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SUBALPINE MEADOW VEGETATION OF TALISH HIGHLANDS OF AZERBAIJAN

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СУБАЛЬПИЙСКАЯ ЛУГОВАЯ РАСТИТЕЛЬНОСТЬ ТАЛЫШСКОГО НАГОРЬЯ АЗЕРБАЙДЖАНА

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Abstract. Subalpine meadow vegetation of Talish highlands has been spread over the subalpine zone of Lankaran highlands at lawny mountain-meadow soils at the height of 1800 m to 2500 m above sea level. During the carried out ecological-geobotanical research, it has been determined 7 formation classes, 12 formation groups and 20 associations. In parallel with the study of type composition and structure of phytocenosis found in the area of investigation, it has been also determined endemic species, productivity of formations, and intensification of degradation at soil-plant coverage of some lawny subalpine meadows, decrease in abundance and productivity of forage crop. Currently, for the purpose of the improvement of natural phytocenosis productivity, crop quality, protection of their genetic reserve and landscapes, as well as the vegetation study for solution of protection problems on the base of scientific means is of a great importance.

Аннотация. Субальпийская луговая растительность Талышского нагорья распространена в субальпийском поясе на газонных горно-луговых почвах на высоте от 1800 до 2500 м над уровнем моря. В ходе проведенных эколого-геоботанических исследований выявлено 7 классов формаций, 12 групп формаций и 20 ассоциаций. Параллельно с изучением типового состава и структуры фитоценоза, обнаруженного на территории исследований установлены также эндемичные виды, продуктивность формаций, усиление деградации почвенно-растительного покрова некоторых газонных субальпийских лугов, снижение численности и продуктивность кормовых культур. В настоящее время большое значение в целях повышения продуктивности природных фитоценозов, качества сельскохозяйственных культур, охраны их генетического резерва и ландшафтов, а также изучения растительности для решения охранных задач на основе научных средств имеет.

Keywords: steppes, plant communities, formations, associations.

Ключевые слова: степи, растительные сообщества, формации, ассоциации.

Depending on various typed soils of different heights, the Republic of Azerbaijan has multicolored vegetation, and the most valuable and useful trees, shrubs or grassy representatives have been found. One of regions possessing rich vegetation is Lankaran group regions. During the research, the study of subalpine meadow vegetation of Talish highlands was one of prior issues.

Subalpine meadow vegetation of Talish highlands has been spread over lawny mountain-

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meadow soils at subalpine zone at 1800 m to 2500 m above sea level [1-3].

For its origin, lawny meadows are nearly equal to swamped meadows and interfere in each other at appropriate condition of the area of distribution [4-7].

These types of groupings have been found in Yardimli, Lerik (Dashbashi summer grazing area at the height of 2493 m of Komurgoy mountain foothills, slopes between Shingedulen (2417 m) and Chayrud (2088 m) mountains) at grazing areas of upper highlands of Astara district [8-11].

Materials and methods

Subalpine meadow vegetation at subalpine zone of Yardimli, Lerik and Astara regions has been determined as an object of the study. It has been conducted several geobotanical research works during the study of phytocenosis found at lawny mountain-meadow vegetation of subalpine zone of Talish highlands [11-13].

In the result of conducted research, as well as ecological- geobotanical data map of region, it has been revealed that subalpine meadow vegetation of Talish highlands found in Yardimli, Lerik and Astara summer grazing areas.

Data about distribution of subalpine meadows at Great Caucasus and Lesser Caucasus Mountain chains, Nakhchivan AR and Talish highlands were found in the works of most botanists [14].

Subalpine meadows are distinguished for their rich floristic composition, structure of formations and high productivity in comparison with alpine meadows [15].

During investigation of subalpine meadow vegetation of Talish highlands, it has been prepared a classification scheme of subalpine vegetation, during determination of found plant, it was taken into account the systematic taxons, vital forms [16], International Botanical Codex, and studied projective coverage, ecological groups by means of different methods [17].

Results and discussion

During investigation it has been defined that subalpine meadow fauna of Talish highlands was formed of 7 formation classes, 12 formation groups and 20 associations. As a result of the conducted ecological and phytocoenological studies, it is clear that the subalpine meadows of the mountainous part of Talish are divided into 7 formation classes. The followings are determined as formation classes: 1. Wheat-grassy subalpine meadows; 2. Wheat-grassy different-grassy stepped subalpine meadows; 3. Different-grassy-wheat-grassy subalpine steps; 4. Shruby-different-grassy-wheat-grassy subalpine meadows; 5. Leguminous-different-grassy-wheat grassy mesophilic subalpine meadows; 6. Leguminous-wheat- grassy subalpine meadows; 7. Different-grassy subalpine meadows [2-14].

It has been given comprehensive information about phytocoenological structure and type composition of some formation classes below:

1. Wheat-grassy subalpine meadow formation class is represented with 3 formation group and 3 association, i. e. Stipetum-Festucosum formation group is represented with Stipetum transcaucasica-Festucosum ovina; Stipeta-Poaetum-Festucosum formation group with Stipeta transcaucasica-Poaetum pratensis-Festucosum ovina; Poaetum-Festucosum formation group with Poaetum pratensis-Festucosum ovina associations.

As it is obvious from 1 classification scheme, the largest vegetation has been registered at wheat grassy subalpine meadows at summer grazing areas of investigated regions [2-4, 10, 14, 16, 17],

During the investigation, in species composition of the Stipetum transcaucasica-Festucosum

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ovina association of Stipetum-Festicosum formation group, it has been registered 29 species of which 5of them are represented with shrub (17.2%), 2 of them with subshrubs (6.9%), 17 herbs (10.3%). According to the ecological group analysis of registered species, 15 types (51.7%) have been considered as xerophytes, 6 of them as mesoxerophytes (20.7%) and 8 of them as mesophytes (27,6%).

The dominant type of this phytocenosis is *Festuca ovina* L. of which abundance is between 3 and 4 points and subdominant is *Stipa transcaucasica* Grossh. of which abundance is estimated between 2 and 3 points [15, 17].

Different layering has been observed in the phytocoenological structure of formation. Thus, it has not been registered plants of phytocenotic structure in I layer. On II layer, shrubs as *Astragalus aureus* Willd.; subshrubs as *Stachys inflata* Benth., perennial grasses as *Stipa transcaucasica* Grossh., *Phleum pratense* L., *Achillea millefolium* L., *Alchemilla oxysepala* Juz., *Nepeta sulphurea* C. Koch etc., on the III-layer *Festuca ovina* L., *Poa pratensis* L., *Teucrium orientale* L., *Trisetum rigidum* (M. Bieb.) Roem. & Schult., *Euphorbia hyrcana* Grossh. etc. species have been defined. The project coverage is equal to 60-80%.

2 of 29 species defined in the type of composition of phytocenosis is considered to be Azerbaijani endemics as *Stachys macrantha* and *Euphorbia hyrcana* [8-10, 15].

2. Wheat-grassy different-grassy stepped subalpine meadow formation class is represented with one Festuceta-Poaetum-Thymosum formation group and two Festuceta ovina-Poaetum meyeri -Thymusosum trautvetteru and Poaetum meyeri-Thymusosum trautvetteri associations.

During the investigation, Festuceta-Poaetum-Thymusoosum formation group phytocenosis has been defined at no. 22 “Shikheli Yurdu” and no. 23 “Dara Kechmaz” summer grazing areas of Yardimli district.

In the species composition of this phytocenosis it has been observed 25 species, which 3 of them are shrubs (12%), 2 of them subshrubs (8,0%), 17 of them perennial grasses (68%), and 3 of them an annual (12%). According to ecological analysis, 17 species of them are defined to be xerophytes (68%), 3 of them mesoxerophytes (12%), and 5 of them mesophytes (20.0%).

Dominant of the phytocenosis is *Thymus trautvetteri* Klokov & Des.-Shost. species, of which abundance is estimated as 3-4 points, sub dominance *Poa meyeri* Trin. ex Roshev. type abundance with 2-3 points and *Festuca ovina* L. type abundance with 2 points [2-4, 8-10].

A three-layering has been observed in the structure of investigated phytocenosis. Thus, trees as *Filipendula ulmaria* (L.) Maxim. on the layer I, grasses as *Elytrigia trichophora* (Link) Nevski, *Stipa holosericea* Trin. & Rupr., *Achillea vermicularis* Trin., *Poa meyeri* Trin. ex Roshev., *Onobrychis altissima* Grossh., *Bromopsis variegata* (M. Bieb.) Holub etc. on the layer II, small-height shrubs as *Astragalus euoplus* Trautv., *Astragalus aureus* Willd., *Acantholimon hohenackeri* (Jaub. & Spach) Boiss., *Thymus trautvetteri* Klokov & Des.-Shost., *Alchemilla sericata* Rchb. ex Buser, *Trifolium repens* L., *Anisantha tectorum* (L.) Nevski etc. on the layer III have been observed. Project coverage of phytocenosis is 50-80%.

In the result of carried out research, it has been revealed that degradation of soil-plant coverage of lawny subalpine meadows becomes more intensive, abundance and productivity of valuable forage crops decreases. That’s why protection and storage of the phytocenosis, improvement of their structure is one of prior issues. As well, 1 of 25 species which was defined in type composition of relevant formation — *Thymus trautvetteri* Klokov & Des.-Shost. is considered as Azerbaijani endemic and it needs to be protected [3-5, 7, 8, 10, 15].

3. Different grassy-wheat grassy subalpine step meadow formation class is represented with two formation groups and 4 formation associations and considered to be specific phytocenosis of

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Lankaran highlands. The formation, covering large area is observed in no. 3 Yahar Yurd of Yardimli region, as well in summer grazing areas in the boundary of Lerik district. In the mentioned formation class, Thymuseta-Stipetum-Festucosum formation group is represented with Thymuseta trautvetteri-Stipetum holosericea-Festucosum valiesiaca association, and Cephalarieta-Poaetum-Festucosum formation group with Cephalarieta kotschyi-Poaetum pratensis-Festucosum ovina and Cephalarieta kotschyi-Festucosum valiesiaca associations.

During the investigation, it has been revealed 24 species in the species composition of Thymuseta-Stipetum-Festucosum formation. According to biomorphological classification, 3 of them were related to shrubs (12,5%), one to subshrubs (4.2%), 15 to perennial grasses (62,5%), and 5 to an annual grass (20,8%). According to ecological analysis of these species, 18 were related to xerophyte (75,0%) and 6 to mesoxerophytes (25,0%).

Phytocenosis dominant of *Festuca valesiaca* Schleich. ex Gaudin abundance is 3-4 points, sub dominances *Stipa holosericea* Trin. abundance is 2-3 points and *Thymus trautvetteri* Klokov & Des.-Shost. abundance is 2 [1-10, 14, 17].

Several species have been observed in the layers of phytocenosis plant coverage structure. Thus, on the layer I — *Stipa holosericea* Trin., layer II — *Festuca valesiaca* Schleich. ex Gaudin, *Poa pratensis* L., *Filipendula vulgaris* Moench, *Astragalus aureus* Willd., and layer III — *Acantholimon hohenackeri* (Jaub. & Spach) Boiss., *Juniperus communis* var. *saxatilis* Pall., *Thymus trautvetteri* Klokov & Des.-Shost., *Elymus caninus* (L.) L., *Phleum phleoides* (L.) H. Karst., *Trifolium hybridum* L., etc. perennial grasses, as well as *Anisantha sterilis* (L.) Nevski, *Bromus briziformis* Fisch. & C. A. Mey., *Hordeum crinitum* (Schreb.) Desf., *Euphorbia hyrcana* Grossh. and *Xeranthemum squarrosum* Boiss. an annual grass has been determined. Total project coverage of phytocenosis is 30-70%.

In the result of conducted ecological-geobotanical research, it has been determined that Thymuseta-Stipetum-Festucosum formation abundance is approximately equal to 8.2 metric centner. Cephalarieta-Poaetum-Festucosum formation group of different grassy-wheat grassy subalpine meadow step formation class has been registered at no. 9 summer grazing area of Yardimli district at 2038 m height above sea level. As it is depicted on classification scheme, the formation is represented with two associations. In the species composition of this formation, it has been shown 21 species of floral plants. The dominant of phytocenosis *Festuca rupicola* Heuff. its abundance is 2-3 points, the sub dominances are *Poa pratensis* L. and *Cephalaria kotschyi* Boiss. et Hohen. and their abundance is estimated as 2 points. Total project coverage of phytocenosis is equal to 50-80% [16, 17],

4. Bushy-different grassy-wheat grassy subalpine step meadow formation class is represented with 2 formation groups and 5 associations at Yardimli, Lerik and Astara areas. Astracantheta-Thymusetum Festucosum formation group of this formation class is spread over the large areas as no. 4 Khaninin kanari of Lerik district and along the Yardimli boundaries with neighbor lands of Iran (at the foothills of Balmadin mountain, as well as at high slopes of Kalaputu mountain of Astara district at height of 2093 m above sea level. Essentially, fauna coverage is spread over soft lawny mountain-meadow lands [4, 13]. *Festuca pratensis* Huds. creates proper subalpine lawny meadows. It has been observed intensification of degradation and desertification process in grazing areas of phytocenosis.

28 types have been registered in type composition of phytocenosis, 4 of them defined as shrub (14,3%), 1 undershrub (3,6%), 1 subshrub (3,6%), 16 perennial grasses (57,1%), 3 biennial grass (10.7%), 3 an annual grass (10,7%). During ecological analysis of the species, it has been defined that 20 of them are xerophyte (71.4%), 5 of them mesoxerophytes (17,9%) and 3 of them are

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mesophytes (10.7%) [18].

Dominance in the coenosis is *Festuca pratensis* Huds., of which abundance is estimated 3-4 points, sub dominance *Thymus trautvetteri* Klokov & Des.-Shost. as abundance 2-3 points, and *Astragalus aureus* Willd. Podlech abundance as 2. Total project coverage of phytocenosis is 45-75%.

In phytocenotic structure, it has been determined *Rosa cuspidata* M. Bieb. on layer I, *Astragalus aureus* Willd., *Astragalus resupinatus* M. Bieb., *Rumex scutatus* L., *Festuca pratensis* Huds., *Dactylis glomerata* L., *Thymus trautvetteri* Klokov & Des.-Shost. on layer II, *Festuca rupicola* Heuff., *Agrostis tenuis* Sibth., *Hypericum perforatum* L., etc. species on layer III.

While analyzing fauna coverage on the base of ecological groups [2-4], determination of large distribution of xerophytes in the structure type of phytocenosis obviously proves desertification of investigated area.

It has been met two types, as well as *Thymus trautvetteri* Klokov & Des.-Shost. and *Centaurea zuvandica* (Sosn.) Sosn. plants specific to Azerbaijani flora in this phytocenosis, which also needs protection [15].

Flora coverage of Acantholimoneta-Thymusetum-Poaosum formation group of shruby-various grassy subalpine steppe meadow formation class was spread over southern-eastern slope of Khanbulag-Kurdasa pasture lawns of Lerik region.

This formation group includes 3 associations, and Acantholimoneta-ho-henackeri-Thymusetum-trautvetteri-Poassum-pratensis, Acantholimonetum hohenackeri-Thymusosum kotschyanus and Thymusetum trautvetteri-Poaosum pratensis.

In the type of composition of phytocenosis *Poa pratensis* L., *Thymus kotschyanus* Boiss. & Hohen. has been defined as dominants, *Acantholimon hohenackeri* (Jaub. & Spach) Boiss. and *Thymus trautvetteri* Klokov & Des.-Shost. as subdominant. Abundance of edification types (dominants and subdominants) has been estimated 2-3 and 2 points. Total project coverage is determined between 40-60% [8].

5. Leguminous-different-grassy-wheat grassy-mesophilic subalpine meadow formation class is represented with 2 formation groups and 4 associations.

Trifoliumeta-Thymusetum-Festucosum formation group of this class are found at deserted mountain-meadow soils. The formation is represented with two associations-Trifoliumeta repensis-Thymusetum trautvetteri-Festucosum rubra and Trifolietum hybrida-Thymusetum trautvetteri. Mesophile subalpine meadow was spread over the region in the form of small patterns at mountain-meadow soils of Kizyurdu mountain foothills at 2200-2400 m height of sea level [14].

Fauna coverage of the formation is bounded with forest area of Lankaran highlands from in the East and Sourthern-east, and also defined at no. 12 summer grazing of Lerik district.

Type composition of phytocenosis is too rich and consists of 35 species. 2 of them are shrubs (5,7%), 1 subshrub (2,9%), 21 perennial grasses (60,0%), 3 biennial grasses (8,6%). For its ecological group, 14 species distributed to xerophytes (40,0%), 15 mesoxerophyte (42,9%), 6 mesophytes (17,1%).

Abundance of formation dominant Festuca rubra L. is 3-4 points, subdominant of formation is *Thymus trautvetteri* Klokov & Des.-Shost. and *Trifolium repens* L. and abundance of both species are estimated 2-3 points and 2 points accordingly. The structure of fauna coverage formation was distributed to 3 layers, and also has been determined that *Crataegus pentagyna* Waldst. & Kit. ex Willd., *Rosa nisami* Sosn. of shrubs, *Stipa capillata* L. of grasses have been found on layer I, as well *Dactylis glomerata* L., *Stipa capillata* L., *Festuca rubra* L., *Trifolium repens* L., *T. hybridum* L., *Medicago* ×*caucasica* Vassilcz., *Festuca drymeja* Mert. & W. D. J. Koch, etc. on layer II,

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Thymus trautvetteri Klokov & Des.-Shost., *Ziziphora biebersteiniana* (Grossh.) Grossh., *Convolvulus pentapetaloides* L., etc. on layer III.

Productivity of fauna coverage of formation is 9.4 cwt/ha according to used dry weight.

Plant coverage of Coronileta-Verbascumetum-Alchemillosum formation group of leguminous-different grassy-wheat grassy-mesophile subalpine meadow formation class was spread over grazing areas of Kagoy village of Lerik district (in the boundary of Astara district) at the height of 1811 m above sea level in steppe brown soils. The formation group is represented with Coronileta hyrcana-Verbascumetum laxum-Alchemillosum persica and Verbascumetum laxum-Coronileta hyrcana associations [14-17].

It has been defined 24 and 30 species of floral plants in the species structure of associations.

The dominant species of Coronileta hyrcana-Verbascumetum laxum-Alchemillosum persica association is *Alchemilla persica* Rothm., subdominant *Coronilla hyrcana* Prilipko, the abundance 2-3-point, dominant species of Verbascu-metum laxum-Coronileta hyrcana association is *Coronilla hyrcana*, the abundance 3-4-point, subdominant *Verbascum laxum* Fil. & Ják., the abundance 2-3 point. Total project coverage is equal to 60-80%.

6. Leguminous-wheat grassy subalpine meadow formation class Onabrychisetum-Poaosum formation group was met at no. 8 Sarichay summer grazing area slopes of Lerik district.

The formation is represented with Onabrychisetum transcaucasica-Poaosum pratensis association, 30 species are defined in the species content, and differs for its biodiversity. 1 of species was estimated as a shrub (3.3%), 2 species subshrubs (6.7%), 14 species perennial grasses (46.7%), 3 species biennial grasses (10.0%), and 10 species annual (33.3%). In accordance with ecological analysis, 17 types are specific to xerophytes (56.7%), 7 types to mesoxerophytes (23.3%), 5 types to mesophytes (16.7%), and 1 type to hydrophytes (3.3%).

The dominant type of phytocenosis is *Poa pratensis* L. abundance 3-4 points, subdominant *Onobrychis transcaucasica* Grossh. and abundance is 2-3 points [10, 17].

It has been determined two-layering in the structure of phytocenosis. Thus, types as *Astragalus xiphidium* Bunge, *Bromopsis variegata* (M. Bieb.) Holub, *Lolium perenne* L., *Helictotrichon pratense*, *Dactylus glomerata*, *Pimpinella aurea*, *Cichorium glandulosum* on layer II, *Poa meyeri* Trin. ex Roshev., *P. pratensis* L., *Trigonella orthoceras* Kar. & Kir., *Ziziphora tenuior* L., *Onobrychis cornuta* (L.) Desv., *Festuca alexeenkoi* E. B. Alexeev, *Achillea millefolium* L., *Ranunculus repens* L., *Avena fatua* L., etc. on layer III are found. Total project coverage is 45-75%.

7. Thymusetum-Astracanthosum formation group plant coverage of different grassy-leguminous subalpine meadow formation class has been registered at no. 20 Saribulag summer grazing area of Yardimli district. In the species content of registered Thymusetum trautvetteri-Astracanthosum talyschense association, it has been found 27 species. It has been determined that 3 of them are shrubs (11.1%), 1 of them subshrubs (3.7%), 11 of them perennial grasses (40.8%), 3 of them biennial grasses (11.1%), and 9 of them is specific to annual grasses (33,3%). From ecological group analysis, it became obvious that 17 species relate to xerophytes (63%), 8 types to mesoxerophytes (29.6%), 2 types to mesophytes (7.4%).

Formation dominant is *Astragalus talyschensis* Bunge of which abundance is 3-4 points, as well subdominant *Thymus trautvetteri* Klokov & Des.-Shost. abundance is estimated as 2-3 points.

Three-layering has been observed in the structure of fauna coverage. Thus, *Rosa cuspidata* M. Bieb. on layer I, *Eryngium billardieri* Del., *Cotoneaster integerrimus* Medik., *Rumex pulcher* L., *Anthemis rigescens* Willd., *Stachys persica* S. G. Gmel. ex C. A. Mey., *Coronilla cretica* L., *Nepeta sulphurea* K. Koch on layer II, and *Astragalus aureus* Willd., *Festuca rupicola* Heuff., *Papaver*

orientale L., *Trigonella coerulescens* (M. Bieb.) Halácsy, etc. on layer III. Total project coverage of phytocenosis is 30-70% [14, 16].

Explanation of results

The carried out ecological-phytocoenological research and investigation results show that most of plants found subalpine meadow areas of Lankaran highlands are perennial grasses and xerophytes dominate according to ecological analysis. Determination of large distribution of xerophytes in the type of content of phytocenosis has obviously proved desertification of investigated area. Along with the study of type content (7 formation classes, 12 formation groups, 20 associations have been defined), structure of phytocenosis found in the investigated area, it has been determined endemic species, productivity of formations, intensification of degradation in some steppe subalpine meadow soil-fauna coverage, decrease in abundance of forage crops and productivity.

As it has been mentioned above, the achieved results show that improvement of crop quality, productivity of natural phytocenosis, protection of their genetic reserve and landscapes, as well as the study of vegetation for the solution of protection issues on the base of scientific means is of great importance.

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