although the life period of fronds firstly depends on variability of climate factors in certain degree.

The ferns being green in winter mainly come across in south zones of Far East and Caucasus. The number of species including this group decrease sharply toward north, but some of species come across in arctic zones. A group of ferns being green in winter is rhythmical seasonal relict features plants, other species included this group are concerned to third period relicts. Five species [*Polypodium vulgare* L., *Asplenium adiantum-nigrum* L., *Aspleniumt richomanes* L., *Polystichum lonchitis* (L.) Roth., *Polystichum aculeatum* (L.) Roth] of ferns in flora of Nakhchivan Autonomous Republic including this group.

The forms being green in summer: thus majority of ferns included this group [*Cheilanthes persica* (Bory) Mett. *Cheilanthes pteridioides* (Reichard) C.Chr., *Notholaena marantae* (L.) Br., *Adiantum capillus-veneris* L., *Asplenium septentrionale* (L.) Hoffm., *Cetereach officinarum* Willd., *Athyrium distentifolium* Tausch ex Opiz., *Cystopteris fragilis* (L.) Bernh., *Dryopteris filix-mas* (L.) Schott. *Botrychium lunaria* (L.) Swartz in Schrad., Journ]. When temperature low the fronds of these ferns are getting dry. Some of ferns grow in south zones and including this group indicate themselves as always-green ferns (*Drypoteris filix-mas*). These facts had been indicated in researches of Russian and other foreign

researchers (Sato, Sakai, 1980; Shmakov, 2001). Green forms in summer increase from South to North. According information which indicated above we can conclude that, some of species features not only depend on only their biological characteristics (biomorphological features, ecological amplitude, adaptation level), but also depend on climate factors. Climate factor (not only general climate features, but also micro condition of growth places) determine seasonal rhythm of development, its changing influence the period of vegetation and going to wintering of species in half evergreen position [1, s. 165-188; 2, s. 258-264; 3, s. 49-54; 5, s. 369-375; 8, s. 36-72; 10, s. 161-167].

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