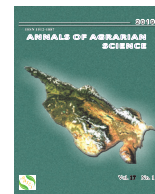




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### **Spiraea formation (*Spiraeta hypericifoliae*) in Tbilisi environs (East Georgia, South Caucasus)**

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#### ABSTRACT

Spiraea formation (*Spiraeta hypericifoliae*) of Tbilisi environs is studied for the first time. This formation is one of the typical representatives of hemixerophilous shrubberies of shibliak type for vegetation cover of Tbilisi surroundings. Plant communities of Spiraea formation with different plots area are fragmentary spread almost all over the territory of Tbilisi environs from 600 to 1000(1100) m above s.l.. Plant communities are developed on slopes with various exposure and inclination, mainly on the cinnamonic and grey-cinnamonic soils. In Tbilisi environs the Spiraea's plant communities are either primary or secondary origin. Formation is characterised by rich typological and floristic composition. We identified 5 plant communities: (1) *Spiraetum gramino-mixtoherbosum*, (2) *Spiraetum muscosum*, (3) *Paliuroso-Spiraetum gramino-mixtoherbosum*, (4) *Spiraetum festucoso-bothriochloosum*, (5) *Spiraetum festucoso-bothriochloosum*. From them first plant community is widespread and others are rare. For each separated plant communities the basic structural characteristics (general projective coverage, projective coverage, distribution and height of layers, sodding degree, dominant-edificator plants, 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 (topography, altitude, exposure, inclination, soil type) are given. 189 species of vascular plants, which belong to 43 families and 133 genera, were recorded. In the floristic spectrum leading families are: 1. Poaceae – 26 species (13,7%), 2. Asteraceae – 20 species (10,6%), 3. Fabaceae – 13 (6,9%), 4-5. Lamiaceae, Rosaceae – 12-12 (6,3-6,3%), 6. Brassicaceae – 10 (5,3%), 7. Apiaceae – 9 (4,8%), 8. Caryophyllaceae – 7 (3,7%), 9-10. Asparagaceae, Rubiaceae – 6 (3,2-3,2%). The life form spectrum is as follows: hemicryptophytes (including biennials) – 92 species (49,2%), therophytes – 50 (26,4%), phanerophytes – 18 (9,5%), chamaephytes – 6 (3,2%), geophytes – 23 (12,2%).

**Keywords:** Tbilisi environs, East Georgia, *Spiraeta hypericifolia*, plant communities, structural characteristics, floristic composition.

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#### Introduction

The part of basin of the Mtkvari River, which is spread from the village 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 make its topography 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, Narikhala, Tabori, Telet-sakharaulo), (4) Western and extreme 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 topography [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 skeletal in most cases. There are the same types, but slightly salinity soils are on the plains of Ponichala and Kumisi-Tsalaskuri, where the solonets and solonchak are 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 ridge and partly on the Skhaltba low range. And, brown forest soil of various modifications is met in the upper parts of these ridges. 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, 5-9].

Tbilisi environs are characterized by large biodiversity. Both ecosystem and floristic biodiversity are expressed [10-16]. From the point of landscapes creation and taken space, shrubberies of shibliak type are one of the important and are represented by diverse modifications. From them Spirea formation (*Spiraeta hypericifoliae*) is one of the characteristic for vegetation cover of Tbilisi surroundings [12, 16]. According to our research it is spread in the other regions of East Georgia too (Shida Kartli and Iori plateau).

Though, the literature data about this formation is scanty. There is not presented distribution area, structural and physical-geographic characteristics of plant communities of Spirea formation in the above-mentioned scientific works; floristic composition and life forms spectrum of formation is not given.

The literature data about distribution of this formation in other regions of Caucasus cannot be found.

## Objectives and methods

The object of research is Spirea formation (*Spiraeta hypericifolia*) of Tbilisi environs. The main aim of the research was to establish area, typological, floristic composition and spectrum of life forms of Spirea formation 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 was obtained by the route method. 50 geo-botanical surveys (relevés) were made. Geo-botanical surveys were carrying out on 25 m<sup>2</sup> plots. During the geo-botanical surveys, studying the structure of phytocoenoses and identification of syntaxa, we were guided by the traditional geo-botanical methods [17-23].

On the each plots were registration general projective cover (in %) of plant communities, projective cover (in %), distribution, height and floristic composition of each layers, sodding degree (in %), general floristic composition, coenotic role of each species (projective cover in %), as well physical-geographical characteristics (topography, exposure, inclination, soil 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 25 m<sup>2</sup> and spectra of life forms. Based on the geo-botanical surveys floristic composition of Spirea formation was established.

## Results and analysis

### I. Area and distribution regularities

This formation is one of the characteristic for vegetation cover of Tbilisi surroundings. Plant communities of this formation with different plots area are fragmentary spread on the both sides of the

river Mtkvari. Plant communities of Spirea formation mainly are spread in second climate type zone and in first climate type zone are comparatively rare. Their altitudinal range is from 600 to 1000 (1100) m above s.l. Plant communities are developed on slopes with various exposure and inclination, mainly on the cinnamonic and grey-cinnamonic soils. Often soils are skeletal. Mainly, soils are thin or middle depth. Spirea plant communities are rare on plane places.

In the Tbilisi environs the Spirea's plant communities are either primary or secondary origin. Nowadays, to draw the line between the primary and the secondary coenoses is impossible in most cases. Secondary plant communities were formed by digressive succession processes of post-forest vegetation. Accordingly, secondary plant communities of Spirea formation are included in the area of forests and xeromezophilous shrubberies of lower mountain belt [12, 24].

## II. Typological composition and geo-botanical characteristic

Within the Spirea formation we identified 5 plant communities: (1) Spiraetum graminomixtoherbosum, (2) Spiraetum muscosum, (3) Paliuroso-Spiraetum graminomixtoherbosum, (4) Spiraetum festucoso-bothriochloosum, (5) Spiraetum festucoso-bothriochloosum.

From them first plant community (Spiraetum graminomixtoherbosum) is widespread. In some cases area of this plant community is large and comprises almost all slopes. Others plant communities are rare and presented by comparatively small plots. Their plant communities are fragmentary spread in the distribution range of first plant community.

### (1) Spiraetum graminomixtoherbosum

#### Physical-geographical characteristics:

**Area in the Tbilisi environs:** fragmentarily is spread almost all over of the range of Spirea formation; **Altitude (m):** 600-1100; **Topography:** slope; **Exposure (macro):** N (rare S, W); **Exposure (micro):** N, N-E, N-W, W, S-W, S-E; **Inclination:** 20°-35° (rare 10°-18°); **Soil:** cinnamonic or grey-cinnamonic, often skeleton, middle or thin depth;

#### Geo-botanical characteristics:

**General projective coverage:** 90-95% (100%);

**I layer (shrubs): Projective coverage** - from 50-60% to 95-98%, **Distribution** - more or less evenly or evenly (rare, uneven), **Average height (cm)** - 100-120; **II layer (herbs, semi-shrubs & dwarf semi-shrubs): Projective coverage** - from 40-50% to 70-75% (rare 25-30%), **Distribution** - uneven; **III layer (moss cover): Projective coverage** - 60-90% (rare 3-5%), **Distribution** - more or less evenly; **Sodding degree:** (rare, 1-6%); **Litter:** from + to 50-60%; 0,1-1,5(2) cm depth (mostly are developed on the moss cover);

Dominant-edificator: *Spiraea hypericifolia* (projective coverage from 40-45% to 90-95%);

#### Characteristic species:

**Shrubs:** *Paliurus spina-christi*, *Prunus incana* (frequency of occurrence 40-40%), *Jasminum fruticans* (32%), *Rhamnus pallasii* (28%), *Ephedra procera* (24%), *Cotoneaster morulus* (20%); **Semi-shrubs & dwarf semi-shrubs:** *Teucrium nuchense* (frequency of occurrence 41.7%); **Perennial plants:** *Galium verum* (frequency of occurrence 100%), *Phleum phleoides* (96%), *Potentilla recta* (92%), *Falcaria vulgaris*, *Rumex tuberosus* (84-84%), *Filipendula vulgaris*, *Thalictrum collinum* (80-80%), *Dactylis glomerata*, *Euphorbia boissieriana*, *Melica transsilvanica* (68-68%), *Elymus repens*, *Medicago caerulea* (60-60%), *Salvia nemorosa*, *Stachys atherocalyx* (56-56%), *Dictamnus albus*, *Hypericum perforatum*, *Stipa pennata* (48-48%), *Inula oculus-christi*, *Asparagus verticillatus* (40-40%); **Annual plants:** Despite the diversity of species, the constant species were not identified;

**Number of species:** 178;

**Species richness on 25 m<sup>2</sup>:** 33,3;

#### Spectrum of life forms:

Phanerophytes – 18 species (10,1%), Chamaephytes – 4 (2,3%), Hemicryptophytes (including biennials) – 87 (48,9%), Geophytes – 23 (12,9%), Therophytes – 46 (25,8%).

### (2) Paliuroso-Spiraetum graminomixtoherbosum

#### Physical-geographical characteristics:

**Area in the Tbilisi environs:** lower part of Digmistskali River gorge (between of Lisi Lake and settlement Vashlijvari); **Altitude (m):** 650-700; **Topography:** relief is uneven with slightly expressed terraces and paths; **Exposure (macro):** N; **Exposure (micro):** N, N-E; **Inclination:** 18-20

to 25-30; **Soil:** cinnamonic or grey-cinnamonic, skeleton, middle or thin depth;

**Geo-botanical characteristics:**

**General projective coverage:** 95-100%; **I layer (shrubs):** *Projective coverage:* 55-60 to 80%, *Distribution* - uneven or more or less evenly, *Average height (cm)* - 120-140, *Maximum height (cm)* - 180-200 (*Paliurus spina-cristi*); **II layer (herbs, semi-shrubs & dwarf semi-shrubs):** *Projective coverage* - as an average 50-80%, *Distribution* - uneven (rare, evenly); **III layer (moss cover):** *Projective coverage* - 80-100%, *Distribution* - evenly; **Sodding degree:** 2-8%; **Litter:** from 5-10% to 35-45%; 0,1-1 cm depth (mostly are developed on the moss cover);

**Dominant-edificator:** *Spiraea hypericifolia* (projective coverage 40-55%);

**Subdominant-edificator:** *Paliurus spina-cristi* (projective coverage 18-25%);

**Characteristic species:**

**Shrubs:** *Rhamnus pallasii* (frequency of occurrence 100%), *Prunus incana* (60%), *Jasminum fruticans* (40%); **Semi-shrubs & dwarf semi-shrubs:** *Teucrium nuchense* (frequency of occurrence 40%); **Perennial plants:** *Asparagus verticillatus*, *Galium verum*, *Falcaria vulgaris*, *Melica transsilvanica*, *Thalictrum collinum*, *Phleum phleoides*, *Potentilla recta*, *Rumex tuberosum* (frequency of occurrence 100-100%), *Allium rotundum*, *Dianthus subulosus*, *Achillea nobilis*, *Alyssum murale*, *Stachys atherocalyx* (80-80%), *Eryngium campestre*, *Inula germanica*, *I. oculus-cristi* (60-60%); **Annual plants:** the constant species were not identified;

**Number of species:** 68;

**Species richness on 25 m<sup>2</sup>:** 41;

**Spectrum of life forms:**

Phanerophytes – 7 (10,3%), Chamaephytes – 2 (2,9%), Hemicryptophytes (including biennials) – 42 species (61,8%), Geophytes – 3 (4,4%), Therophytes – 13 (20,6%).

**(3) *Spiraetum muscosum***

**Physical-geographical characteristics:**

**Area in the Tbilisi environs:** fragmentarily is spread almost all over of the range of *Spiraea* formation; **Altitude (m):** 600-1100; **Topography:** Slope; **Exposure (macro):** N (rare S, W); **Exposure (micro):** N, N-E, N-W, W, S-W, S-E; **Inclination:**

20°-35° (rare 10°-18°); **Soil:** cinnamonic; middle or thin depth;

**Geo-botanical characteristics:**

**General projective coverage:** 95-100%; **I layer (shrubs):** *Projective coverage* - from 80-85 to 95-98%, *Distribution* - evenly, *Average height (cm)* - 100-120; **II layer (herbs, semi-shrubs & dwarf semi-shrubs):** *Projective coverage* - 2-10%, *Distribution* - uneven; **III layer (moss cover):** *Projective coverage* - 60-90%, *Distribution* - evenly; **Sodding degree:** –; **Litter:** +; 0,1-0,5 cm depth (mostly are developed on the moss cover); **Dominant-edificator:** *Spiraea hypericifolia* (projective coverage from 60-70% to 95-98%); **Characteristic species:**

**Shrubs:** *Prunus incana* (frequency of occurrence 90%), *Paliurus spina-cristi*, *Rhamnus pallasii*(40-40%), *Jasminum fruticans* (30%); **Semi-shrubs & dwarf semi-shrubs:** the constant species were not identified; **Perennial plants:** *Galium verum* (frequency of occurrence 70-70%), *Thalictrum collinum* (60-60%), *Filipendula vulgaris* (50%), *Phleum phleoides*, *Silene latifolia* (40-40%), *Festuca valesiaca*, *Melica transsilvanica* (30-30%); **Annual plants:** *Bromus squarrosus*, *Lolium rigidum* (frequency of occurrence 30-30%);

**Number of species:** 68;

**Species richness on 25 m<sup>2</sup>:** 16;

**Spectrum of life forms:**

Phanerophytes – 9 (13,2%), Chamaephytes – 2 (3,0%), Hemicryptophytes (including biennials) – 33 species (48,5%), Geophytes – 8 (11,8%), Therophytes – 16 (23,5%).

**(4) *Spiraetum stuposum pennatae***

**Physical-geographical characteristics:**

Area in the Tbilisi environs: western foothills of Saguramo range, Mamadaviti Range (vicinities of Kustba Lake), Lisi range (vicinities of Lisi Lake), lower part of Digmistskali River gorge (between of Lisi Lake and settlement Vashlijvari); **Altitude (m):** 650-850; **Topography:** Slope; **Exposure:** N, N-W, S-W, S-E, E; **Inclination:** 25°-35°; **Soil:** cinnamonic or grey-cinnamonic, very skeletal, thin depth;

**Geo-botanical characteristics:**

**General projective coverage:** 80-90%; **I layer (shrubs):** *Projective coverage* - from 35-45% to 65-70%, *Distribution* - in many cases, uneven, *Average height (cm)* - 90-100; **II layer (herbs, semi-shrubs &**

dwarf semi-shrubs): Projective coverage - 40-70%, Distribution - more or less evenly; III layer (moss cover): Projective coverage - from 15-20% to 50-60%, Distribution - more or less evenly; Sodding degree: 8-10%; Litter: from 8-10% to 50-60%; 0,5-3 cm depth;

Dominant-edificator: *Spiraea hypericifolia* (projective coverage from 35-45% to 65-70%);

Subdominant-edificator: *Stipa pennata* (projective coverage 15-25%);

#### Characteristic species:

Shrubs: *Paliurus spina-christi* (frequency of occurrence 50%), *Prunus incana* (37,5%); Semi-shrubs & dwarf semi-shrubs: *Teucrium nuchense*, *Teucrium polium* (frequency of occurrence 50-50%), *Thymus coriifolius* (37,5%); Perennial plants: *Galium verum* (frequency of occurrence 100%), *Phleum phleoides*, *Potentilla recta*, *Rumex tuberosus* (87,5-87,5%), *Filipendula vulgaris*, *Melica transsilvanica*, (75-75%), *Dactylis glomerata*, *Salvia nemorosa*, (62,5-62,5%), *Euphorbia boissieriana*, *Stachys atherocalyx*, *Thalictrum collinum* (50-50%), *Hypericum perforatum*, *Inula oculus-christi* (37,5-37,5%); Annual plants: the constant species were not identified;

**Number of species: 90;**

**Species richness on 25 m<sup>2</sup>: 34;**

**Spectrum of life forms:**

Phanerophytes – 9 (10,0%), Chamaephytes – 5 (5,6%), Hemicryptophytes (including biennials) – 43 species (47,8%), Geophytes – 11 (12,2%), Therophytes – 22 (24,4%).

#### (5) *Spiraetum festucoso-bothriochloosum*

##### Physical-geographical characteristics:

**Area in the Tbilisi environs:** foothills of Saguramo range, vicinities of Jvari Monastery; Mamadaviti range, vicinities of Kustba Lake; **Altitude (m):** 650-800; **Topography:** slope and upper plane places of slopes; **Exposure (macro):** S, N; **Inclination:** from 12°-15° to 30°-35°; **Soil:** grey-cinnamonic, very skeleton, middle or thin depth; denuded bedrocks are observed also;

##### Geo-botanical characteristics:

**General projective coverage:** 90-100%; **I layer (shrubs): Projective coverage** - from 30-50% to 70-80%, **Distribution** - uneven, **Average height (cm)** - 90-120; **II layer (herbs, semi-shrubs & dwarf semi-shrubs): Projective coverage** - from

20-30% to 50%, **Distribution** - uneven; **III layer (moss cover): Projective coverage** – is not or + (S Exposure), 40-50% (N Exposure), **Distribution** - uneven; **Sodding degree:** 12-14%; **Litter:** +; 0,1-0,5 cm depth;

**Dominant-edificator:** *Spiraea hypericifolia* (projective coverage from 30-50% to 70-80%);

**Subdominant-edificators:** *Festuca valesiaca* (projective coverage 20-25%), *Bothriochloa ischaemum* (projective coverage 5-10%);

#### Characteristic species:

**Shrubs:** *Paliurus spina-christi*, *Prunus incana*, *Rhamnus pallasii* (frequency of occurrence 40-40%); **Semi-shrubs & dwarf semi-shrubs:** *Teucrium nuchense*, *Teucrium polium* (60-60%); *Helianthemum nummularium* (frequency of occurrence 40%); **Perennial plants:** *Galium verum*, *Melica transsilvanica* (frequency of occurrence 100-100%), *Rumex tuberosus*, *Stachys atherocalyx* (80-80%), *Dactylis glomerata*, *Eryngium campestre*, *Medicago caerulea*, *Potentilla recta* (60-60%), *Allium rotundum*, *Astragalus brachycarpus*, *Dictamnus albus*, *Filipendula vulgaris*, *Hypericum perforatum*, *Phleum phleoides*, *Polygalla transcaucasica* (40-40%); **Annual plants:** *Arenaria serpyllifolia* (frequency of occurrence 100%), *Alyssum hirsutum*, *Medicago minima* (80-80%), *Bromus squarrosus*, *Helianthemum salicifolium*, *Lolium rigidum* (60-60%), *Petrorhagia prolifera*, *Alyssum linifolium*, *Trifolium arvense* (40-40%);

**Number of species: 55;**

**Species richness on 25 m<sup>2</sup>: 28;**

**Spectrum of life forms:**

Phanerophytes – 5 (9,1%), Chamaephytes – 3 (5,4%), Hemicryptophytes (including biennials) – 21 species (38,2%), Geophytes – 5 (9,1%), Therophytes – 21 (38,2%).

### III. Floristic composition

189 species of vascular plants, which belong to 43 families and 133 genera, were recorded. In the floristic spectrum leading families are: 1. Poaceae – 26 species (13,7%), 2. Asteraceae – 20 species (10,6%), 3. Fabaceae – 13 (6,9%), 4-5. Lamiaceae, Rosaceae – 12-12 (6,3-6,3%), 6. Brassicaceae – 10 (5,3%), 7. Apiaceae – 9 (4,8%), 8. Caryophyllaceae – 7 (3,7%), 9-10. Asparagaceae, Rubiaceae – 6 (3,2-3,2%).

First plant community is outstanding by rich floristic composition – 179 species of vascular plants. From 55 to 90 species of vascular plants were recorded in others plant communities. The life form spectrum is as follows: hemicryptophytes (including biennials) – 92 species (49,2%), therophytes – 50 (26,4%), geophytes – 23 (12,2%), phanerophytes – 18 (9,5%), chamaephytes – 6 (3,2%).

Most of constant species are perennial herbs (in many cases hemicryptophytes) and shrubs. In spite of species diversity (50 species), there are no constant species for Spirea formation among therophytes.

Full list of recorded plants is given bellow.

## GYMNOSPERMAE

### Cupressaceae

*Juniperus communis* L. subsp. *oblonga* (M.Bieb.) Galushko (*Juniperus oblonga* M.Bieb.; *Juniperus communis* var. *saxatilis* Pall.)

### Ephedraceae

*Ephedra procera* C.A.Mey. [*Ephedra major* subsp. *procera* (C.A.Mey.) Bornm.]

## ANGIOSPERMAE

### DYCOTYLEDONEAE

#### Sapindaceae (Aceraceae)

*Acer ibericum* M.Bieb. [*Acer monspessulanum* subsp. *ibericum* (M.Bieb. ex Willd.) Yalt.]

#### Anacardiaceae

*Cotynus coggygria* Scop.

*Rhus coriaria* L.

#### Apiaceae

*Bupleurum marschallianum* C.A.Mey.

*Bupleurum rotundifolium* L.

*Daucus carota* L.

*Eryngium campestre* L.

*Eryngium caeruleum* M.Bieb. (*E. caucasicum* Trautv.)

*Falcaria vulgaris* Bernh.

*Heracleum antasiaticum* Manden.

*Malabaila dasyantha* (K.Koch) Grossh.

*Seseli grandivittatum* (Sommier & Levier)

Schischk.

## Apocynaceae

*Vinca herbacea* Waldst. & Kit.

## Asteraceae (Compositae)

*Achillea biebersteinii* Afan.

*Achillea nobilis* L.

*Carduus hamulosus* Ehrh.

*Centaurea ovina* Pall. ex Willd.

*Centaurea reflexa* Lam.

*Crepis rhoeadifolia* M.Bieb. [*C. foetida* L. subsp. *rhoeadifolia* (M.Bieb.) Čelak.]

*Crepis sancta* (L.) Babc.

*Galatella linosyris* (L.) Rchnb.fil. [*Crinitaria linosyris* (L.) Less.]

*Galatella villosa* (L.) Rchb.f. [*Crinitaria villosa* (L.) Cass.]

*Crupina vulgaris* Pres. ex Carss.

*Filago eriocephala* Guss.

*Inula aspera* Poir.

*Inula oculus-christi* L.

*Inula germanica* L.

*Jurinea blanda* (M.Bieb.) C.A.Mey.

*Psephellus carthalinicus* Sosn.

*Klasea radiata* (Waldst. & Kit.) Á.Löve & D.Löve [*Serratula radiata* (Waldst. & Kit.) M.Bieb.]

*Tragopogon graminifolium* DC.

*Tragopogon tuberosus* K.Koch

*Xeranthemum squarrosum* Boiss.

## Boraginaceae

*Aegonychon purpurea-coeruleum* Holub.

*Echium rubrum* Jacq.

*Lappula barbata* (M.Bieb.) Gürke

*Lycopsis orientalis* L. (*Anchusa arvensis* subsp. *orientalis* (L.) Nordh.)

## Brassicaceae

*Alyssum alyssoides* (L.) L.

*Alyssum desertorum* Stapf

*Alyssum hirsutum* M.Bieb.

*Alyssum linifolium* Stephan ex Willd.

[*Meniocus linifolius* (Stephan ex Willd.) DC.]

*Alyssum murale* Waldst. & Kit.

*Erophila verna* (L.) DC.

*Draba nemorosa* L.

*Hirschfeldia incana* (L.) Lagr.-Foss.

*Thlaspi orbiculatum* steven

*Turritis glabra* L.

#### Caprifoliaceae (Dipsacaceae)

*Cephalaria media* Litv.

*Lonicera iberica* M.Bieb.

*Scabiosa columbaria* L.

*Scabiosa micrantha* Desf.

#### Caryophyllaceae

*Arenaria serpyllifolia* L.

*Dianthus subulosus* Freyn & Conrath

*Gypsophila bicolor* (Freyn. & Sint.) Grossh.

*Petrorhagia prolifera* (L.) P.W.Ball. & Heywood

[*Kohlruschia prolifera* (L.) Kunth]

*Silene latifolia* Pojar. [*Melandrium latifolium* (L.)

Maire; *M. boissieri* Schischk.]

*Silene italica* (L.) Pers.

*Silene cyri* Schischk.

#### Cistaceae

*Helianthemum lasiocarpum* Janques & Herincq

[*H. ledifolium* (L.) Mill.]

*Helianthemum nummularium* (L.) Mill.

*Helianthemum salicifolium* (L.) Mill.

#### Convolvulaceae

*Convolvulus arvensis* L.

*Convolvulus cantabrica* L.

#### Crassulaceae

*Sedum pallidum* M.Bieb.

*Sedum caucasicum* (Grossh.) Boriss. [*S. maximum* subsp. *ruprechtii* (Jalas) Soó]

*Sempervivum transcaucasicum* Muirhead

#### Euphorbiaceae

*Euphorbia boissieriana* (Woronow) Prokh.

*Euphorbia helioscopia* L.

*Euphorbia iberica* Boiss.

*Euphorbia seguieriana* Neck.

#### Fabaceae (Leguminosae)

*Astragalus brachycarpus* M.Bieb.

*Securigera varia* (L.) Lassen (*Coronilla varia* L.)

*Cytisus caucasicus* Grossh.

*Dorycnium herbaceum* Vill. [*D. pentaphyllum*

Scop. subsp. *herbaceum* (Vill.) Rouy]

*Genista* sp.

*Lotus corniculatus* L.

*Medicago caerulea* Less. ex Ledeb.

*Medicago minima* (L.) Bartal.

*Mellilotus neapolitanus* Ten.

*Onobrychis cyri* Grossh.

*Onobrychis radiata* (Desf.) M.Bieb.

*Trifolium arvense* L.

*Trifolium campestre* Schreb.

#### Geraniaceae

*Geranium lucidum* L.

*Geranium robertianum* L.

*Erodium cicutarium* (L.) L'Her

#### Hypericaceae

*Hypericum perforatum* L.

#### Lamiaceae

*Nepeta mussinii* Spreng. ex Henckel

*Origanum vulgare* L.

*Phlomis pungens* Willd. [*Phlomis herba-venti* subsp. *pungens* (Willd.) Maire ex DeFilipps]

*Phlomoidea tuberosa* (L.) Moench (*Phlomis tuberosa* L.)

*Salvia nemorosa* L.

*Salvia verticillata* L.

*Scutellaria orientalis* L.

*Sideritis montana* L.

*Stachys atherocalyx* K.Koch

*Teucrium nuchense* K.Koch [*Teucrium*

*chamaedris* subsp. *nuchense* (K.koch) Rech.f.]

*Teucrium polium* L.

*Thymus coriifolius* Ronniger

**Linaceae***Linum austriacum* L.*Linum corymbulosum* Rchb.**Oleaceae***Fraxinus excelsior* L.*Jasminum fruticans* L.**Orobanchaceae***Melampyrum arvense* L.**Papaveraceae***Papaver arenarium* M.Bieb.*Papaver dubium* L.**Plantaginaceae***Plantago lanceolata* L.*Veronica multifida* L.**Polygallaceae***Polygala transcaucasica* Tamamsch.**Polygonaceae***Rumex tuberosus* L.**Primulaceae***Cyclamen vernalis* Sweet [ *Cyclamen coum* subsp. *caucasicum* (K.Koch) O.Schwarz]*Primula macrocalyx* Bunge [ *Primula veris* subsp. *macrocalyx* (Bunge) Lüdi]*Primula woronowii* Losinsk.**Ranunculaceae***Adonis flammea* Jacq.*Thalictrum collinum* Wallr.**Resedaceae***Reseda lutea* L.**Rhamnaceae***Paliurus spina-christi* Mill.*Rhamnus pallasii* Fisch. & C.A. Mey.**Rosaceae***Cotoneaster morulus* Pojark.*Cotoneaster racemiflorus* (Desf.) Booth ex Bosse*Filipendula vulgaris* Moench*Fragaria vesca* L.*Fragaria viridis* Weston*Potentilla recta* L.*Sanguisorba minor* subsp. *balearica* (Bourg. ex Nyman) Muñoz Garm. & C.Navarro (*Poterium polygamum* Waldst. & Kit.)*Prunus incana* (Pall.) Batsch [ *Cerasus incana* (Pall.) Spach]*Prunus spinosa* L.*Pyrus salicifolia* Pall.*Rosa spinosissima* L.*Spiraea hypericifolia* L.**Rubiaceae***Asperula arvensis* L.*Crucianella angustifolia* L.*Galium album* Mill.*Galium tenuissimum* M.Bieb*Galium spurium* L. (*Galium vaillantii* DC.)*Galium verum* L.**Rutaceae***Dictamnus albus* L.**Scrophulariaceae***Verbascum formosum* Fisch. ex Schrank**Thymeleaceae***Thymelaea passerina* (L.) Coss. & Germ.**Violaceae***Viola alba* Besser*Viola arvensis* Murray*Viola kitaibeliana* Schult.**MONOCOTYLEDONEAE****Amaryllidaceae (Alliaceae)***Allium pseudoflavum* Vved.*Allium rotundum* L.*Allium sp.***Asparagaceae (Hyacinthaceae)***Asparagus officinalis* L.*Asparagus verticillatus* L.*Bellevalia montana* (K.Koch) Boiss.*Muscari armeniacum* Leichtlin ex Baker (*Muscari szovitsianum* Baker)*Ornithogalum ponticum* Zahar.

*Scilla siberica* Haw.

#### Colchicaceae

*Colchicum trigynum* (Steven ex Adams) Stearn

[*Merendera trigyna* (Steven ex Adams) Stapf]

#### Cyperaceae

*Carex liparocarpos* Gaudin subsp. *bordzilowskii*  
(V.I.Krecz.) T.V.Egorova

*Carex humilis* Leyss.

#### Iridaceae

*Crocus biflorus* Mill. subsp. *adamii* (J.Gay)

B.Mathew.

*Crocus speciosus* M.Bieb.

*Iris pumila* L.

*Iris reticulata* M.Bieb.

#### Lilaceae

*Fritillaria caucasica* Adams

*Gagea chlorantha* (M.Bieb.) Schult. & Schult.f.

*Gagea commutata* K.Koch

#### Poaceae

*Aegilops ovata* L. (*Ae. neglecta* Req. ex Bertol.)

*Aegilops tauschii* Coss.

*Agropyron cristatum* subsp. *pectinatum*

(M.Bieb.) Tzvelev

*Avena sterilis* L. subsp. *ludoviciana* (Durieu)

J.M.Gillet & Magne

*Bothriochloa ischaemum* (L.) Keng

*Brachypodium distachyon* (L.) P.Beauv.

[*Trachynia distachya* (L.) Link.]

*Brachypodium sylvaticum* (Huds.) P.Beauv.

*Bromus biebersteinii* Roem. & Schult.

[*Bromopsis biebersteinii* (Roem. & Schult.)

Holub]

*Bromus japonicus* Thunb.

*Bromus squarrosus* L.

*Cleistogenes serotina* (L.) Keng

*Cynosurus echinatus* L.

*Dactylis glomerata* L.

*Elymus repens* (L.) Gould [*Agropyron repens* (L.)

P.Beauv.; *Elytrigia repens* (L.) Nevski]

*Elymus hispidus* (Opiz) Melderis [*Agropyron*

*intermedium* (Host) P. Beauv.; *Elytrigia*

*intermedia* (Host.) Nevski]

*Festuca valesiaca* Schleich. ex Gaudin

*Koeleria cristata* (L.) Pers.

*Lolium rigidum* Gaudin

*Melica transsilvanica* Schur

*Phleum paniculatum* Huds.

*Phleum phleoides* (L.) H.Karst.

*Poa angustifolia* L.

*Poa bulbosa* L. subsp. *vivipara* (Koeler) Arcang.

*Poa nemoralis* L.

*Stipa capillata* L.

*Stipa pennata* L.

#### Conclusion

Area of Spirea formation (*Spiraeta hypericifolia*) in Tbilisi environs is in foothills and lower mountain belt, approximately 600-1000 (1100) m above s.l.. Plant communities of formation are developed on slopes and plane places with various exposure and inclination, mainly on the cinnamonic and grey-cinnamonic soils. Often soils are skeletal. Mainly, soils are thin or middle depth. In Tbilisi environs the Spuirea's plant communities are either primary or secondary origin.

Typological composition of Spirea formation (*Spiraeta hypericifolia*) of Tbilisi environs is such: (1) Spiraetum graminomixtoherbosum, (2) Spiraetum muscosum, (3) Paliuroso-Spiraetum graminomixtoherbosum, (4) Spiraetum festucosobothriochloosum, (5) Spiraetum festucosobothriochloosum.

189 species of vascular plants, which belong to 43 families and 133 genera, were recorded. In the floristic spectrum leading families are: 1. Poaceae – 26 species (13,7%), 2. Asteraceae – 20 species (10,6%), 3. Fabaceae – 13 (6,9%), 4-5. Lamiaceae, Rosaceae – 12-12 (6,3-6,3%), 6. Brassicaceae – 10 (5,3%), 7. Apiaceae – 9 (4,8%), 8. Caryophyllaceae – 7 (3,7%), 9-10. Asparagaceae, Rubiaceae – 6 (3,2-3,2%).

The life form spectrum is as follows: hemicryptophytes (including biennials) – 92 species (49,2%), therophytes – 50 (26,4%), phanerophytes – 18 (9,5%), chamaephytes – 6 (3,2%), geophytes – 23 (12,2%).

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