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Steppe of Tbilisi environs (East Georgia, South Caucasus)

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ABSTRACT

Steppes of Tbilisi environs are studied. In the Tbilisi surroundings the steppe vegetation is either of primary or secondary origin. Steppe vegetation in the Tbilisi environs are represented by 4 formations: (1) Bothriochloeta ischaemum, (2) Festuceta valesiaci, (3) Stipeta pennatae and (4) Gramino-Mixtoherbeta. From them Bothriochloeta ischaemum and Festuceta valesiaci formations have more area covering and characterized by the comparatively rich typological composition. Typological composition of each formation is established. For each separated plant communities the basic structural characteristics (general projective coverage, sodding degree, dominant-edificatory plant, characteristic species, number of species, moss cover, litter, species richness, spectrum of life forms), distribution area in the Tbilisi environs and main physical-geographical conditions (altitude, exposure, inclination, soil type) are given.

Introduction

The part of basin of the river Mtkvari, which is spread from the vil. Dzegvi to the section between Ponichala and Rustavi, is considered in the environs of Tbilisi. Endings of the thick geographic units of various origins and geographic age are gathered in the vicinities of Tbilisi that makes its relief considerably complicated. Privately, they are involved in the environs of Tbilisi: (1) extreme southern branching of Caucasian range – Saguramo-Ialno ridge, (2) Eastern part of Kvernaki low range (Skhaltba low range), (3) Eastern endings of Trialeti ridge (the ranges of Satskepela and Armazi, Mskhaldidi and Lisi, Mtatsminda, Narikala, Tabori, Telet-Sakharaulo), (4) Western and extremee north-western part of Iori upland (Samgori, Vaziani, Tbilisi Sea and its adjacent territory, etc.), (5) Extreme north-western ending of Mtkvari-Arax lowland (plains of Ponichala and Kumisi-Tsalaskuri). Hypsometrical amplitude of the Tbilisi vicinity is from 350 m to 1875 m above s.l.. Types of low and middle-height mountain-gorge and stepped plain relief are highlighted in the relief [1–5].

In the environs of Tbilisi, two types of climate with the appropriate two zones of the climate are apportioned [2,3]: (1) The climate with insufficient humidity, dry and hot summer and mild but well expressed winter, (2) moderately humid climate with moderately warm summer and moderately cold snowy winter. The first zone of the climate contains the whole left side of the river Mtkvari, plains of Ponichala and Kumisi-Tsalaskuri and the river floodplain as well. The secondary climate zone contains the mountainous part of the right side and the main part of Saguramo-Ialno range.

Mainly, grey cinnamonic soil is developed on the western ending of the Iori upland and on the slopes of middle-height low range, which is of skeletal in most cases. Just of the same types, but light saline soil is on the plains of Ponichala and Kumisi-Tsalaskuri, where the solonets and solonchak is speckled. Mainly, different modifications of cinnamonic soil (cinnamonic leached, cinnamonic calcareous, cinnamonic light) are spread on the slopes of eastern endings of Trialeti range, on the slopes of southern exposure of Saguramo-Ialno ringe and partly on the Skhaltba low range. And, brown forest soil of various modifications are met in the upper parts of these ringes. Alluvial soils remained on the terraces of the rivers. Thin primitive skeletal soil and scree-stony are widely spread in the grey cinnamonic soil areal. Rocky bareness of groundless soil covering is also met. The section of clay and clay-sand badlands is met on the southern slope of Skhaltba low range [2,3,5–8].

Variety of relief-edaphic conditions, geographical location and muster of several geographic units those are different from each other, existence of different climate zones, geological past, modern geophysical and geochemical processes and etc. conditions

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significant biodiversity of Tbilisi environs. From the point of landscapes creation and taken space, forests, shrubberies and steppes are the most important, which are represented by diverse modifications [9].

Steppes are the main pastures in the Tbilisi environs and their floristic-geobotanical and ecological study is important as from an angle of agricultural, as from an angle of conserve of ecological balance and biodiversity. Though, the literature data about steppe vegetation of Tbilisis surroundings are scanty [10–12].

Objectives and methods

The object of research is steppe vegetation of Tbilisi environs. The main aim of the research was to establish area, typological composition and distribution regularities of steppe vegetation in the Tbilisi environs; determination of area and main physical-geographical conditions of identified syntaxa (plant communities); study their geo-botanical structure and evaluation of ecological situation.

Geo-botanical data were obtained by the route method. Geo-botanical descriptions were carrying out on 1 m^2 and 25 m^2 plots. During the geo-botanical descriptions, studying the structure of phytocoenoses and identification of syntaxa, we were guided the traditional geo-botanical methods [13–19].

On the each plots were registration general projective cover (in %) of plant communities, sodding degree (in %), floristic composition, coenotic role of each species (projective cover in %), height of layers, as well physical-geographical characteristics (relief, exposure, inclination, soli type, altitude). In the process of cameral work for each plant community were established frequency of occurrence of each species and were determined constant (typical) species, were calculated species richness on 1 m^2 and 25 m^2 and spectra of life forms.

Results and analysis

Steppe vegetation is fragmentary developed almost all over the territory of Tbilisi environs, on the both sides of the river Mtkvari. Its altitude range is in foothills and lower mountain belt, approximately 450–900 (1000) m above s.l.. Plant communities of steppe are developed on slopes with various exposure and inclination, mainly on the grey-cinnamonic and also on cinnamonic soils. Soils are thin or middle depth.

In the Tbilisi environs the steppe vegetation is either primary or secondary origin. Nowadays, to draw the line between the primary and the secondary coenoses is impossible in most cases. Spreading of primary steppe vegetation is linked with first climate zone (the climate with insufficient humidity, dry and hot summer and mild but well expressed winter) and various modifications of grey-cinnamonic soils which are developed in this zone. Plant communities of secondary steppe were formed by digressive succession processes of post-forest vegetation. Their area is outside of first climate zone. They are spread on second climate type zone (the climate with insufficient humidity, dry and hot summer and mild but well expressed winter). Accordingly, secondary plant communities of steppe are included in the area of forests and shrubberies of foothill and lower mountain belt [9,20].

Steppe vegetation in the Tbilisi environs is represented by several formations: (1) yellow bluestem formation (Bothriochloeta ischaemum), (2) fescue formation (Festuceta valesiaci), (3) feather grass formation (Stipeta pennatae) and (4) grass-forbs formation (Gramino-Mixtoherbeta).

Yellow bluestem formation (Bothriochloeta ischaemum)

Yellow bluestem formation (Bothriochloeta ischaemum) is one of the characteristic formations of vegetation of Tbilisi environs. Their plant communities are fragmentary developed almost all over the territory of Tbilisi environs, on the both sides of the river Mtkvari. Altitude range of formation is in foothills and lower mountain belt, approximately 450–900 (1000) m above s.l.. Yellow bluestem plant communities are developed on slopes with various exposure and inclination, mainly on the grey-cinnamonic and also on cinnamonic soils. In the Tbilisi environs they are either primary or secondary origin. Yellow bluestem plant communities of secondary origin are formed by deforest and cutting of shrubberies [9,12,20].

On the one hand, relief-edaphic and climatic factors and, on the other hand, different origin of communities, determine typological diversity of yellow bluestem formation in the Tbilisi environs. The following plant communities are identified by us: (1) Bothriochloetum gramino-mixtoherbosum, (2) Botriochloetum festucoso gramino-mixtoherbosum, (3) Bothriochloetum festucosum, (4) Bothriochloetum ephemerosum, (5) Bothriochloetum stiposum arabici, (6) Bothriocholoetum astracanthosum caucasici.

Short geo-botanical characteristic of identified plant communities is given bellow.

(1) Bothriochloetum gramino-mixtoherbosum

Area in the Tbilisi environs: foothills of Armazi range (on the territory of surroundings of Mukhatgverdi cemetery) & Skhaltba range;

Altitude (m): 600–700;
Exposure (macro): E, W, S-W;
Exposure (micro): N-E, E, W, S-W, W;
Inclination: from 2-3° to 20–22°;
Soil: skeletal cinnamonic & grey-cinnamonic, middle depth;
General projective coverage: 80–95% (rarely, 60–75%, 100%);
Sodding degree: 20–25% (rarely, 10%, 28–32%);
Dominant-edificatory: *Bothriochloa ischaemum* (projective coverage 25–35%, rarely, 15–20%, 50%);
Characterized species:

- **Perennial plants** – *Festuca valesiaca* (frequency of occurence 93%), *Koeleria cristata* (89%), *Salvia nemorosa* (82%), *Medicago caerulea* (78%), *Eryngium campestre* (70%), *Polygala transcaucasica*, *Potentilla recta* (67-67%), *Galium verum*, (63%), *Plantago lanceolata* (59.3%), *Onobrychis cyri* (56%), *Potentilla adenophylla* (58%), *Falcaria vulgaris* (48-48%), *Cleistogenes serotina* (44%), *Phleum pratense*, *Stipa capillata* (41-41%);
- **Annual plants** – *Trifolium campestre* (frequency of occurence 70%), *Linum corymbulosum* (59%), *Carthamus lanatus* (52%), *Scabiosa micrantha* (48%), *Helianthemum salicifolium* (44%), *Helianthemum lasiocarpum*, *Brachypodium distachyon* (41-41%);
- **Semi-shrubs & dwarf semi-shrubs** – *Thymus coriifolius* (frequency of occurrence 63%), *Teucrium polium* (48%);

Number of species: 140;
Moss cover: + (rarely);
Litter: from 1-2% to 20–22%;
Species richness on 1 m^2: 31 species;
Species richness on 25 m^2: 42,8 species.
Spectrum of life forms: Phanerophytes – 3 species (2,1%), Chamaephytes – 5 (3,6%), Hemicryptophytes (with biannual plants) – 83 (59,3%), Geophytes – 7 (5,0%), Therophytes – 42 (30,0%).