

Shrub Vegetation of the Limestone Massif of Khvamli Mountain

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The research area belongs to the botanical-geographical province of Kolkheti. Khvamli Mountain belongs to the limestone forest and alpine subprovinces of Western Transcaucasia. Khvamli ridge is separated as a independent sub-district within the framework of Racha limestone ridge and Lechkhumi district. The latter includes: Lechkhumi-Racha low-mountainous sub-district. In the study area there are bushy plants, which belong to 24 botanical families, 38 genera and 57 species. Of these, 5 species are endemic to the Caucasus, and 4 species are endemic to Georgia. From the shrubs of the Khvamli ridge we consider only those formations that are widespread, participate in the undergrowth as synusia, create both independent cenoses and subalpine groupings that make up the forest and also play a certain role in the change of forest and meadow vegetation. © 2023 Bull. Georg. Natl. Acad. Sci.

Khvamli, vegetation, shrubs, cenosis, endemic

The research area belongs to the botanical-geographical province of Kolkheti. According to A. Kolakovsky [1,2] Khvamli mountain is included in the limestone forest and alpine sub-provinces of Western Transcaucasia. E. Sokhadze [3] refers it into the limestone district of the mountain sub-province of North Kolkheti in Kolkheti province. R. Gagnidze [4] considers the Khvamli massif in Racha-Lechkhumi district of the West Transcaucasia limestone subprovince of the Kolkheti province. Morphologically the surface of Khvamli is a plateau divided by karst erosion processes. Its topographic appearance is determined by the com-

plex of funnels, wells and springs flowing underneath, the depth of which is mostly 40-50 m and the length is several tens of meters. The mentioned karst formations give Khvamli a wave-shaped riddled surface. The watersheds between abysses and untrodden paths are characterized by convex ridges and are almost devoid of flat surfaces. At an altitude of 1700 meters there is a "foot-ridge ice cellar", in which the snow shoveled in winter remains throughout summer, the temperature here is below zero degree, there are icicles and sticks inside. The western side of Khvamli consists of two-step steep rocks. This side

is impassable, it has only one entrance, which starts at the bottom of the first step. The steps gradually rise in the west direction. The lower northern or upper cretaceous cuesta is less karstic. The climatic regime for the upper belt of the Khvamli limestone massif is peculiar related to the condensation of moisture brought from the Black Sea by the southwest winds. This explains frequent thick fog here.

Research Method and Results

The vegetation of Khvamli is represented as follows: the massif from the base to 1000 m. is covered with secondary forest, often with shrubs. The main constituent species of the forest are: *Quercus pontica*, *Carpinus caucasica*, *Carpinus orientalis*, *Acer trautvetteri*, *Corylus avellana*, *Crataegus pentagyna*, *Rubus caucasicus*, *Lonicera caprifolia*, *Staphylea colchica*. On the southern slopes, there are oak forests with some beeches. Beech (*Fagus orientalis*) can be found 1000 m above sea level, the role of which gradually increases with height. Spruce (*Picea orientalis*) and fir-tree (*Abies nordmanniana*) can be found in the forest from about 1300 meters above sea level, and at 1400-1500 meters they form high-stemmed beech-coniferous forests. *Fagus orientalis*, *Carpinus caucasica*, *Picea orientalis*, *Abies nordmanniana*, *Ulmus elliptica* prevail in the forest up to 1500 meters above sea level. *Corylus avellana*, *Daphne glomerata*, *Laurocerasus officinalis*, *Ilex colchica*, *Rubus caucasicus* are typical for sub-forest. Among the ferns in this belt there are *Pteridium tauricum* and *Dryopteris filix-mas*. There are no *Castanea sativa*, *Rhododendron ponticum*. From 1500 meters above sea level the forest has more mesophilic character, *Fagus orientalis* (*Picea orientalis*) prevails among the woody plants here, *Pinus sylvestris*, *Ulmus elliptica*, *Tilia begoniifolia* are less involved. *Ilex colchica*, *Rhamnus imeretina*, *Laurocerasus officinalis* can be found in the sparse forests. Ferns and *Paeonia macrophylla* are typical in the windows of sprouts. There are more

ferns in this belt than in the lower one. The upper border of the forest in this part of the massif is located at an altitude of 1600-1700 meters above sea level. Here the forests are represented by scarcity of beech (*Fagus orientalis*), spruce (*Picea orientalis*), pines (*Pinus spp.*) and mountain maple (*Acer trautvetteri*). *Rhamnus imeretina*, *Ribes nigrum* and *Daphne glomerata* can be found in the undergrowth mixed with *Taxus baccata* and *Juniperus depressa*. In the subalpine vegetation above the forest, in some cases separate sections of the forest are preserved, which are represented by bushes, secondary high herbage of the meadow. Peculiar rock plants are common in the subalpine belt. Separate sections of the forest are preserved here on steep and rocky places at an altitude of 1800-1900 m. above sea level. Here, the woody plants of the forest include: *Fagus orientalis*, *Pinus sylvestris* and *Picea orientalis*. *Betula litwinowii* and *Acer trautvetteri* are less common, and the most common shrubs are: *Daphne mezereum*, *Laurocerasus officinalis*, *Frangula alnus* and *Vaccinium myrtillus*. Less: *Juniperus oblonga*, *Corylus avellana*, *Crataegus pentagyna* [5].

The forest complexes of the Khvamli ridge are made up of 236 species, which are included in 154 genera, the meadow complexes are made up of 181 species, the flora complexes of rocks and sloughs are made up of 79 species, tall herbaceous complexes include 16 species, 18 species are found in ruderal areas.

From the shrubs of the Khvamli ridge, we consider only those formations that are widespread, participate in the undergrowth as synusia, create both independent cenosis and forest (subalpine) groupings and also play a certain role in the change of forest and meadow vegetation.

Nuts. The nut trees of the Khvamli massif can be typologically grouped as follows: 1. Nuts of the undergrowth, together with nuts. This group often includes: *Rhododendron luteum*, *Crataegus pentagyna*, *Mespilus germanica*, *Rhododendron caucasicum*, *Rosa canina*, *Cornus mas*, *Sambucus nigra*,

components of tall grasses, graminaceous grasses and other. 2. The nut trees of the forest edge. They are ecologically, floristically and genetically very close to the nut trees of the undergrowth. 3. Independent (secondary) groves, in which typical, pure nut trees are distinguished, with some herbs: *Prunella vulgaris*, *Poa pratensis*, *Viola alba*, *Briza media*, *Galium verum*, *Geranium robertianum*, *Asperula odorata*, *Galium cruciatum*, *Campanula collina*.

Junipers. The junipers on the Khvamli ridge are mainly presented by *Juniperus depressa* and *Juniperus oblonga*. Junipers form groups mostly on southern slopes, on stony and gravelly soils. Their cenoses are always scattered, fragmented and leave the impression of groups. Xeromorphic and hemixeromorphic shrubs and grasses are widespread in its sparse cenoses. In subalpine forests, juniper is mostly connected with pine forests. They are often found with *Rhododendron luteum* and *Rhododendron caucasicum*. Juniper forms microcomplex groupings with granular herbaceous formations and shrubs of subalpine meadows. *Daphne glomerata*, *Ribes biebersteinii*, *Vaccinium myrtillus*, *Hypericum ptarmicifolium*, *Hypericum perforatum*, *Galium cruciatum* and others are almost always found within junipers. The juniper has an aggressive attitude towards the subalpine meadows and often digs into them.

Azaleas. In the study region, azaleas (*Rhododendron luteum*) do not form independent groups, they usually come in the form of an undergrowth and participate in the forest edge shrub complexes. Secondary azaleas represented in fragments or shrubbery are typologically unstable, unformed cenoses. The typological structure of azalea is as follows: pure azaleas, azaleas with blueberries, azaleas with grasses, azaleas with tall grasses, azaleas with shrubs, azaleas with ferns. The following are most frequently found among the azaleas: *Daphne mezereum*, *Corylus avellana*, *Rubus saxatilis*, *Vaccinium myrtillus*, *Vaccinium*

arctostaphylos, *Poa pratensis*, *Aquilegia colchica*, *Poterium polygamum*, *Veronica gentianoides*, *Campanula collina*, *Symphytum asperum*.

Blueberries. Two types of bilberry are common on the Khvamli ridge: Caucasian bilberry *Vaccinium arctostaphylos* and black bilberry *Vaccinium myrtillus*. Caucasian bilberry is a typical dominant of the understory and rarely forms independent groups. *Ilex colchica*, *Laurocerasus officinalis*, *Rhododendron luteum*, *Rhododendron ponticum* and *Lonicera caprifolium* come with it, from herbs: *Dentaria bulbifera*, *Geranium sylvaticum*, *Asperula odorata*, *Laser trilobum*, also ferns, mosses and lichen. Black bilberry *Vaccinium myrtillus* is an understory shrub too but it also forms independent cenoses, especially in the subalpine belt. On the Khvamli massif, it can be most frequently found in the azaleas, pine forests, birch-azaleas and spruce forests.

Willows. *Salix caucasica*, *Salix caprea*, *Salix pseudomedemii* are the most common willows on Khvamli. In different groups of highland vegetation, willows are included as fragments. Sometimes they form willow shrubs, such shrubs are not solid from the phytocenological point of view, their floristic composition is very variable and depends on the bordering coenoses.

Daphne. *Daphne mezereum* and *Daphne pontica* are widely spread on Khvamli. A typical component of the forest is *Daphne mezereum*. Together with the Georgian snow rose (*Rhododendron caucasicum*), Caucasian bilberry (*Vaccinium arctostaphylos*), black bilberry (*Vaccinium myrtillus*) and azalea (*Rhododendron luteum*), it participates in the understory of beech, birch, beech-birch, fir-tree and other formations.

The Caucasian rhododendrons. The Caucasian rhododendron or the Georgian snow rose (*Rhododendron caucasicum*) actively participates in the formation of the phytolandscape of Khvamli

highlands. The Caucasian rhododendron is a shrub with a very wide ecological range. It creates both independent, dominant, very solid cenoses after the upper border of the forest, and, at the same time, it participates in the subalpine forest as a dominant-edifier. It takes a very active position in all cenoses, wherever it participates. The Caucasian rhododendron sub-forest is combined into the Kolkhetian type of sub-forest. The following plants almost always participate in the floristic composition of the rhododendrons: *Lycopodium selago*, *Sorbus caucasigena*, *Oxalis acetosella* [6].

Below is a list of the shrubby plants of the Khvamli ridge*:

Arctostaphylos caucasica Lipsch. ●
 Berberis vulgaris L.
 Buxus colchica Pojark.
 Carpinus orientalis Mill.
 Cornus mas L.
 Corylus avellana L.
 Corylus iberica Wittm.ex Bobrov●
 Corylus imeretica Kem. – Nath. ○
 Cotinus coggygia Scop.
 Crataegus microphylla K. Koch
 Crataegus pentagina Waldst.& Kit. ex Willd.
 Cytisus hirsutissimus K. Koch
 Daphne albowiana Woronow ex Pobed.
 Daphne mezereum L.
 Daphne pontica L.
 Daphne pseudosericea Pobed. ●
 Euonymus latifolius A. Gray
 Frangula alnus Mill.
 Hedera colchica K. Koch
 Hedera helix L.
 Hippophae rhamnoides L.
 Ilex colchica Pojark.
 Juniperus depressa Steven
 Juniperus oblonga M. Bieb.
 Laurocerasus officinalis M. Roem.
 Ligustrum vulgare L.
 Lonicera caprifolium L.
 Mespilus germanica L.
 Periploca graeca L.

Conclusion

Shrub plants distributed in the study area belong to: 24 botanical families, 38 genera, 57 species. Out of these 5 species are endemic to the Caucasus, and 4 species are endemic to Georgia. Of these, 8 species belong to the class of dycotyledons and 1 species to monocotyledons [8].

The research conducted on the vegetation of the limestone massif of the Khvamli mountain is important for the study of the systematics, ecology, and plant diversity of western Georgia's phytocenoses. The collected material was processed at Kutaisi Akaki Tsereteli University and is stored in the herbarium of the same university.

Rhamnus cordata Medwedew
 Rhamnus imeretina Booth, Petz. & Kirchn.
 Rhododendron caucasicum Pall.
 Rhododendron luteum Sweet
 Rhododendron ponticum L.
 Rosa canina L.
 Rosa corimbifera Borkh.
 Rosa tomentosa Sm.
 Rubus caucasicus Focke
 Rubus idaeus Vell.
 Rubus moschus Juz. ○
 Rubus nakeralicus Sanadze ○
 Rubus platyphyllus K. Koch. ○
 Ruscus colchicus Yeo ●
 Ruscus ponticus Woronow
 Salix caprea L.
 Salix caucasica Andersson
 Salix kazbekensis A.K.Skvortsov ●
 Sambucus nigra L.
 Smilax excelsa L.
 SorbuscaucasigenaKom.
 Staphylea colchica Steven
 Vaccinium arctostaphylos L.
 Vaccinium myrtillus L.
 Viburnum lantana L.
 Viburnum opulus L.
 Viburnum orientale Pall.
 Viscum album L.
 Vitis sylvestris C.C. Gmel. [7].

*Endemic of the Caucasus – ●, Endemic of Georgia – ○

ბოტანიკა

ხვამლის მთის კირქვიანი მასივის ბუჩქნარების მცენარეულობა

ნ. ძოწენიძე

აკაკი წერეთლის სახელმწიფო უნივერსიტეტი, ზუსტ და საბუნებისმეტყველო მეცნიერებათა ფაკულტეტი, ბიოლოგიის დეპარტამენტი, ქუთაისი, საქართველო

(წარმოდგენილია აკადემიის წევრის გ. ნახუცრიშვილის მიერ)

ხვამლის ბუჩქნარი მცენარეულობა ძირითადად წარმოდგენილია შემდეგი ფორმაციებით: თხილიანი, ღვიანი, იელიანი, მოცვიანები, ტირიფიანები, მაჯალვერიანები. ისინი მონაწილეობს ქვეტყეში, როგორც სინუზია, ქმნიან დამოუკიდებელ ცენოზებსაც, ასევე გარკვეულ როლს ასრულებენ ტყის და მდელოს მცენარეულობის როგორც ბუნებრივ, ასევე ანთროპოგენურ ცვლაში. ყველაზე ფართოდ გავრცელებულია მაჯალვერიანი და დეკიანი ფორმაციები. საკვლევ ტერიტორიაზე გავრცელებულია ბუჩქოვანი მცენარეები, რომლებიც მიეკუთვნება 24 ბოტანიკურ ოჯახს, 38 გვარს, 57 სახეობას. აქედან, კავკასიის ენდემია 5 სახეობა, ხოლო საქართველოსი – 4.

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