



Rare herbs and semiwoody plants for flora of Tbilisi environs (East Georgia, South Caucasus)

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ABSTRACT

Herbaceous and semiwoody rare plants for Tbilisi environs were study. There are identified 112 rare plants, the distribution area and number of which are restricted in the vicinity of Tbilisi. They are of different bio-ecologies and characteristic plant of various ecosystems. Important part of species widespread in Georgia and they do not belong to the rare plants of Georgia. Their distribution in Tbilisi environs is due to various ecological factors. However, 23 species are rare plants not only for Tbilisi environs, but also for the flora of Georgia. Main distribution area of 13 species covers the vicinity of Tbilisi and they are not spread in other regions of Georgia or are very rare. Twenty-nine species are endemics of Caucasus, 5 of which are endemics to Georgia. List of 122 herbaceous and semiwoody rare species for Tbilisi environs identified by us are given below. Distribution area and habitats in Tbilisi environs for each species are given. Endemics of Caucasus and Georgia and life forms are indicated.

Keywords: Tbilisi environs, Biodiversity, Rare species, Endemic, Habitat, Distribution area.

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Introduction

Location and physiological conditions

Tbilisi environs are located in River Mtkvari basin in central part of South Caucasus.

Endings of large geographical units of different origin and geological age are gathered in the surroundings of Tbilisi. They are: Saguramo-Ialno and Skhalba ridges, the eastern endings of the Trialeti Range, the extreme end of the north-west and western parts of Iori plateau and Ponichala and Kumisi-Tsalaskuri plains (parts of Kvemo Kartli lowland). Hypsometrical amplitude of Tbilisi environs is about from 350 amsl to 1875 amsl [1-5].

Two types of climate are separated out in Tbilisi environs. Accordingly, there are two climatic zones shaped [2, 3]: (1) Climate with insufficient humidity, dry hot summer and mild but well expressed winter;

(2) Moderately humid climate with moderately warm summer and moderately cold snowy winter. The first zone includes the whole left side of the Mtkvari, Fonichala and Kumisi-Tsalaskuri planes and even river floodplain. The average annual atmospheric precipitation is from 380 to 530 mm and the average annual temperature is within 11.5-12.3°C. Here annual evaporation predominate the sum of precipitation. Snow cover is unstable and brief. Dryness index is equal to 2. The second climatic zone includes the mountainous part of the right side of the Mtkvari. The average annual atmospheric precipitation is from 550 to 800 mm and the average annual temperature is within 7.4-10.8°C. Snow cover is comparatively stable and long. Precipitation-evaporation ratio is equal to 1 [2, 3, 6, 7].

Grey-cinnamonic, cinnamonic and brown forest soils are distributed. Besides them, alluvial soils are developed on the terraces of rivers. Rocky and scree-

stony ecotypes and loamy and clay-sandy badlands have limited area [8, 9].

Short review of vegetation of study area

Tbilisi environs are characterised by high level of biodiversity. Approximately 1650 species of vascular plants was recorded [10, 11]. One hand, hemixerophilous and xerophilous and, second hand, mesophilous and wetlands types of vegetation are spread [12]. Xerophilous and hemixerophilous vegetation are presented by desert (semidesert), steppe and shibliak type shrubberies. Deciduous forest, shrubberies and meadow are common in mesophilous vegetation. Besides them vegetation units of rocky and scree-stony ecotypes, loamy and clay-sandy badlands and wetlands have limited area.

Aim of the research

Protection and conservation of biodiversity are one of the most pressing issues in the modern era. It is especially important to protect the natural landscapes and biodiversity around large cities, because rapid urban development and recreational load threaten both ecosystems and flora and fauna diversity. Therefore, an urgent task is to identify rare and endangered species and monitor them in urban conditions. In most cases, the focus is on the protection of fauna, and from plants to trees and shrubs. Less attention is paid to herbaceous and semiwoody plants, while the core of the floristic composition of ecosystems is mostly formed by herbaceous plants.

The aim of our research was to identify rare herbaceous and semiwoody plants of Tbilisi environs, determine their distribution area and habitats them which will allow us to develop measures for their protection and monitoring.

Objectives and Methods

A route method was used to identify rare species. Studies were conducted on the entire area of environs of Tbilisi. All main characteristic habitats of Tbilisi environs were studied. The determining criteria were the quantity and distribution range of species. The focus was on fragmentation of the distribution area. In addition to own research, literary data are used [10, 11, 13-15]. We used our previous studies in the vicinity of Tbilisi to specify the distribution ranges and habitats of species [16-23].

Caucasus and accordingly endemics of Caucasus are discussed within borders of Caucasus ecoregion [24]. Life forms of the plants follow Raunkiaer's sys-

tem [25] and Serebriakov's classification [26].

Results and Analysis

Different physiographical conditions and large altitudinal amplitude allow plants characteristic of different ecosystems to spread. Plants of different bio-ecologies in the form of individual units and not numerous populations are intruding into appropriate habitats. In some cases, the range of these plants is local, and in some cases their total area is more or less wide, although it is disjunctive and quantity of these species in a certain part of the range is small.

We have identified 122 rare herbaceous and semiwoody (semishrubs and undershrubs) plants in vicinity of Tbilisi. They are of different bio-ecologies and characteristic plant of various ecosystems. Important part of species widespread in Georgia and they do not belong to the rare plants of Georgia. Their distribution in Tbilisi environs is due to various ecological factors. Accordingly, they can be divided into following groups:

(1) **Plants of different ecotopes of upper the forest, subalpine and alpine belts (mostly plants of meadow and subalpine forests)** - *Allium kunthianum*, *Astrantia maxima*, *Asyneuma amplexicaule*, *Centaurea cheiranthifolia* subsp. *cheiranthifolia*, *Cephalaria gigantea*, *Dianthus cretaceus*, *Gladiolus caucasicus*, *Hypericum linarioides*, *Lilium szovitsianum*, *Puschkinia scilloides*, *Silene vulgaris*, *Tanacetum coccineum*, *Tephrosia cladobotrys*, etc.);

(2) **Plants of mesophilous forests** - *Actaea spicata*, *Allium ursinum*, *Anemone ranunculoides*, *Convallaria majalis* subsp. *transcaucasica*, *Doronicum macrophyllum*, *Galanthus kemulariae*, *Galanthus woronowii*, *Ornithogalum magnum*, *Paeonia caucasica*, *Paris incompleta*, etc.;

(3) **Plants of arid and semiarid ecosystems** - *Amberboa moschata*, *Asphodeline prolifera*, *Astragalus cyri*, *Astragalus stevenianus*, *Astragalus xifidium*, *Eremurus spectabilis*, *Genista transcaucasica*, *Hedysarum sericeum*, *Jurinea elegans*, *Koelpinia linearis*, *Onobrychis komarovii*, *Reseda globulosa*, *Scabiosa rotata*, *Psephellus amblyolepis*, *Sternbergia colchiciflora*, *Stizolophus coronopifolius*, *Tulipa eichleri*, etc.;

(4) **Plants of rocky, stony and scree ecotopes** - *Alopecurus textile* subsp. *tiflisiensis*, *Astragalus kadschorensis*, *Bufonia tenuifolia*, *Centaurea bella*, *Paronychia kurdica*, *Pyrethrum fruticosum*, *Silene propinqua*, *Silene solenantha*, *Silene solenantha*, *Telephium orientale*, *Tripleurospermum elongatum*, etc.;

(5) **Plants of extremely wet and wetland ecotopes** - *Alopecurus aequatialis*, *Iris pseudacorus*, *Iris spuria* subsp. *carthaliniae*, *Petasites georgicus*, etc.;

(6) **Plants of saline ecotopes** - *Salicornia europaea*, *Salsola soda*;

(7) **Plants growing on river sands and river-gravels** - *Cladochaeta candidissima*, *Glaucium flavum*.

From the identified 122 species the plants whose main distributed area covers the environs of Tbilisi and are not spread in other regions of Georgia or are very rare, are especially noteworthy. Such are: *Anthemis saguramica*, *Galanthus kemulariae*, *Glaucium grandiflorum*, *Iris paradoxa*, *Isatis subradiata*, *Minuartia hybrida*, *Minuartia intermedia*, *Papaver rhoeas*, *Phelypaea helenae*, *Tulipa biebersteiniana*, *Viola mirabilis*.

The species of the family *Orchidaceae* should be mentioned separately. There are distributed 30 species of this family in the vicinity of Tbilisi. Majority of them are more or less widespread in Georgia and some are rare species of flora of Georgia (for example: *Neottia nidus-avis*). 23 out of 27 species are presented in limited numbers in the vicinity of Tbilisi and belong to rare plants. They are of different bio-ecologies and characteristic plant of various ecosystems. They grow in as hemixerophilous (*Ophrys caucasica*, *Dactylorhiza romana* subsp. *georgica*, etc.) as mesophilous (*Anacamptis coriophora*, *Dactylorhiza urvilleana*, *Limodorum abortivum*, *Neotinea tridentata*, *Neottia nidus-avis*, *Orchis purpurea*, *Cephalanthera rubra*, etc.) and wetland (*Anacamptis laxiflora*) habitats.

It should be noted that out of 122 species 21 are rare plants not only for Tbilisi environs, but also of the flora of Georgia. Such are: *Alopecurus aequatialis*, *Anthemis saguramica*, *Asphodeline lutea*, *Bufonia tenuifolia*, *Calendula arvensis*, *Coluteocarpus vesicaria*, *Glaucium grandiflorum*, *Helianthemum georgicum*, *Iris iberica*, *Iris paradoxa*, *Isatis subradiata*, *Minuartia hybrida*, *Minuartia intermedia*, *Papaver rhoeas*, *Phelypaea helenae*, *Phelypaea coccinea*, *Roemeria refracta*, *Silene solenantha*, *Stizolophus balsamita*, *Tulipa biebersteiniana*, *Viola mirabilis*.

Endemics deserve special attention. Twenty-nine of 122 species are endemics of Caucasus, 5 of which are endemics of Georgia. One species – *Galanthus kemulariae* is local endem of Tbilisi environs (Saguramo Ridge).

List 122 herbaceous, semishrubs and undershrubs

rare species for Tbilisi environs identified by us are given below. Distribution area and habitate in Tbilisi environs and life forms for each species are given. Endemics of Caucasus and Georgia are indicated.

Abbreviations:

An. – annual
 Bian. – biannul
 Ch. – chamaephytes
 G. – geophytes
 H. – hemicryptophytes
 He. – heliophytes
 P.H. – perennial herb
 Th. – therophytes
 Ush. – undershrub

Conventional Signs

☉ – Endemic of Caucasus
 ○ – Endemic of Georgia
 ● – Local Endemic of Tbilisi environs
 ▲ – Plant included in “Red list of Endemic Plants of the Caucasus (Solomon, Shulkina, Schatz, 013)

Pteridophyta

Dryopteridaceae

Polystichum lonchitis (L.) Roth

In ravine; in forest, probably on rocky and stony ecotopes; surroundings of Kojori (Udzo); in the environs of Tbilisi was found only once [10]. P.H. / H.

Ophioglossaceae

Ophioglossum vulgatum L.

On slopes and plane place; in oriental beech forest, forest edges and on moist meadows; Saguramo Ridge; P.H. / H.

Angiospermae Dicotyledoneae

Amaranthaceae (Chenopodiaceae)

Salicornia europaea L.

On moist salty ecotopes; was spread on the shores of saline lakes, wick in the past were in place of the Tbilisi Sea [27]. An. / Th.

Salsola soda L.

On moist salty ecotopes; was spread on the shores of saline lakes, wick in the past were in place of the Tbilisi Sea [27]. An. / Th.

Apiaceae (Umbelliferae)▲ *Astrantia maxima* Pall.

On slopes and plane place; on meadows and in forest edges; surroundings of Kojori and Kiketi. P.H. / H.

Asteraceae (Compositae)◎ ▲ *Amberboa moschata* (L.) DC.

On dry, clay, loamy and clay-sandy balands, hills and scree slopes; in different xerophilous floristic complexes; Skhalba low range and foothills of Armazi Ridge (section of Mtsketa-Dzegvi). An. or Bian. / Th. or H.

○ ▲ *Anthemis saguramica* Sosn. [*Cota saguramica* (Sosn.) Lo Presti & Oberpr.]

On slopes with brown forest and cinnamonic soils; in forest edges and shrubberies; Saguramo Ridge; P.H. / H.

Calendula arvensis L.

On dry slopes; on skeletal cinnamonic soils; in hemixerophilous shrubberies; Teleti Ridge – “In the environs of Tbilisi was found only once” [11, 28]. An. / Th.

▲ *Centaurea cheiranthifolia* Willd. [*Cyanus cheiranthifolius* (Willd.) Sojak]

subsp. *cheiranthifolia* [*Centaurea fischeri* Willd.; *Cyanus cheiranthifolius* (Willd.) Sojak subsp. *cheiranthifolius*]

On slopes and plane place; in middle mountine belt; on meadows and in forest edges; eastern endings of Trialeti Ridge (surroundings of Kojori, Satskepela and Mskhaldidi-Lisi ridges). P.H. / H.

Centaurea pseudoscabiosa Boiss. & Buhse

subsp. *glehnii* (Trautv.) Wagenitz (*Centaurea glehnii* Trautv.)

On slopes with cinnamonic soils; on dry meadows; gorge of River Vere – surroundings of Betania. P.H. / H.

◎ ▲ *Cladochaeta candidissima* (M. Bieb.) DC.

“Grows on river-gravels. Mentioned for shore of River Aragvi near Mtskheta” [11]; “Tbilisi (herbarium of Medvedev)” [29]. P.H. / H.

◎ ▲ *Doronicum macrophyllum* Fisch.

On slopes and plane place; in forests and forest edges; Saguramo Ridge [11]. P.H. / H.

◎ ▲ *Jurinea elegans* (Steven) DC.

On dry slopes; loamy and stony soils; in different hemixerophilous and xerophilous floristic complexes; Skhalba low range. P.H. / H.

Koelpinia linearis Pall.

On dry slopes; on stony cinnamonic soils,

sometaines on rocky ecotopes; on north-facing slopes of Tabori Ridge (Dabakhana). An. / Th.

Petasites hybridus (L.) G. Gaertn., B. Mey. & Scherb. [*Petasites georgicus* Manden.; *Petasites hybridus* subsp. *georgicus* (Manden.) Toman]

In moist ravines; gorge of River Tsavkisiškali. P.H. / H.

◎ ▲ *Psephellus amblyolepis* (Ledeb.) Wagenitz [*Centaurea ambliolepis* Ledeb.; *Sosnovskya ambyolepis* (Ledeb.) Takht.]

On dry slopes and hills; on loamy, clay-sandy and stony soils; in different hemixerophilous and xerophilous floristic complexes; Skhalba low range. P.H. or Ush. / H. or Ch.

Psephellus bellus (Trautv.) Wagenitz (*Centaurea bella* Trautv.)

On dry stony slopes and exposed rocky bedrocks; in tragacanthic shrubberies and in different hemixerophilous and xerophilous plant communities; Mamdaviti (Mt. Udzo), Satskepela, Mskhaldidi and Skhaltba ridges. P.H. / H.

Stizolophus balsamita (Lam.) K. Koch

On dry slopes; on skeletal cinnamonic soils; on north-facing slopes of Tabori Ridge (Dabakhana) – “Botanical garden of Tbilisi” [30]. An. / Th.

Stizolophus coronopifolius (Lam.) Cass.

On dry slopes, hills and plane places; on saline, loamy and stony grey-cinnamonic soils; in different hemixerophilous and xerophilous floristic complexes; west ending of Iori upland (Vaziani) foothills of Saguramo Ridge (Avchala). An. / Th.

▲ *Tanacetum coccineum* (Willd.) Grierson [*Pyrethrum coccineum* (Willd.) Worosch.; *Pyrethrum roseum* (Adams) M. Bieb.]

On slopes and plane place; in middle mountine belt; on meadows and in forest edges; eastern endings of Trialeti Ridge (Mamadaviti, Satskepela and etc. ridges). P.H. / H.

◎ ▲ *Tephrosieris cladobotrys* (Ledeb.) Griseb. & Schek (*Senecio cladobotrys* Ledeb.)

On slopes with brown forest soils; in forests, forest edges and in plant communities of secondary meadows; Saguramo Ridge; P.H. / H.

Tragopogon coloratus C. A. Mey.

On dry slopes; on skeletal cinnamonic soils; in plant communities of hemixerophilous shrubberies and steppe; gorge of River Tsavkisiškali – north-facing slopes of Tabori Ridge (Dabakhana). P.H. / H.

Tripleurospermum elongatum (DC.) Bornm. [*Chamaemelum elongatum* (DC.) Boiss.]

On dry slopes; on stony cinnamonic soils and rocky ecotopes; in different hemixerophilous floristic

complexes; Armazi Ridge (Armazi gorge). P.H. / H.

Brassicaceae

Coluteocarpus vesicaria (L.) Holmboe [*Noccaea vesicaria* (L.) Al-Shehbaz]

On dry slopes; on rocky, stony and scree ecotopes; in different hemixerophilous and xerophilous floristic complexes; surroundings of Mtskheta. [10, 31]. P.H. / H.

Isatis subradiata Rupr.

[*Isatis cappadocica* subsp. *subradiata* (Rupr.) P.H. Davis]

On rocky and scree slopes; Mamadaviti (Mt. Mtatsminda) and Teleti ridges. P.H. / H.

Campanulaceae

Asyneuma amplexicaule (Willd.) Hand.-Mazz.

“Soghanlugh Ridge (Krivets – TBI)” [32]. P.H. / H.

Remark: Soghanlugh Ridge is same as Teleti Ridge.

Asyneuma rigidum (Willd.) Gross.

“Tbilisi (Beideman)” [32]. P.H. / H.

Campanula saxifraga subsp. *aucheri* (A. DC.) Ogan. (*Campanula armazica* Kharadze)

On dry slopes; on rocky and stony ecotopes; in different hemixerophilous floristic complexes; foothills of Armazi Ridge (between Mtskheta and Karsani; St. Nino Monastery; Armazi gorge) [10, 33]. P.H. / H.

Caryophyllaceae

Bufonia tenuifolia L. (*Bufonia parviflora* Griseb.)

On dry slopes; on heavily skeletal cinnamonic soil; in different hemixerophilous plant communities; north-facing slopes of Tabori Ridge. P.H. / H.

Cerastium semidecandrum L.

On dry slopes; on stony and scree ecotopes; [10, 34]. An. / Th.

☉ *Dianthus cretaceus* Adams

On dry slopes; in middle mountine belt; on meadows; surroundings of Kojori [10]. P.H. / H.

☉ *Minuartia akinfiewii* (Schmahl.) Woronow

On dry slopes; on skeletal cinnamonic soils, stony and scree ecotopes; in different hemixerophilous plant communities; Skhaltba and Armazi (Armazi gorge, surroundings of vil. Dzegvi, etc.) ridges. An. / Th.

Minuartia hybrida (Vill.) Schischk.

On dry slopes; on stony, scree and rocky ecotopes; in different hemixerophilous floristic complexes;

Teleti Ridge; An. / Th.

Minuartia intermedia (Boiss.) Hand.-Mazz.

On dry slopes; on skeletal cinnamonic soils; “near Avchala” [10], “It is known only according to one copy, which Zedelmeier collected near Avchala” [35]. An. / Th.

Paronychia kurdica Boiss.

On dry slopes; on stony and rocky ecotopes; in different hemixerophilous floristic complexes; Tabori low range and etc. An. / Th.

Silene propinqua Schischk.

On dry slopes; on stony and scree ecotopes; in different hemixerophilous floristic complexes; Teleti and Tabori ridges; P.H. / H.

☉▲ *Silene solenantha* Trautv.

On dry slopes; on stony and rocky ecotopes; in different hemixerophilous floristic complexes; Mamadaviti Ridge (Mt. Mtatsminda). P.H. / H.

Silene vulgaris (Moench) Garcke (*Silene wallichiana* Klotzsch)

On slopes and plane place; in middle mountine belt; in secondary meadows and mezophilous shrubberies; surroundings of Kojori [10]. P.H. / H.

Telephium imperati L.

subsp. *orientale* (Boiss.) Nyman [*Telephium orientale* Boiss.]

On dry slopes; on stony and rocky ecotopes; in different hemixerophilous floristic complexes; Teleti, Tabori (Dabakhana) and Armazi (Martazi gorge) ridges. P.H. / H.

Cistaceae

○ ▲ *Helianthemum georgicum* Jus. & Pozdeeva

On dry slopes; on stony and rocky ecotopes; in tragacanthic plant communities [21] and in different hemixerophilous floristic complexes; Mskhaldidi Ridge [21] and etc. Ush. / Ch.

Dipsacaceae

▲ *Cephalaria gigantea* (Ledeb.) Bobrov

On slopes and plane place; in middle and upper mountine belts; on meadows and in forest edges; Kojori and Mamadaviti ridges (surroundings of Kojori), Satskepela and Mskhaldidi ridges (surroundings of vil. Bevreti). P.H. / H.

Scabiosa rotata M. Bieb. [*Lomelosia rotata* (M. Bieb.) Greuter & Burdet]

On dry slopes; on heavily skeletal cinnamonic soil; in different hemixerophilous plant communities; Mamadaviti Ridge (Mt. Mtatsminda) and etc. An. / Th.

Fabaceae

Astragalus alyssoides Lam. (*Astragalus schischkini* Grossh.)

On dry slopes; on stony cinnamonic soils; in different hemixerophilous floristic complexes; Satskepela Ridge (surroundings of vil. Bevreti), Armazi Ridge (Martazi gorge), surroundings of Kojori [10, 36]. P.H. / H. or Ush. / Ch.

○ ▲ *Astragalus cyri* Fomin

On dry slopes; on loamy and stony cinnamonic soils; in hemixerophilous floristic complexes;

▲ *Astragalus kadschorensis* Bunge

Mostly on rocky ekotopes, sometimes on stony slopes; surroundings of Kojori (Mamadaviti Ridge – Mt. Udzo, Kojori Ridge – Azeula fortress, etc.). P.H. / H.

Astragalus stevenianus DC.

On dry slopes; on loamy and stony cinnamonic soils; in different hemixerophilous floristic complexes; Mamadaviti Ridge (Mt. Mtatsminda), west ending of Iori upland (Mt. Makhata) [10]. P.H. / H.

▲ *Astragalus xifidium* Bunge

On dry slopes; on loamy and stony cinnamonic soils; in different hemixerophilous floristic complexes; Skhaltba low range. Ush. / Ch.

◎ ▲ *Genista transcaucasica* Schischkin

On dry slopes; on stony cinnamonic soils; in different hemixerophilous floristic complexes; foothills of Saguramo Ridge (section of Gldani-Mamkoda). Ush. / Ch.

◎ ▲ *Hedysarum sericeum* M. Bieb.

On dry stony slopes; in different hemixerophilous and xerophilous floristic complexes; Skhaltba low range. P.H. / H.

Medicago fischeriana (Ser.) Trautv. (*Trigonella fischeriana* Ser.)

On dry slopes; on skeletal cinnamonic soils; in different hemixerophilous floristic complexes; surroundings of Kojori [37]. An. / Th.

Melissitus brachycarpus (Fisch.) Latsch. [*Medicago brachycarpa* Fisch.; *Trigonella brachycarpa* (Fisch.) Moris]

On dry slopes; on stony grey-cinnamonic and cinnamonic soils; in different hemixerophilous plant communities; west ending of Iori upland (Mt. Makhata), surroundings of Kojori [38]. An. / Th.

○ ▲ *Onobrychis angustifolia* Chinth.

On dry slopes and plane places; on stony and loamy ecotopes; in different hemixerophilous and xerophilous floristic complexes; Skhaltba low range, surroundings of Mtskheta (slopes of Bebristsikhe

fortress). P.H. / H.

◎ ▲ *Onobrychis komarovii* Grossh.

On dry slopes and plane places; on skeletal grey-cinnamonic soils, stony and loamy ecotopes; in different hemixerophilous plant communities; west ending of Iori upland (Mt. Makhata). An. / Th.

Hypericaceae

Hypericum linarioides Bosse (*Hypericum polygonifolium* Rupr.)

On dry slopes and meadows. Meets near Kojori” [10]. P.H. / H.

Orobanchaceae

Phelypaea coccinea (M. Bieb.) Poir. [*Diphelypaea coccinea* (M. Bieb.) Nicolson]

On dry slopes; on skeletal cinnamonic and grey-cinnamonic soils; in different hemixerophilous plant communities; parasitic on the roots of species of genera *Psephellus* Cass., *Centaurea* L. and *Serratula* L.; Skhaltba, Mamadaviti (Mt. Udzo), Armazi (Armazi gorge) and Saguramo ridges, west part of Iori upland (Vaziani). P.H. / G.

Phelypaea helenae Popl. [*Diphelypaea helenae* (Popl.) Tzvelev]

On dry slopes; on skeletal cinnamonic soils; in different hemixerophilous plant communities; parasitic on the roots of species of genus *Psephellus* Cass.; environs of Mtskheta [10, 39, 40]. P.H. / G.

Paeoniaceae

◎ ▲ *Paeonia caucasica* (Schipcz.) Schipcz. [*Paeonia corallina* Retz. var. *caucasica* Schipcz.; *Paeonia daurica* subsp. *coriifolia* (Rupr.) D. Y. Hong]

On slopes with brown forest soils; in deciduous forest; Saguramo-Ialno, Mamadaviti and Sakaraulo (surroundings of Kojori) ridges. P.H. / G.

Papaveraceae

Glaucium flavum Crantz

On dry slopes; on stony cinnamonic soils; in different hemixerophilous plant communities; on north-facing slopes of Tabori Ridge – Leghvtakhevi gorge. Bian. / H.

Glaucium grandiflorum Boiss & A. Huet

On dry slopes; on stony cinnamonic soils; Mamadaviti Ridge, foothills of Saguramo Ridge (between vil. Gldani and vil. Mamkoda). Bian. / H.

Papaver rhoeas L.

On dry slopes; on skeletal cinnamonic soils; on north-facing slopes of Tabori Ridge (National

botanical garden of Georgia). An. / Th.

Roemeria refracta DC.

“Tbilisi (Overin)” [40].

Ranunculaceae

Actaea spicata L.

On slopes with brown forest soils; in deciduous forests; surroundings of Kojori. P.H. / G.

Anemone ranunculoides L.

On slopes with brown forest soils; in deciduous forests; Saguramo Ridge. P.H. / G.

▲ *Pulsatilla violacea* Rupr. (*Pulsatilla georgica* Rupr.)

On dry slopes; on stony and rocky ecotopes; Mamadaviti (Mt. Udzo), Kojori (Azeula fortress), and Mskhaldidi (surroundings of vil. Mskhaldidi) ridges. P.H. / H.

Resedaceae

▲ *Reseda globulosa* Fisch. & C. A. Mey.

Grows on dry stony slopes; meets very rare [10]. An. / Th.

Rosaceae

▲ *Alchemilla caucasica* Buser

On slopes; on meadows; surroundings of vil. Tsavkisi and vil. Bevreti [10]. P.H. / H.

◎ ▲ *Alchemilla hirtipedicellata* Juz.

On slopes; on meadows; surroundings of vil. Bevreti [10]. P.H. / H.

▲ *Alchimilla sericata* Reichb. ex Bull.

On rocky and stony slopes; in tragacanthis plant communities and other floristic complexes; Mskhaldidi (surroundings of vil. Mskhaldidi) and Kojori (Azeula fortress) ridges. P.H. / H.

▲ *Alchemilla valdehirsuta* Buser

On slopes and plane places; in forest edges and meadows; environs of Kojori and vil. Bevreti. P.H. / H.

Fragaria moschata Weston

on slopes with skeletal cinnamonic soils; in shrubberies of different types and forest edges; Teleti and Tabori (Dabakhana) ridges, foothills of Saguramo Ridge (section of Gldani-Mamkoda). P.H. / H.

Violaceae

Viola mirabilis L.

On slopes with brown forest soils; in deciduous forest; Ialno Ridge (surroundings of vil. Martkopi) [10, 41]. P.H. / H.

Monocotyledoneae

Amarylidaceae (Alliaceae)

Allium erubescens K. Koch

On slopes and plane places; on meadows; surroundings of Kojori [11]. P.H. / G.

▲ *Allium kunthianum* Vved.

On slopes and plane places; on meadows, sometimes on rocks; surroundings of Kojori [10]. P.H. / G.

Allium paradoxum (M. Bieb.) G. Don.

On slopes; on cinnamonic and brown forest soils; in deciduous forests; eastern endings of Trialeti Ridge (Teleti, Kojori and Saguramo ridges, gorge of River Vere). P.H. / G.

Allium ursinum L.

On slopes; on cinnamonic and brown forest soils; in deciduous forests; Saguramo Ridge and surroundings of Kojori. P.H. / G.

○ ● ▲ *Galanthus kemulariae* Kuth.

On slope with brown forest soil; in deciduous forests; Saguramo Ridge (near Zedazeni Monastery). P.H. / G.

◎ ▲ *Galanthus woronowii* Losink.

On slopes with brown forest and cinnamonic soils; in deciduous forests; Armazi Ridge (surroundings of vil. Didgori and vil. Telovani, Martazi gorge) and Saguramo-Ialno Ridge. P.H. / G.

Sternbergia colchiciflora Waldst. & Kit.

On dry slopes and plane places; on grey-cinnamonic and cinnamonic skeletal soils; in plant communities of steppe and meadow-steppe; west ending of Iori upland – Mt. Makhata, surroundings of Tbilisei sea [11], foothills of Saguramo Ridge [18], surroundings of Avchala [11]. P.H. / G.

Araceae

Arum italicum Mill.

subsp. *albispalum* Prime (*Arum albispalum* Steven ex Ledeb.)

On slopes and plane places; on brown forest and cinnamonic soils; in deciduous forests and forest edges; Mamdavit (Mt. Udzo) and Saguramo ridges. P.H. / G.

Asparagaceae

Bellevallia speciosa Woronow ex Grossh.

“Near Tabakhmela, very rare; [11]; “Tbilisi” [42]. P.H. / G.

Convallaria majalis L. [*Convallaria majalis* L. subsp. *transcaucasica* (Utkin ex Grossh.) Bordz.

[*Convallaria transcaucasica* Utkin ex Grossh.]

On slopes with brown forest soils; in deciduous forest; eastern endings of Trialeti Ridge [Saguramo, Mamadaviti (Mt. Udzo), Mskhaldidi and etc. ridges]. P.H. / G.

☉ ▲ *Ornithogalum magnum* Krasch. & Schischk.

On slopes and plane places; on brown forest soils; in deciduous forest and forest edges; Armazi (surroundings of vil. Didgori and vil. Telovani) and Saguramo ridges. P.H. / G.

Puschkinia scilloides Adams

On slopes with cinnamonic soils; in shrubberies of different types; Skhaltba and Saguramo ridges. P.H. / G.

Iridaceae

☉ ▲ *Gladiolus caucasicus* Herb.

On slopes and plane places; on meadows of middle mountine belt; eastern endings of Trialeti Ridge. P.H. / G.

☉ ▲ *Iris iberica* Steven

On dry slopes and plane places; on cinnamonic and grey-cinnamonic soils; in different hemixerophilous plant communities; west ending of Iori upland (Mt. Makhata) [11], Teleti Ridge [15], adjacent slope of Nutsubidze street and etc. P.H. / G.

Iris spuria L.

☉ ▲ subsp. *carthalinae* (Fomin) B. Mathew (*Iris carthalinae* Fomin)

In wetlands and moist meadows; shore of Lake Lisi [11], foothills of Armazi Ridge (slope of Mukhadgverdi Cemetery) and etc. P.H. / G.

▲ *Iris paradoxa* Steven

On dry slope with cinnamonic soil; in hemixerophilous shrubberies; adjacent slope of Nutsubidze street. P.H. / G.

Remark: in recent years, individual of this species is no longer recorded here.

Iris pseudacorus L.

In wetlands and shores of rivers; on shore of River Mtkvari near Zahesi [11]. Ph. / He.

Liliaceae

Fritillaria caucasica Adams

On dry slopes; on skeletal cinnamonic soils; in shrubberies of shibliak type (plant communities of *Spiraea hypericifolia* and etc.); Teleti and Mamadaviti ridges, slopes of Lake Lisi. P.H. / G.

☉ ▲ *Lilium szovitsianum* Fisch. & Ave-Lall.

On slopes; on brown forest and cinnamonic soils; in forest edges, shrubberies, adjacently of forest

edges plant communities of meadow-steppes and meadows; eastern endings of Trialeti Ridge. P.H. / G.

Tulipa biebersteiniana Schult. & Schult. f.

On slopes with cinnamonic soils; in forest edges and shrubberies; Teleti Ridge. P.H. / G.

☉ ▲ *Tulipa eichleri* Regel

On dry slope; on loamy ecotop. in hemixerophilous floristic complexes; foothills of Saguramo Ridge. P.H. / G.

Melanthaceae (*Trilliaceae*)

Paris incompleta M. Bieb.

On slopes with brown forest soils; in deciduous forest; Saguramo Ridge. P.H. / G.

Orchidaceae

Anacamptis coriophora (L.) R. M. Bateman, Pridgeon & M. W. Chase (*Orchis coriophora* L.)

On slopes and plane places; "In shrubberies and on moist meadows. Near Mtskheta" [11]. P.H. / G.

Anacamptis palustris (Jacq.) R. M. Bateman, Pridgeon & M. W. Chase (*Orchis palustris* Jacq.)

On moist meadows and wetlands; "On the shores of Lake Lisi and Lake Udzo" [11]. P.H. / G.

Cephalanthera damasonium (Mill.) Druce

On slopes; on brown forest and cinnamonic soils; in deciduous forest and shrubberies; Armazi and Saguramo ridges. P.H. / G.

Cephalanthera longifolia (L.) Fretsch

On slopes; on brown forest and cinnamonic soils; in deciduous forest and shrubberies; Armazi and Saguramo ridges. P.H. / G.

Cephalanthera rubra (L.) Rich.

On slopes; on brown forest and cinnamonic soils; in deciduous forest; between Kojori and Mt. Udzo. P.H. / G.

Corallorhiza trifida Châtel.

On slopes with cinnamonic and brown forest soils; in deciduous forest; Ialno Ridge. P.H. / G.

Dactylorhiza romana (Sebast.) Soó

subsp. *georgica* (Klinge) Soó ex Renz & Taubenheim [*Dactylorhiza flavescens* (K. Koch) Holub]

On slopes and plane places; on cinnamonic soils; in shrubberies of shibliak type, plant communities of meadow-steppe and forest edges; Teleti, Mamadaviti and Saguramo ridges. P.H. / G.

▲ *Dactylorhiza urvilleana* (Steud.) H. Baumann & Künkele [(*Orchis urvilleana* Steud.; *Orchis amblyoloba* Nevski; *Dactylorhiza amblylioloba* (Nevski) Aver.)]

On slopes and plane places; on brown forest and cinnamonic soils; in deciduous forests and forest edges; Saguramo, Kojori and Sakaraulo ridges. P.H. / G.

Dactylorhiza viridis (L.) R. M. Bateman, Pridgeon & M. W. Chase [*Coeloglossum viride* (L.) Hartm.]

On slopes and plane places; “in meadows and forests” [11]; Teleti and Ialno ridges. P.H. / G.

Epipactis helleborine (L.) Crantz [*Epipactis latifolia* (L.) All.]

On slopes with cinnamonic and brown forest soils; in deciduous forests and mesophilous and xeromesophilous shrubberies; surroundings of Kojori and Tskneti – Mamadaviti, Sakaraulo and Kojori ridges. P.H. / G.

Gymnadenia conopsea (L.) R. Rb.

On slopes and plane places; on meadows; surroundings of Kojori and Mtskheta [11]. P.H. / G.

Limodorum abortivum (L.) Sw. [*Centrosia abortiva* (L.) Sw.]

On slopes with brown forest and cinnamonic soils; in deciduous forests and shrubberies; Armazi and Saguramo-Ialno ridges. P.H. / G.

Neottia tridentata (Scop.) R. M. Bateman, Pridgeon & M. W. Chase (*Orchis tridentata* Scop.)

On slopes with cinnamonic and brown forest soils; in deciduous forests and shrubberies; Armazi and Saguramo ridges. P.H. / G.

Neottia ustulata (L.) R. M. Bateman, Pridgeon & M. W. Chase (*Orchis ustulata* L.)

On slopes and plane places; on cinnamonic soils; in forest edges and shrubberies, in plant communities of meadow-steppe; Mamadaviti Ridge and etc. P.H. / G.

Neottia nidus-avis (L.) Rich.

On slopes with brown forest soils; in deciduous forest; Saguramo-Ialno Ridge. P.H. / G.

Neottia ovata (L.) Bluff & Fingerh. [*Listera ovata* (L.) R. Rb.]

On slopes and plane places; on moist meadows; Armazi (environs of Mtskheta) and Ialno (environs of vil. Norio) ridges [11]. P.H. / G.

☉ ▲ *Ophrys caucasica* Woronow ex Grossh.

On slopes with cinnamonic soils; in shrubberies of shibliak type, sometimes in artificial plantations; Teleti and Mamadaviti ridges. P.H. / G.

Ophrys oestriifera M. Bieb.

On slopes and plane places; on cinnamonic and brown forest soils; in forest edges, shrubberies, adjacently of forest edges plant communities of meadow-steppes and meadows; Saguramo Ridge. P.H. / G.

Orchis mascula (L.) L.

On slopes and plane places; on different type soils; in forest edges, shrubberies, meadow-steppes and on meadows; Armazi and Saguramo ridges. P.H. / G.

Orchis purpurea Huds.

On slopes with cinnamonic and brown forest soils; in deciduous forests; eastern endings of Trialeti Ridge. P.H. / G.

Orchis stevenii Rchb. f. [*Orchis militaris* subsp. *stevenii* (Rchb.f.) B. Baumann, H. Baumann, R. Lorenz & Ruedi Peter]

On slopes and plane places; in deciduous forests, as well on moist ecotopes; Mamadaviti and Saguramo ridges; P.H. / G.

Spiranthes spiralis (L.) Chevall.

On slopes and plane places; on cinnamonic soils; in plant communities of secondary meadow-steppe and artificial plantations; foothills of Saguramo Ridge (surroundings of Avchala settlement – near Petre Apostle Church) [18]. P.H. / G.

Steveniella satyrioides (Spreng.) Schltr.

On slopes and plane places; on cinnamonic and brown forest soils; in deciduous forests and shrubberies; Teleti, Armazi and Saguramo-Ialno ridges. P.H. / G.

Poaceae (Gramineae)

Alopecurus aequalis Sobol.

“Was Found only once on the shore of Udzo Lake” [11]. An. / Th.

Alopecurus tifiensis (G. Westb.) Grossh. [*Alopecurus textilis* subsp. *tifiensis* (G. Westb.) Tzvelev]

On dry slopes; rocky and stony ecotopes; in different hemixerophilous plant communities; Teleti and Tabori ridges, environs of Mtskheta. Bian. or P.H. / H.

Bromopsis variegata (M. Bieb.) Holub (*Bromus variegatus* M. Bieb.)

On slopes; on meadows. near Kojori. P.H. / H.

Xanthorrhoeaceae

Asphodeline lutea (L.) Rchb.

On dry slopes; on skeletal cinnamonic soils and stony ecotopes; in different hemixerophilous and xerophilous floristic complexes; Saguramo-Ialno Ridge. P.H. / G.

☉ ▲ *Asphodeline prolifera* (M. Bieb.) Kunth [*Asphodeline dendroides* (Hoffm.) Woronow]

On dry stony slopes; “on the left side of River Mtkvari” [11]. An. / Th.

Eremurus spectabilis M. Bieb.

On dry slopes; on stony and scree ecotopes; in xerophilous plant complex; foothills of Armazi Ridge (Martazi gorge). P.H. / G.

Conclusion

1. There are identified 122 rare herbaceous and semiwoody (semishrubs and undrshrubs) plants for Tbilisi environs. Their distribution area and number are restricted in the environs of Tbilisi. They are of different bio-ecologies and characteristic plant of various ecosystems.

2. Important part of these species widespread in Georgia and they do not belong to the rare plants of Georgia. Their distribution in Tbilisi environs is due to various ecological factors.

3. 21 species are rare plants not only for Tbilisi environs, but also of the flora of Georgia.

4. Main distribution area of 11 species (*Anthemis saguramica*, *Galanthus kemulariae*, *Glaucium grandiflorum*, *Iris paradoxa*, *Isatis subradiata*, *Minuartia hybrida*, *Minuartia intermedia*, *Papaver rhoeas*, *Phelypaea helenae*, *Tulipa biebersteiniana*, *Viola mirabilis*) covers the vicinity of Tbilisi and they are not spread in other regions of Georgia or are very rare.

5. 33 of 122 species are endemics of Caucasus, 5 of which are endemic of Georgia. One species – *Galanthus kemulariae* is local endemic of Tbilisi environs (Saguramo Ridge).

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