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Small-headed milk-vetch tragacanthic shrubberies (Astracantheta microcephalae) in Tbilisi environs

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A B S T R A C T

Small-headed milk-vetch tragacanthic shrubberies (Astracantheta microcephalae) of Tbilisi environs are studied for the first time. They are not appertaining to characteristic formations of Tbilisi environs. Its plant communities are fragmentary spread and with different plots area are inserted in the area of various vegetations. Their altitudinal range is from foothills to middle mountain belt (800 to 1400 m a.s.l.). In Tbilisi environs tragacanthic plant communities of A. microcephala mostly are secondary origin and derived as a result of digressive successions of oak forest (Querceta iberici). Primary plant communities are rare. Typological composition of formation is poor. 3 plant communities were identified in Tbilisi environs by us: (1) Astracanthetum graminoso-mixtoherbosum, (2) Astracanthetum festucosum valesiaci and (3) Astracantheto-Paliuroso-Rhamnosum. The first plant community is comparatively widespread and presented by different variants. The rest plant communities are rare and have local distribution area. Phytocoenological characteristics of plant communities are presented. Geo-botanical descriptions are represented in the form of consolidated table. General geo-botanical characteristics (general projective coverage, sodding degree, density, projective coverage, distribution and average height of each layer, floristic composition, coenetic role of each species – projective coverage, and etc.) and physical-geographical conditions (altitude, relief, exposure, inclination) are given. 200 species of vascular plants, which belong to 38 families and 133 genera, were recorded. In the floristic spectrum leading families are: 1. *Asteraceae* - 27 species (13,5%%), 2. *Fabaceae* – 19 (9,5%), 3. *Poaceae* – 18 (9%), 4. *Caryophyllaceae* – 17 (8,5%), 5-6. *Lamiaceae and Rosaceae* – 16-16 (8-8%), 7. *Brassicaceae* – 12 (6%), 8. *Rubiaceae* – 8 (4%), 9. *Apiaceae* – 7 (3,5%), 10. *Cistaceae* – 5 (2,5%). The life form spectrum is as follows: hemicryptophytes (including biennials) – 99 species (49,5%), therophytes – 55 (27,5%), phanerophytes – 16 (8/%), chamaephytes – 15 (7,5%), geophytes – 15 (7,5%).

Keywords: Astracantheta microcephalae, Plant community, Typology, Phytosociological characteristics, Floristic composition, Tragacanthic shrubbery.

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Introduction

Tragacanthic shrubberies are one of the characteristic for xerophilous vegetation of Caucasus. They have fragmentary distribution in Caucasus. Tragacanthic shrubberies are distributed both on Greater and Lesser Caucasus mountain ranges, in Zuvand, on Sheki and Iori plateaus [1-6]. Their altitudinal diapason is very large – from foothills to subalpine belt (800-2300 m a.s.l.). Tragacanthic shrubberies are developed on the thin skeletal and stony soils and rocks.

Species of genus *Astracantha*, *Astragalus*, *Acantholimon* and *Onobrychis* (*Astracantha denudata*, *A. aurea*, *A. microcephala*, *A. caucasica*, *Acantholimon hohenackeri*, *Onobrychis cornuta*, etc.) are dominants of Caucasus tragacanthic vegetation [1-6]. Florogenetically Caucasus tragacanthic vegetation is in the connection to relevant vegetation of Southwest Asia.

Astracantheta denudati, Astracantheta aurei and Astracantheta microcephalae are main tragacanthic formations in Georgia. Beside them Astracantheta caucasici and Astragaleta tanae are also distributed.

Tragacants of *Acantholimon* are rare (Acantholimonietum fominii, Acantolimonietum armenum and Acantolimonietum lepturoides). They are presented with small plots [5-9]. Floristic composition of Ass tragaleta denudati and Astragaleta aurei distributed on northern slopes of Greater Caucasus were studied by M. Ivanishvili [5] and Astcantheta microcephalae distributed in South Georgia (Meskheti) – by L. Khintibidze [6].

Tragacanthic shrubberies in Tbilisi environs do not belong to characteristic vegetation. But with its original phytocenological structure take distinguished position in the vegetation cover of Tbilisi surroundings. Their plant communities with different plots are fragmentary distributed and inserted in the area of various vegetations. Though, tragacanthic shrubberies in Tbilisi environs are represented by 3 formations. They are: (1) small-headed milk-vetch formation (Astracantheta microcephalae), (2) Caucasian milk-vetch formation (Astracantheta caucasici) and (3) Tana's milk-vetch formation (Astragaleta tanae) [8, 9]. From them the first formation is comparatively widespread. Caucasian milk-vetch formation is locally spread in the surroundings of vil. Martkopi on the foothills of Ialno ridge. Tana's milk-vetch formation is distributed on Mt. Didgori (Armazi ridge). Its small population also is on Mskhaldidi ridge near with vil. Mskhaldidi.

Literary data about tragacanthic shrubberies of Tbilisi environs is very scanty – only typological composition and distribution area of Astracantheta microcephalae and Astracantheta caucasici are given in Lachashvili et al. [8]. Phytocenological structure, floristic composition and distributed regularities were not studied. Their floristic and geo-botanical characteristics comparison to corresponding data of South Caucasus (Meskheti) and Greater Caucasus tragacanthic shrubberies would be interesting.

The aim of our research was to establish typological composition, distributed regularities and full floristic composition of Astracantheta microcephalae formation in Tbilisi environs; determine phytosociological structure for each distinguished plant communities.

Objectives and Methods

The object of research is small-headed milk-vetch tragacanthic shrubbery (Astracantheta microcephalae) of Tbilisi environs.

Phytosociological data was obtained by the route method in 2015-2019. 30 geo-botanical surveys (releve) were made. Geo-botanical surveys were carrying out on 25 m² plots. Number of species was quantifying on 1 m² plots also. During the geo-botanical surveys, studying the structure of phytocoenoses and identification of syntaxa, we were guided by the traditional geo-botanical methods [10-16]. Instead of the term "association" that is observed in soviet literature, we use the term "plant community" that is recognized through the Europe.

Life forms of the plants are separated on the basis of C. Raunkiaer [17] and I. Serebriakov classifications [18].

Soil types are founded on the modern classifications [19-21].

Results and Analysis

I. Areal and short physical-geographical characteristics

Small-headed milk-vetch formation (Astracantheta microcephalae) in Tbilisi surroundings is rare and is not appertaining to characteristic and widespread formations. Its plant communities are fragmentary distributed on Tabori, Mamadaviti, TeleTi, Sakaraulo and Mskhaldidi-Lisi ridges and with different plots area are inserted in the distribution area of various vegetation (steppe, shrubberies of different types, forest). Their altitudinal range is from foothills to middle mountain belt (800 to 1400 m a.s.l.).

Small-headed milk-vetch communities in Tbilisi environs mainly are spread in both climate zones: (1) moderately humid climate with moderately warm long summer and moderately cold snowy winter; average annual temperature is 7.4°-11°C, mean annual precipitation – 550-800 (900) mm, precipitation-evaporation ratio – within the range 1; (2) climate with insufficient humidity, dry hot summer and mild but well expressed winter; snow cover is unstable and brief; average annual temperature is 11,7°-12,5°C, mean annual precipitation – 380-550 mm, precipitation-evaporation ratio – within the range 0,4-0,6 [22-24].

Small-headed milk-vetch communities are formed on the cinnamonic skeletal soils and eroded slopes with scree and bare mother rocks.

Plant communities of *A. microcephala* in Tbilisi environs are either primary or secondary origin. Secondary origin communities are more frequent. They are derived as a result of digressive successions of oak forest (Querceta iberici) and relate to one of the last stage (IV stage) of post-forest vegetation succession [25, 26]. Primary plant communities are rare.

II. Typological composition and geo-botanical characteristic

Small-headed milk-vetch shrubberies in Tbilisi environs are not distinguished by typological variety. Within formation 3 plant communities were identified by us. They are: (1) Astracanthetum graminoso-mixtoherbosum (2) Astracanthetum festucosum valesiaci and (3) Astracantheto-Paliuroso-Rhamnosum. From them the first plant community is comparatively widespread and presented by different variants.

The distribution area in the environs of Tbilisi and consolidated geo-botanical tables are given below.

Abbreviations:

m – Meter cm – Centimeter s. – Specimen

E – East S – South
N – North W – West

Th – Therophyte G – Geophyte Ph – Phanerophyte
H – Hemicryptophyte Ch – Chamaephyte

1. Astracanthetum graminoso-mixtoherbosum

A. Surroundings of vil. Shindisi

Distribution in Tbilisi environs: Tabori ridge, surroundings of vil. Shindisi; *Altitude (m):* 835-845; *Topography:* slope; *Exposure (macro):* W, N-E; *Exposure (micro):* S-W, N-W, W, N-E; *Inclination:* 30°-35° (40°); *Soil:* cinnamonic, sceletal; *Species richness (1 m²):* 30,7; *Species richness (25 m²):* 52,4.

Table 1. *Astracanthetum graminoso-mixtoherbosum (surroundings of vil. Shindisi)*

Surveys	1	2	3	4	5	6	7
Exposure (macro)	W	W	W	W	W	W	N-E
Exposure (micro)	S-W	S-W	W-NW	W-NW	N-W	W	N-E
Inclination	30°	30°	40°	40°	35°-37°	35°-37°	32°-35°
General projective coverage (%)	70	70	80	75	85-86	75	70-73
Sodding degree (%)	0.5	-	-	-	-	-	-
I layer (Shrubs)							
Projective coverage (%)	40-45	40-45	50-55	32-35	43-45	50-55	38-40
Distribution	Uneven	Uneven	More or less evenly	Uneven	Uneven	Uneven	Uneven
Average height (cm)	40-50	40-50	45-50	50-60	50	50	45-50
Maximum height (cm)	70	70	100	70-80	80	85	75
II layer (Grass cover)							
Projective coverage (%)	58-60	62-65	73-75	65-68	70-73	60-63	58-60
Distribution	More or less evenly	Evenly	Evenly	Evenly	Evenly	Evenly	Evenly
Average height (cm)	20-25	20-25	25-30	20-25	20-25	22-25	25-27
Maximum height (cm)	60	60-70	45	37-40	60	70	70
III layer (Moss cover)							
Projective coverage (%)	-	-	-	+	-	-	+

Species richness							
Species richness - 1 m^2	31	27	28	33	36	31	29
Species richness - 25 m^2	53	53	50	54	51	53	54
Floristic composition	Projective coverage (%)						
Shrubs (Ph)							
Astracantha microcephala	40-45	40-45	51	32-35	43-45	50-53	45-50
Prunus incana	-	+	-	-	-	-	-
Paliurus spina-christi	-	+	1	+	-	+	-
Rhamnus pallasii	+	+	1	+	+	1	+
Spiraea hypericifolia	-	1	10	-	1	1	1-2
Semishrubs & dwarf semishrubs (Ch)							
Scutellaria orientalis	1	+	3-4	3	3-4	2-3	1-2
Teucrium nuchense	+	3-4	4-5	4-5	6-7	-	3
Teucrium orientale	-	-	-	-	-	-	+
Teucrium polium	+	3-4	4-5	-	+	3	2-3
Thymus coriifolius	15-17	16-18	-	11-12	14-15	-	9-10
Ziziphora clinopodioides	+	+	-	-	-	-	-
Perennial herbs (H)							
Achillea neilreichii	+	1	2-3	2-3	-	2	-
Alcea rugosa	-	-	-	+	-	-	-
Alyssum tortuosum	-	-	-	-	-	+	-
Artemisia absinthium	+	+	+	-	-	-	-
Astragalus brachycarpus	-	-	+	+	-	-	-
Astragalus bungeanus	3-4	4-5	5-6	-	2-3	5-6	1-2
Bothriochloa ischaemum	+	+	+	-	-	2-3	-
Campanula bononiensis	-	-	-	-	-	-	+ 1 s.
Carex liparocarpos subsp. *bordzilowskii*	+	+	-	0,5	+	-	-
Centaurea ovina	+	+	1-2	1-2	2-3	2-3	1
Cleistogenes serotina	-	+	3-4	-	-	-	0,5
Convolvulus cantabrica	-	-	-	+	-	-	-
Dactylis glomerata	-	-	-	+	-	-	-
Elymus repens	-	-	-	-	-	+	-
Eryngium campestre	+	+	+	0,5	1-2	-	1
Euphorbia boissieriana	2-3	1-2	1	+	-	0,5	-

Euphorbia seguieriana	+	+	1	+	-	-	+
Falcaria vulgaris	-	+	-	+	1	-	+
Festuca valesiaca	1-2	+	+	+	0,5	+	+
Galium verum	5-6	4-5	3-4	-	3-4	5-6	3-4
Inula oculus-christi	-	-	+	+	-	-	-
Jurinea blanda	-	-	-	-	+	+	-
Koeleria macrantha	2	2-3	3-4	3	4-5	3-4	2-3
Medicago caerulea	+	2-3	-	3-4	5-6	4-5	5-6
Melica transsilvanica	3-4	8-9	11-12	-	-	7-8	9-10
Nepeta racemosa	-	+	2-3	0,5	1-2	2-3	1
Onobrychis cyri	-	-	-	1	0,5	+	+
Petrorhagia saxifraga	+	1-2	1	-	0,5	1	+
Phleum phleoides	+	+	+	+	+	+	+
Plantago lanceolata	-	-	-	+	+	-	-
Poa angustifolia	-	-	-	-	-	-	+
Potentilla humifusa	1	-	-	0,5	+	-	+
Potentilla recta	+	-	+	+	0,5	0,5	+
Sanguisorba minor subsp. *balearica*	+	1-2	-	-	-	+	-
Salvia nemorosa	-	-	-	-	-	+	+
Salvia verbascifolia	-	-	-	0,5	-	+	-
Scabiosa columbaria	-	-	-	+	-	+	-
Scorzonera biebersteinii	+	0,5	-	-	-	+	-
Stachys atherocalyx	-	-	+	+	+	1	-
Stipa arabica	1	-	-	-	-	1	0,5
Stipa capillata	-	-	-	-	-	-	+
Taraxacum praticola	-	-	-	+	-	-	-
Thalictrum collinum	-	-	-	-	-	-	+
Trifolium ambiguum	-	-	-	+	-	-	-
Trifolium tumens	-	-	-	+	+	-	-
Leontodon asperrimus	-	-	+	-	-	-	-
Veronica multifida	-	-	-	-	+	-	0,5
Vinca herbacea	+	-	+	+	+	+	-
Perennial herbs (G)							
Allium pseudoflavum	+	+	-	-	+	-	-
Allium rotundum	-	-	-	-	-	+	+
Gagea tenuifolia	-	-	-	-	-	-	+
Gagea chlorantha	-	-	-	+	-	-	-
Iris caucasica	+	-	-	-	-	-	-

Poa bulbosa subsp. *vivipara*	-	+	-	-	-	-	-
Rumex tuberosus	-	-	-	-	+	-	-
Biennial plants (H)							
Carduus hamulosus	+	+	+	-	-	+	+
Chondrilla juncea	-	+	-	-	-	-	-
Lappula barbata	+	+	-	-	0,5	-	-
Silene latifolia	-	-	-	+	+	-	-
Picris strigosa	-	-	-	-	-	-	+
Silene cyri	-	-	-	-	-	+	-
Verbascum formosum	-	+	+	0,5	-	0,5	-
Annual plants (Th)							
Adonis flammea	+	-	-	-	-	-	-
Alyssum alyssoides	+	2-3	1-2	3-4	2-3	1-2	1
Alyssum desertorum	-	-	-	-	-	-	+
Alyssum linifolium	+	-	+	+	-	+	+
Arabidopsis thaliana	+	+	+	0,5	+	+	0,5
Arenaria serpyllifolia	-	-	-	+	+	-	+
Asperula arvensis	+	+	1-2	3-4	1	2-3	1-2
Astrodaucus orientalis	-	+	-	-	-	-	-
Bromus japonicus	-	-	-	-	+	0,5	-
Camelina microcarpa	+	+	+	-	-	+	-
Cerastium glutinosum	-	-	-	+	-	-	-
Clypeola jonthlaspi	+	+	0,5	+	0,5	-	+
Crepis sancta	+	+	1	2-3	1	1-2	1
Crupina vulgaris	-	-	+	-	-	-	-
Daucus carota	-	-	-	-	-	-	+
Draba nemorosa	-	+	+	-	0,5	+	-
Erodium cicutarium	+	+	3-4	-	2-3	-	-
Filago arvensis	+	-	-	-	-	+	-
Helianthemum salicifolium	+	+	1-2	4	2-3	2	1
Holosteum umbellatum	-	-	+	0,5	-	-	-
Kohlrauschia prolifera	-	-	-	-	-	-	+
Linaria simplex	-	-	+	+	+	-	-
Lolium rigidum	+	+	3-4	3	-	2	2-3
Medicago minima	+	-	-	-	0,5	+	-
Medicago rigidula	+	-	+	-	-	-	-
Papaver arenarium	+	+	+	+	+	+	+
Papaver dubium	-	-	-	-	+	-	-

Psilurus incurvus	+	-	+	-	+	+	-
Queria hispanica	-	-	-	-	+	-	-
Scabiosa micrantha	-	-	-	+	-	-	-
Sideritis montana	-	-	-	-	-	+	-
Silene conica	+	+	-	-	-	-	-
Thlaspi perfoliatum	+	3-4	5-7	4-5	5-6	4-5	3-4
Trifolium arvense	-	-	-	-	-	-	+
Trifolium campestre	-	-	-	-	-	-	+
Viola kitaibeliana	+	1	2-3	1-2	1	-	0,5
Xeranthemum squarrosum	+	+	3-4	4-5	2-3	2-3	0,5

B. Surroundings of vil. Mskhaldidi

Distribution in Tbilisi environs: Mskhaldidi ridge, surroundings of vil. Mskhaldidi; *Altitude (m):* 1220-1235; *Topography:* slope; *Exposure (macro):* S; *Exposure (micro):* S; *Inclination:* 20°-30°; *Soil:* cinnamonic, skeletal, surface small-stony; often fragments of bare mother rocks are on the surface; *Species richness (1 m²):* 17,2; *Species richness (25 m²):* 28,7.

Table 2. *Astracanthetum graminoso-mixtoherbosum (surroundings of vil. Mskhaldidi)*

Surveys	1	2	3	4	5	6	7	8
Exposure (macro)	S	S	S	S	S	S	S	S
Exposure (micro)	S	S	S	S	S	S	S	S
Inclination	22°-23°	30°	23°-25°	20°	30°-32°	20°	25°-26°	20°-22°
General projective coverage (%)	73-75	63-65	70-72	58-60	73-75	57-60	62-65	68-70
Sodding degree (%)	10	-	-	-	-	-	-	-
I layer (Shrubs)								
Projective coverage (%)	30	30	55	35	35	25-27	30-32	28-30
Distribution	Uneven	Uneven	Uneven	Uneven	More or less evenly	Uneven	More or less evenly	More or less evenly
Average height (cm)	25	30	25-27	20-25	20	25	28-30	25-28
Maximum height (cm)	35	40	40	30	30	35	40	37
II layer (Grass cover)								
Projective coverage (%)	70	50	40	40	60	40-45	50-55	55-60
Distribution	evenly	uneven	More or less evenly	More or less evenly	More or less evenly	uneven	More or less evenly	More or less evenly
Average height (cm)	5-7	5-7	8-10	6-8	5-7	5-7	7-8	6-8
Maximum height (cm)	50	50	55	45	55	50	52	57

III layer (Moss & lichen cover)								
Projective coverage (%)	-	-	-	-	-	-	-	-
Species richness								
Species richness - 1 m^2	22	16	15	11	22	16	17	19
Species richness - 25 m^2	30	24	30	27	32	29	30	28
Floristic composition	Projective coverage (%)							
Shrubs (Ph)								
Astracantha microcephala	30	30	55	35	35	25-27	30-32	28-30
Cotoneaster racemiflorus	+	-	-	+ 1 s.	+ 2 s.	-	-	-
Crataegus kyrtostyla	-	+	-	-	-	-	-	-
Rosa canina	-	-	-	-	+ 2 s.	-	-	-
Semishrubs & dwarf semishrubs (Ch)								
Artemisia caucasica	15-17	10	15	18-20	10	12-13	16-18	13-15
Dianthus orientalis	-	-	-	-	+	-	-	-
Fumana procumbens	-	-	-	1	12	+	-	1
Helianthemum georgicum	1	+	1	5-6	+	+	1	+
Hyssopus officinalis	-	-	1-2	-	-	-	-	-
Scutellaria orientalis	-	+	3	+	4	+	+	+
Teucrium nuchense	10	20	10	15	25	13-15	15-17	12-14
Teucrium polium	1	3	6-7	+	5	1-2	+	2-3
Thymus coriifolius	10	+	10	7-8	6-8	8-10	5-7	7-8
Ziziphora clinopodioides	-	+	1	-	-	-	+	-
Perennial herbs (H)								
Achillea neilreichii	+	+	+	+	-	+	+	-
Agrimonia eupatoria	-	-	+ 1 s.	-	-	-	-	-
Alchemilla sericata	-	-	-	-	+ 1 s.	-	+ 1 s.	-
Galium humifusum	-	-	+	-	-	-	-	-
Astragalus bungeanus	+	-	+	-	+	+	+	-
Bothriochloa ischaemum	+	+	-	+	-	-	+	-
Bromus biebersteinii	2	-	-	+	3	+	1	+
Carex liparocarpos subsp. *bordzilowskii*	15-16	18-20	-	17-18	8	10-12	10	13-15
Carex humilis	-	-	-	-	5	-	+	-

Centaurea bella	-	-	-	+	1	+	-	+
Centaurea ovina	-	-	-	+	-	-	+	-
Cleistogenes serotina	-	-	+ 1 s.	-	-	-	-	-
Clinopodium vulgare	-	-	+ 1 s.	-	-	-	-	-
Convolvulus cantabrica	-	-	+ 1 s.	-	-	+ 1 s.	+ 1 s.	-
Securigera varia	-	-	+	-	-	-	-	-
Dactylis glomerata	-	1-2	-	-	-	-	-	-
Euphorbia seguieriana	-	-	-	-	+	+	-	-
Festuca valesiaca	20-25	-	-	+	-	-	-	+
Fragaria viridis	-	1	12	-	-	-	-	-
Koeleria macrantha	+	-	-	+	+	+	-	+
Leontodon asperrimus	-	-	-	-	-	+	-	-
Lotus corniculatus	-	-	+	-	+	-	-	-
Medicago caerulea	+	-	-	-	-	-	-	-
Nepeta racemosa	2	12	15	-	+	3-5	8-10	5-6
Onobrychis cyri	-	-	-	-	-	+	-	+
Petrorhagia saxifraga	13-15	10	15	15	15-18	11-13	10-12	13-15
Phleum phleoides	-	-	-	+	-	-	-	-
Plantago lanceolata	1	+	-	+	+	+	+	+
Poa angustifolia	5	5	5	+	5	3	3-4	5
Potentilla humifusa	15-16	-	15	12-13	2-3	7-8	8-10	11-13
Potentilla argentea	-	-	+	-	-	-	-	-
Sanguisorba minor subsp. *balearica*	+	+	-	-	+	-	+	+
Pyrethrum sericeum	-	-	-	-	2	+	-	+
Scorzonera biebersteinii	+	-	-	-	-	-	-	-
Sempervivum transcaucasicum	-	-	-	+	-	-	-	+ 1 s.
Stachys atherocalyx	+	-	-	-	-	-	+	-
Stipa capillata	-	-	-	-	+	-	+	-
Thesium arvense	+	-	+	-	+	+	-	+
Trifolium tumens	+	+	-	-	-	-	-	-
Seseli grandivittatum	-	-	+	-	-	-	-	-
Biennial plants (H)								
Anthyllis lachnophora	-	-	-	-	+	+	-	-
Annual plants (Th)								
Clinopodium acinos	+	+	+	+	-	+	+	+
Alyssum desertorum	+	+	+	+	+	+	+	+

Asperula arvensis	+	-	-	-	-	-	+	-
Bromus squarrosus	+	+	+	+	-	-	+	+
Crepis sancta	-	+	-	-	-	-	-	+
Sideritis montana	-	-	+	+	+	+	+	+
Trifolium arvense	+	-	-	-	-	-	-	-

C. Surroundings of vil. Lisi, between vil. Lisi and Tsodoreti

Distribution in Tbilisi environs: foothills of Mskhaldidi-Lisi ridge, surroundings of vil. Lisi; *Altitude (m):* 800-850; *Topography:* slope; *Exposure (macro):* **N**; *Exposure (micro):* N-W, N; *Inclination:* 30°-33°; *Soil:* thin, cinnamonic, stony, with bare mother rocks; stones on the surface are results of process of break-up of mother rock; *Species richness (1 m²):* 10,2; *Species richness (25 m²):* 60;

Table 3. *Astracanthetum graminoso-mixtoherbosum (surroundings of vil. Lisi)*

Surveys	1	2	3	4
Exposure (macro)	N	N	N	N
Exposure (micro)	N-W	N-W	N-NW	N-W
Inclination (macro)	30°-32°	30°-32°	30°-32°	30°-32°
Inclination (micro)	25°-28°	20°	20°-22°	22°-24°
General projective coverage (%)	70	55	50	60
Sodding degree (%)	+	2-3	-	+
I layer (Shrubs)				
projective coverage (%)	28-30	26-28	17-20	27-28
Distribution	More or less evenly	Uneven	Uneven	More or less evenly
Average height (cm)	50	40-50	70-80	50-55
Maximum height (cm)	80	75	120	110
II layer (Grass cover)				
Projective coverage (%)	43-45	38-40	35-37	40-42
Distribution	More or less evenly	More or less evenly	Uneven	More or less evenly
Average height (cm)	20-30	20-30	20-40	25-27
Maximum height (cm)	80	120	120	115
III layer (Moss & lichen cover)				
Projective coverage (%)	20	30-32	15	20-22
Moss	20	30-32	15	20-22
Lichen	+	-	+	+
Species richness				
Species richness - 1 m^2	10.6	9.7	10,5	10.1
Species richness - 25 m^2	56	63	59	62

Floristic composition	Projective coverage (%)			
Shrubs (Ph)				
Astracantha microcephala	25	25-26	15-20	23-25
Carpinus orientalis	1-2	-	-	-
Cytisus caucasicus	+	-	-	-
Cotoneaster morulus	2-3	+	-	1-2
Cotoneaster racemiflorus	-	-	+	-
Juniperus oxycedrus	+	+	-	-
Lonicera iberica	+	-	-	-
Rosa canina	+	+	-	+
Spiraea hypericifolia	-	+	+	+
Semishrubs & dwarf semishrubs (Ch)				
Artemisia caucasica	+	10	5-6	4-5
Bupleurum exaltatum	-	+	-	+
Fumana procumbens	1-2	+	+	1
Helianthemum nummularium	5	7-8	5-6	5-6
Scutellaria orientalis	7	1-2	3-4	2-3
Teucrium nuchense	+	-	+	+
Teucrium polium	+	+	+	+
Thymus coriifolius	6	1-2	3-4	6-7
Perennial herbs (H)				
Achillea neilreichii	1-2	+	1	1-2
Alyssum murale	-	+	+	+
Anthyllis vulneraria subsp. *boissieri*	+	-	-	-
Asperula glomerata	-	+	-	-
Asperula prostrata	-	-	+	+
Astragalus bungeanus	+	+	+	+
Astragalus mollis	-	+	-	-
Bromus biebersteinii	2-3	+	1-2	+
Campanula alliariifolia	+	-	-	-
Carex humilis	1-2	2-3	1-2	2-3
Centaurea ovina	+	-	+	+
Securigera varia	1-2	-	-	-
Dactylis glomerata	+	+	-	+
Euphorbia boissieriana	+	+	+	+
Euphorbia seguieriana	+	+	+	+
Galium album	+	+	+	+

Galium verum	-	+	+	+
Hypericum perforatum	-	+	+	-
Jurinea blanda	3	+	1-2	1
Koeleria macrantha	+	+	+	+
Leontodon asperrimus	+	+	+	+
Linum tenuifolium	+	+	+	+
Medicago caerulea	13	+	4-5	6-7
Melica transsilvanica	-	7-8	2-3	2
Onobrychis cyri	1	+	1-2	2
Ononis pusilla	+	-	-	-
Petrorhagia saxifraga	+	+	+	+
Petrorhagia saxifraga	+	-	-	-
Poa angustifolia	-	-	+	+
Potentilla recta	+	+	+	+
Sanguisorba minor subsp. *balearica*	-	+	-	+
Psephellus carthalinicus	+	10	5-6	4-5
Pyrethrum sericeum	+	+	+	0,5
Salvia verbascifolia	+	-	-	-
Scabiosa columbaria	0.5	+	+	+
Scorzonera biebersteinii	+	+	+	+
Seseli grandivittatum	-	10	1-2	-
Silene italica	-	+	+	-
Stachys atherocalyx	+	-	+	1
Stachys iberica	+	-	-	-
Stipa capillata	-	+	+	+
Thesium arvense	+	+	-	+
Tragopogon graminifolius	-	-	+	+
Turritis glabra	-	+	-	+
Veronica multifida	-	-	+	+
Perennial herbs (G)				
Allium atroviolaceum	+	+	+	+
Allium pseudoflavum	-	+	+	-
Allium rotundum	+	+	+	+
Muscari szovitsianum	+	1	+	+
Rumex ruberosus	+	-	+	+
Tragopogon tuberosus	+	-	-	-
Biennial plants (H)				
Campanula sibirica subsp. *hohenackeri*	+	+	-	+

Annual plants (Th)				
Clinopodium acinos	+	+	+	+
Alyssum alyssoides	-	+	+	+
Arenaria serpyllifolia	-	+	+	+
Asperula arvensis	+	+	+	+
Bromus squarrosus	+	+	+	+
Crucianella angustifolia	-	+	+	-
Filago eriocephala	-	+	+	-
Kohlrauschia prolifera	-	-	+	+
Linaria simplex	-	-	+	+
Medicago minima	-	+	-	-
Melilotus neapolitanus	-	+	-	+
Crepis sancta	-	-	+	+
Queria hispanica	-	-	+	+
Scabiosa micrantha	+	-	-	-
Sedum pallidum	-	+	-	+
Sideritis montana	+	-	-	+
Silene conica	-	+	-	-
Thlaspi perfoliatum	+	-	+	-
Trifolium arvense	-	+	-	-
Trifolium campestre	-	+	-	-
Veronica arvensis	-	+	-	-

D. Surroundings of Kojori, Mt. Udzo

Distribution in Tbilisi environs: Mamadaviti ridge, Mt. Udzo; *Altitude (m):* 1390-1400; *Topography:* slope; *Exposure (macro):* S-W; *Exposure (micro):* S-W, rare S and S-E; *Inclination:* 30°-33°; *Soil:* thin, cinnamonic, sceletal, with small stones and bare mother rocks; *Species richness (25 m²):* 40; General projective coverage – 70-75%; Sodding degree – -;

Shrubs: projective coverage – 30-35%; Distribution – More or less evenly; Average height (cm) – 35-50.

Grass cover: projective coverage – 55-60%; Distribution – more or less evenly; Average height (cm) – from 15-25 to 40-60 (80).

Floristic composition

Shrubs (Ph)

1. *Astracantha microcephala* – 30-35%
2. *Crataegus meyeri* – +

Semishrubs & dwarf semishrubs (Ch)

1. *Cerastium argenteum* – +
2. *Teucrium nuchense* – 8-10%
3. *Teucrium orientale* – +

Perennial herbs (H)

1. *Achillea biebersteinii* – 2-3%
2. *Alyssum murale* – +
3. *Bilacunaria microcarpa* – 5%
4. *Bromus biebersteinii* – 25-28%
5. *Clinopodium vulgare* – +
6. *Convolvulus cantabrica* – +
7. *Dactylis glomerata* – +
8. *Eryngium campestre* – +
9. *Euphorbia seguieriana* – +
10. *Festuca valesiaca* – +
11. *Fragaria vesca* – +

Perennial herbs (G)

1. *Allium gramineum* – +
2. *Allium rotundum* – +

Biennial plants (H)

1. *Reseda lutea* – +

Annual plants (Th)

1. *Alyssum desertorum* – +

2. *Arenaria serpyllifolia* – +
3. *Bromus japonicus* – +
4. *Verbascum orientale* – +
5. *Filago eriocephala* – +

3. *Rhamnus pallasii* – + (2 s.)
4. *Rosa spinosissima* – + (1 s.)

4. *Teucrium polium* – 8-10%
5. *Scutellaria orientalis* – 3-5%
6. *Thymus coriifolius* – 2-3%

12. *Galium verum* – +
13. *Hypericum perforatum* – +
14. *Medicago caerulea* – +
15. *Melica transsilvanica* – +
16. *Onobrychis cyri* – +
17. *Petrorhagia saxifraga* – +
18. *Phleum phleoides* – 18-20%
19. *Potentilla recta* – +
20. *Scabiosa georgica* – +
21. *Stachys atherocalyx* – +
22. *Stachys iberica* – +

3. *Bellevalia speciosa* – +
4. *Sedum maximum* subsp. *ruprechtii* – +

6. *Alyssum linifolium* – +
7. *Sedum hispanicum* – +
8. *Trifolium arvevse* – +
9. *Trifolium campestre* – +
10. *Xeranthemum squarrosum* – +

E. Teleti-Sakaraulo ridge

Distribution in Tbilisi environs: Teleti-Sakaraulo ridge, surroundings of vil. Ertisi; *Altitude (m):* 1100-1160; *Topography:* slope; *Exposure (macro):* S-W; *Exposure (micro):* S-W; *Inclination:* 20°-25°; *Soil (Substrate):* bare sandstone mother rocks and its scree; soil weakly and fragmentary is formed between of bare mother rocks, thin, skeletal, surface is stony; *Species Species richness (25 m²):* 20; *General projective coverage* – 35%; *Sodding degree*: –;

Layer structure is not expressed. Plant community is inserted in the derivate of forest, post-forest shrubberies and steppe.

Shrubs: projective coverage – 18-20%; *distribution* – More or less evenly; average *height (cm)* – 20-40.

Grass cover: *projective coverage* – 17-18%; *distribution* – More or less evenly; *height (cm)* – from 10-15 to 50-70.

Floristic composition

Shrubs (Ph)

1. *Astracantha microcephala* – 30-35%
2. *Carpinus orientalis* – + (1 s.)
3. *Cotoneaster morulus* – +
4. *Rhamnus pallasii* – 2-3%

Semishrubs & dwarf semishrubs (Ch)

1. *Scutellaria orientalis* – 2%
2. *Teucrim polium* – 4%
3. *Thymus coriifolius* – +
4. *Fumana procumbens* – +
5. *Artemisia incana* – 1%

Perennial herbs (H)

1. *Alyssum tortuosum* – 4%
2. *Artemisia absinthium* – +
3. *Artemisia vulgaris* – +
4. *Centaurea ovina* – +
5. *Euphorbia seguieriana* – 2-3%
6. *Hypericum perforatum* – +
7. *Onosma tenuiflora* – +
8. *Sanguisorba minor* subsp. *balearica* – 1%
9. *Psephellus carthalinicus* – +
10. *Scabiosa columbaria* – +
11. *Stachys atheroccalyx* – +

Perennial herbs (G)

1. *Allium rotundum* – +
2. *Rumex tuberosus* – +

Annual plants (Th)

1. *Carduus pycnocephalus* subsp. *albidus* – +
2. *Gypsophila elegans* – +
3. *Trifolium arvense* – +

2. Astracanthetum festucosum valesiaci

Distribution in Tbilisi environs: Tabori ridge, surroundings of vil. Shindisi; *Altitude (m):* approximately, 850; *Topography:* slope; *Exposure (macro):* E; *Exposure (micro):* N-E, E; *Inclination:* 22°-28°, rarely 15°-18°; *Soil*: cinnamonic, sceletal; *Species richness (1 m²):* 28,4; Species richness (25 m2): 47,2.

Table 4. *Astracanthetum festucosum valesiaci*

Surveys	1	2	3	4	5	6	7	8
Exposure (macro)	E	E	E	E	E	E	E	E
Exposure (micro)	N-E	N-E	N-E	E	E	N-E	N	E
Inclination	25°-28°	15°-18°	23°-25°	22°-25°	22°-25°	25°-27°	25°-26°	20°-22°
General projective coverage (%)	95-96	93-95	95-97	93-95	95-96	95-98	90-93	92-95
Sodding degree (%)	14-15	17-20	10	22-24	15-17	12-13	8-9	13-14
I layer (Shrubs)								
Projective coverage (%)	26-30	45-50	45-50	23-25	45-50	32-35	22-23	25-28
Distribution	Uneven	Uneven	More or less evenly	Uneven	More or less evenly	Uneven	More or less evenly	More or less evenly
Average height (cm)	35-40	45-50	35-40	40-45	35-40	40	35-40	40
Maximum height (cm)	60-65	70-80	50	60	50-55	50-55	55-60	55-58
II layer (Grass cover)								
Projective coverage (%)	90-95	92-93	93-95	85-90	90-92	92-93	85-87	85-90
Distribution	evenly	evenly	evenly	evenly	evenly	evenly	evenly	evenly
Average height (cm)	12-15	15-20	15-20	15-20	15-20	15-20	15-20	15-17
Maximum height (cm)								
III layer (Moss & lichen cover)								
Projective coverage (%)	7-8	4-6	+	+	1-2	+	10-11	1-2
Moss	+	+	-	-	-	+	10	+
Lichen	7-8	4-6	+	+	1-2	+	1	1-2
Species richness								
Species richness - 1 m^2	29	27	27	29	25	31	31	28
Species richness - 25 m^2	53	46	47	43	42	47	53	47
Floristic composition	Projective coverage (%)							
Shrubs (Ph)								
Astracantha microcephala	25-30	45-50	45-50	23-25	45-50	32-35	22-23	25-28

Crataegus meyeri	+ 1 s.	-	-	-	-	-	-	-
Paliurus spina-christi	-	-	+ 1 s.	-	+ 2 s.	-	-	-
Rhamnus pallasii	-	-	-	-	-	+ 1 s.	+ 1 s.	-
Rosa spinosissima	+1c.	-	-	-	-	-	-	-
Semishrubs & dwarf semishrubs (Ch)								
Scutellaria orientalis	7-8	4-5	10	2-3	+	3-4	4-5	1-2
Teucrium nuchense	13-15	15-17	10-12	5-6	7-8	6-7	8-10	5-6
Teucrium polium	3-4	4-5	8-9	3-4	3-4	5-6	4	6-7
Thymus coriifolius	5-6	6-7	+	2-3	2-3	2-3	4-5	3-5
Teucrium orientale	-	-	-	+	-	-	-	-
Perennial herbs (H)								
Achillea neilreichii	1	+	+	3-4	4-5	1-2	2	+
Artemisia absinthium	-	-	-	-	-	-	+	-
Galium humifusum	-	+ 1 s.	-	-	-	-	-	-
Astragalus bungeanus	-	-	+	7-8	10	6-7	-	3-4
Bothriochloa ischaemum	-	-	+ 1 s.	-	-	-	-	-
Carex liparocarpos subsp. *bordzilowskii*	-	-	-	-	-	-	+	-
Centaurea ovina	+	1-2	+	+	+	+	+	+
Securigera orientalis	-	-	-	+	-	-	-	-
Securigera varia	-	-	-	-	-	+	+	-
Dactylis glomerata	+	-	+	-	-	-	-	-
Dianthus crinitus	-	+	-	-	-	-	-	-
Echium vulgare	-	-	-	-	-	+	-	-
Eryngium campestre	+	+	+	+	+	+	+	+
Euphorbia boissieriana	6-7	+	3-4	-	+	+	+	-
Euphorbia seguieriana	1	+	+	1	+	+	+	+
Falcaria vulgaris	8-9	+	8-10	2-3	10-12	4-5	3-4	5-6
Festuca valesiaca	25-30	35-37	15	42-45	26-27	23-25	20-22	24-26
Galium verum	+	3-4	-	-	-	6-7	+	1
Herniaria incana	+	-	-	+	-	+	-	-
Inula aspera	-	-	-		-	+	-	-
Jurinea blanda	+	1-2	-	-	-	+ 1 s.	-	-
Koeleria macrantha	+	+	6-8	1-2	6-8	4-5	3	3-4
Leontodon asperrimus	+	+	-	-	-	-	-	-
Lotus corniculatus	-	-	-	-	-	-	-	+
Medicago caerulea	3-4	+	6-7	3-4	7-8	4-5	5-6	4-5

Melica transsilvanica	-	-	-	-	-	-	-	+
Nepeta racemosa	-	+ 1 s.	-	-	+	-	-	-
Onobrychis cyri	+	+	+	+	-	-	+	+
Petrorhagia saxifraga	-	-	-	-	-	-	-	+
Phleum phleoides	-	-	-	-	-	+	+	-
Plantago lanceolata	+	+	+	2-3	10	-	+	1-2
Poa angustifolia	18-20	35-40	30	11-12	+	15-16	-	17-18
Potentilla humifusa	-	-	-	-	-	+	25-27	2-3
Potentilla recta	1-2	+	+	+	+	+	+	1
Sanguisorba minor subsp. *balearica*	1	+	+	+	+	-	-	+
Salvia nemorosa	15-16	3-4	+	1-2	7-8	-	3-4	4-5
Salvia verticillata	-	-	-	-	-	-	-	+
Scabiosa columbaria	-	-	+	5-7	4-5	-	-	-
Scabiosa georgica	-	-	-	-	-	+	-	-
Scorzonera biebersteinii	-	-	-	-	-	-	+	-
Seseli grandivittatum	-	-	-	-	-	-	+	-
Stachys atherocalyx	+	+	+	+	1	+	+	+
Stipa capillata	-	-	-	-	+	-	-	-
Taraxacum praticola	+	+	-	+	+	-	+	-
Thalictrum collinum	-	+	-	-	-	-	+	-
Thesium arvense	+	-	+	+	+	+	-	-
Tragopogon graminifolius	-	-	-	-	-	+	-	-
Trifolium ambiguum	+	-	+	-	-	-	-	-
Trifolium tumens	1-2	+	+	+	+	+	+	+
Turritis glabra	-	-	+	-	-	-	-	+
Veronica multifida	3-4	1-2	+	2-3	5	4-5	2	2-3
Vinca herbacea	1	-	-	-	-	-	-	-
Perennial herbs (G)								
Allium pseudoflavum	-	+	-	-	-	-	-	-
Allium rotundum	-	-	-	-	-	-	+	+
Bellevalia speciosa	-	-	+ 1 s.	-	+	-	-	-
Muscari szovitsianum	-	-	-	-	-	-	+	-
Poa bulbosa subsp. *vivipara*	+	+	+	-	-	+	+	+
Ranunculus illyricus	+	+	+	+	+	+	+	+
Rumex tuberosus	3-4	2-3	3-4	-	-	+	+	1
Biennial plants (H)								

Campanula sibirica subsp. *hohenackeri*	-	-	-	-	-	-	-	+
Carduus hamulosus	+	-	+	+	+	-	+	-
Lappula barbata	-	-	-	-	-	-	+	-
Annual plants (Th)								
Adonis flammea	-	+	+	+	+	+	-	-
Alyssum alyssoides	2-3	+	+	+	+	-	+	+
Arabidopsis thaliana	1	-	-	+	+	+	+	-
Arenaria serpyllifolia	+	-	+	+	-	+	+	+
Asperula arvensis	+	+	+	-	-	+	+	-
Filago arvensis	+	+	-	-	-	+	-	-
Carduus pycnocephalus subsp. albidus	-	-	-	-	-	+ 1 s.	-	-
Cerastium glutinosum	1-2	1	+	+	+	+	+	+
Clypeola jonthlaspi	-	-	-	+	+	+	+	-
Cruciata pedemontana	-	-	-	-	-	-	+	-
Crupina vulgaris	-	-	-	-	-	-	-	+
Draba nemorosa	+	-	-	-	-	-	+	-
Erodium ciconium	+	+	-	-	-	-	-	-
Erodium cicutarium	+	-	-	-	-	-	+	-
Helianthemum ledifolium	-	-	-	-	-	-	-	+
Helianthemum salicifolium	+	+	+	+	+	+	+	+
Holosteum marginatum	-	-	+	+	-	-	-	-
Kohlrauschia prolifera	-	-	-	-	-	-	-	+
Lolium rigidum	-	-	-	-	+	-	-	-
Lycopsis orientalis	+	-	-	-	-	-	+	-
Medicago minima	-	-	+	-	-	-	-	+
Medicago rigidula	-	+	-	-	-	-	-	-
Minuartia montana subsp. *wiesneri*	-	-	-	-	-	-	+	-
Crepis sancta	1	+	+	2-3	-	+	+	-
Queria hispanica	-	-	-	-	-	-	-	+
Thlaspi arvense	-	-	-	+	-	-	-	-
Thlaspi perfoliatum	5-6	2	3-4	3-4	2	1-2	4-5	1-2
Trifolium arvense	-	-	-	-	-	-	-	+
Trifolium campestre	-	-	-	-	+	-	-	-

Veronica arvensis	+	-	-	-	-	-	-	-
Viola kitaibeliana	+	+	+	+	+	+	+	+

3. Astracantheto-Paliuroso-Rhmanosum

Distribution in Tbilisi environs: Teleti ridge, between vil. Tabakhmela and vil. Kumisi; *Altitude (m):* 800-850; *Topography*: slope; *Exposure (macro)*: S-W; *Exposure (micro)*: S; *Inclination*: 25°-28°; *Soil (Substrate):* slope is very eroded; soil almost is not formed; substrate is presented with bare sandstone mother rocks and its scree; *Species richness (25 m2)*: 17; *General projective coverage*: 35-40%; *Sodding degree*: –;

I layer (Shrubs): *projective coverage* – 25-27%; *distribution* – uneven; *average height (cm)* – 35-40(45).

II layer (grass cover): *projective coverage – 10-12%; distribution* – uneven*; average height (c*m) – from 10-15 to 25-30.

Floristic composition

Shrubs (Ph)

1. *Astracantha microcephala* – 15-18%
2. *Atraphaxis caucasica* – +
3. *Cotoneaster morulus* – +
4. *Paliurus spina-christi* – 3-5%
5. *Rhamnus pallasii* – 5%
6. *Spiraea hypericifolia* – 1%

Semishrubs & dwarf semishrubs (Ch)

1. *Artemisia incana* – 1-2%
2. *Fumana procumbens* – 1%
3. *Scutellaria orientalis* – 0,5%
4. *Teucrium nuchense* – +
5. *Teucrium polium* – 1%

Perennial herbs (H)

1. *Agropyron cristatum* – 2-3%
2. *Alyssum tortuosum* – 1%
3. *Dactylis glomerata* – +
4. *Euphorbia seguieriana* – 1%
5. *Festuca valesiaca* – +
6. *Stipa arabica* – 1-2%

Biennial plants (H)

1. *Campanula sibirica* subsp. *hohenackeri* – +

Annual plants (Th)

1. *Bromus squarrosus* – +
2. *Carduus pycnocephalus* subsp. *albidus* – 1-2%
3. *Erodium cicutarium* – +
4. *Papaver arenarium* – +

III. Floristic composition

200 species of vascular plants, which belong to 38 families and 133 genera, were recorded. In the floristic spectrum leading families are: 1. *Asteraceae* - 27 species (13,5%%), 2. *Fabaceae* – 19 (9,5%), 3. *Poaceae* – 18 (9%), 4. *Caryophyllaceae* – 17 (8,5%), 5-6. *Lamiaceae* and *Rosaceae* – 16-16 (8-8%), 7. *Brassicaceae* – 12 (6%), 8. *Rubiaceae* – 8 (4%), 9. *Apiaceae* – 7 (3,5%), 10. *Cistaceae* – 5 (2,5%).

Floristic composition mainly consists of hemixerophytic species. Herbs are basic of floristic composition (170 species – 85%) and woody and semi-woody plants are few (accordingly, 16 species – 8% and 14 – 7%).

Composition of woody plants is poor. Beside *Astracantha microcephala* components of shibliak mostly are participated (*Paliurus spina-christi*, *Rhamnus pallasii*, *Cotoneaster morulus*, *C. racemiflorus*, *Crataegus kyrtostyla*, *C. meyeri* and etc.). But in most cases, they are presented with 1-2 specimens and their frequency of occurrence is insignificant.

Core of grass cover composition in the same way is created by steppe and shibliak components. Role of hemixerophytic and xerophytic chamephytes (semishrubs & dwarf semishrubs) is significant. They belong to characteristic plants of skeletal soils, stony and partially rocky ecotypes and frequency of occurrence of most of them is high. Composition of herbs is enriched with characteristic plants of different types of shrubberies and, partially, of dry meadows and steppe-meadows, but they are not appertained to constant species.

The life form spectrum is as follows: hemicryptophytes (including biennials) – 99 species (49,5%), therophytes – 55 (27,5%), phanerophytes – 16 (8/%), chamaephytes – 15 (7,5%), geophytes – 15 (7,5%).

Full list of recorded plants is given bellow. For each species life forms [18, 17] are indicated.

Abbreviations:
An. – Annual plant
Bien. – Biennual plant
P. – Perennial herb
S. – Shrub
Sh. – Semishrub & dwarf semishrub

Th – Therophyte
H – Hemicryptophyte
G – Geophyte
Ch – Chamaephyte
Ph – Phanerophyte

GYMNOSPERMAE
Cupressaceae
Juniperus oxycedrus L. / S. / Ph

ANGIOSPERMAE
DYCOTYLEDONEAE
Apiaceae (*Umbelliferae*)
Astrodaucus orientalis (L.) Drude / An. / Th
Bilacunaria microcarpa (M.Bieb.) Pimenov & V.N.Tikhom. / P. / H
Bupleurum exaltatum M.Bieb. / Sh. / Ch
Daucus carota L. /An. / Th
Eryngium campestre L. / P. / H
Falcaria vulgaris Berhn. / P. / H
Seseli grandivittatum Schischk. / P. / H

Apocynaceae
Vinca herbacea Waldst. & Kit. / P. / H

Asteraceae (*Compositae*)
Achillea biebersteinii Afan. / P. / H
Achillea neilreichii A.Kern. [*Achillea nobilis* subsp. *neilreichii* (A.Kern.) Velen.] / P. / H
Artemisia absinthium L. / P. / H
Artemisia caucasica Willd. / Sh. / Ch
Artemisia incana (L.) Druce / Sh. / Ch
Artemisia vulgaris L. / P. / H
Carduus hamulosus Ehrh. / Bien. / H
Carduus pycnocephalus subsp. *albidus* (M.Bieb.) Kazmi (*Carduus albidus* M.Bieb.) / An. / Th
Centaurea bella Trautv. [*Psephellus bellus* (Trautv.) Wagenitz] / P. / H
Centaurea ovina Pall. ex Willd. / P. / H
Chondrilla juncea L. / P. / H
Crepis sancta (L.) Bornm. / An. / Th
Crupina vulgaris Pers. ex Cass. / An. / Th
Filago arvensis L. /An. / Th
Filago eriocephala Guss. / An. / Th
Inula aspera Poir. / P. / H
Inula oculus-christi L. / P. / H
Jurinea blanda (M.Bieb.) C.A.Mey. / P. / H
Leontodon asperrimus (Willd.) Endl. / P. / H

Picris strigosa M.Bieb. / Bien. / H
Psephellus carthalinicus Sosn. / P. / H
Pyrethrum sericeum (Adams) M.Bieb. [*Tanacetum sericeum* (Adams) Sch.Bip.] / P. / H
Scorzonera biebersteinii Lipsch. / P. / H
Taraxacum praticola Dahlst. / P. / H
Tragopogon graminifolius DC. / P. / H
Tragopogon tuberosus K.Koch / P. / G
Xeranthemum squarrosum Boiss. / An. / Th

Boraginaceae
Anchusa arvensis subsp. *orientalis* (L.) Nordh. (*Lycopsis orientalis* L.) / An. / Th
Echium vulgare L. / P. / H
Lappula barbata (M.Bieb.) Gürke / Bien. / H
Onosma tenuiflora Willd. / P. / H

Brassicaceae (*Cruciferae*)
Alyssum alyssoides (L.) L. / An. / Th
Alyssum desertorum Stapf / An. / Th
Alyssum linifolium Stephan ex Willd. [*Meniocus linifolius* (Stephan ex Willd.) DC.] / An. / Th
Alyssum murale Waldst. & Kit. / P. / H
Alyssum tortuosum Willd. / P. / H
Arabidopsis thaliana (L.) Heynh. /An. / Th
Camelina microcarpa Andrz. ex DC. /An. / Th
Clypeola jonthlaspi L. / An. / Th
Draba nemorosa L. / An. / Th
Thlaspi arvense L. / An. / Th
Thlaspi perfoliatum L. / An. / Th
Turritis glabra L. / P. / H

Campanulaceae
Campanula alliariifolia Willd. / P. / H
Campanula bononiensis L. / P. / H
Campanula sibirica subsp. *hohenackeri* (Fisch. & C.A.Mey.) Damboldt / Bien. / H

Caprifoliaceae
Lonicera iberica M.Bieb. / S. / Ph

Caryophyllaceae
Arenaria serpyllifolia L. / An. / Th
Cerastium argenteum M.Bieb. / Sh. / Ch
Cerastium glutinosum Fr. [*Cerastium pumilum* var. *glutinosum* (Čelak.) E.Rico]
Dianthus crinitus Sm. / P. / H
Dianthus orientalis Adams / Sh. / Ch
Gypsophila elegans M.Bieb. / An. / Th
Herniaria incana Lam. / P. / H
Holosteum marginatum C.A.Mey. / An. / Th
Holosteum umbellatum L. / An. / Th
Kohlrauschia prolifera (L.) Kunth / An. / Th
Minuartia montana subsp. *wiesneri* (Stapf) McNeill / An. / Th
Petrorhagia saxifraga (L.) Link / P. / H
Queria hispanica L. [*Minuartia hamata* (Hausskn.) Mattf.] / An. / Th
Silene conica L. / An. / Th
Silene cyri Schischk. / Bien. / H
Silene italica (L.) Pers. / P. / H
Silene latifolia Poir. (*Melandrium boissieri* Schischk.) / Bien. / H

Cistaceae
Fumana procumbens (Dunal.) Gren. & Godr. / Sh. / Ch
Helianthemum georgicum Jus. & Pozdeeva / Sh. / Ch
Helianthemum ledifolium (L.) Mill. / Sh. / Ch
Helianthemum nummularium (L.) Mill. / Sh. / Ch
Helianthemum salicifolium (L.) Mill. / Sh. / Ch

Convolvulaceae
Convolvulus cantabrica L. / P. / H

Corylaceae
Carpinus orientalis Mill.

Crassulaceae
Sedum hispanicum L. / An. / Th
Sedum maximum subsp. *ruprechtii* (Jalas) Soó [*Sedum caucasicum* (Grossh.) Boriss.] / P. / G
Sedum pallidum M.Bieb. / An. / Th
Sempervivum transcaucasicum Muirhead / P. / H

Dipsacaceae
Scabiosa columbaria L. / P. / H
Scabiosa georgica Sulak. / P. / H
Scabiosa micrantha Desf. / An. / Th

Euphorbiaceae
Euphorbia boissieriana (Woronow) Prokh. / P. / H
Euphorbia seguieriana Neck. / P. / H

Fabaceae (*Leguminosae*)
Anthyllis vulneraria subsp. *boissieri* (Sagorski) Bornm. (*Anthyllis lachnophora* Juz.) / P. / H
Astracantha microcephala (Willd.) Podlech / S./ Ph
Astragalus brachycarpus M.Bieb. / P. / H
Astragalus bungeanus Boiss. / P. / H
Astragalus mollis M.Bieb. / P. / H
Cytisus caucasicus Grossh. [*Chamaecytisus caucasicus* (Grossh.) Holub.; *Cytisus ruthenicus* Wol.] / S. / Ph
Lotus corniculatus L. / P. / H
Medicago caerulea Less. ex Ledeb. / P. / H
Medicago minima (L.) L. / An. / Th
Medicago rigidula (L.) All. / An. / Th
Melilotus neapolitanus Ten. / An. / Th
Onobrychis cyri Grossh. / P. / H
Ononis pusilla L. / P. / H
Securigera orientalis (Mill.) Lassen (*Coronilla orientalis* Mill.) / P. / H
Securigera varia (L.) Lassen (*Coronilla varia* L.) / P. / H
Trifolium ambiguum M.Bieb. / P. / H
Trifolium arvense L. / An. / Th
Trifolium campestre Schreb. / An. / Th
Trifolium tumens M.Bieb. / P. / H

Geraniaceae
Erodium ciconium (L.) L'Hér. / An. / Th
Erodium cicutarium (L.) L'Hér. / An. / Th

Hypericaceae
Hypericum perforatum L. / P. / H

Lamiaceae (*Labiatae*)
Clinopodium acinos (L.) Kuntze [*Thymus acinos* L.; *Acinos arvensis* (Lam.) Dandy; *Acinos thymoides* Moench] / An. / Th
Clinopodium vulgare L. / P. / H
Hyssopus officinalis L. (*Hyssopus angustifolius* M.Bieb.) / Sh. / Ch
Nepeta racemosa Lam. (*Nepeta mussinii* Spreng. ex Henckel) / P. / H
Salvia nemorosa L. / P. / H
Salvia verbascifolia M.Bieb. / P. / H
Salvia verticillata L. / P. / H
Scutellaria orientalis L. / Sh. / Ch
Sideritis montana L. / An. / Th
Stachys atherocalyx K.Koch / P. / H
Stachys iberica M.Bieb. / P. / H
Teucrium nuchense [*T. chamaedris* subsp. *nuchense* (K.Koch) Rech.f.] / Sh. / Ch
Teucrium orientale L. / Sh. / Ch
Teucrium polium L. / Sh. / Ch
Thymus coriifolius Ronniger / Sh. / Ch
Ziziphora clinopodioides Lam. (*Ziziphora serpyllacea* M.Bieb.) / Sh. / Ch

Linaceae
Linum tenuifolium L. / P. / H

Malvaceae
Alcea rugosa Alef. / P. / H

Papaveraceae
Papaver arenarium M.Bieb. / An. / Th
Papaver dubium L. / An. / Th

Plantaginaceae
Linaria simplex Desf. / An. / Th
Plantago lanceolata L. / P. / H
Veronica arvensis L. / An. / Th
Veronica multifida L. / P. / H

Polygonaceae
Atraphaxis caucasica (Hoffm.) Pavlov / S./ Ph
Rumex tuberosus L. / P. / G

Ranunculaceae
Adonis flammea Jacq. / An. / Th
Ranunculus illyricus L. / P. / G
Thalictrum collinum Wallr. / P. / H

Resedaceae
Reseda lutea L.

Rhamnaceae
Paliurus spina-christi Mill. / S. / Ph
Rhamnus pallasii Fisch. & C.A. Mey / S. / Ph

Rosaceae
Agrimonia eupatoria L. / P. / H
Alchemilla sericata Rchb. ex Buser / P. / H
Cotoneaster morulus Pojark. / S. / Ph
Cotoneaster racemiflorus (Desf.) K.Koch / S. / Ph
Crataegus kyrtostyla Fingerh. / S./ Ph

Crataegus meyeri Pojark / S. / Ph
Fragaria vesca L. / P. / H
Fragaria viridis Weston / P. / H
Potentilla argentea L. / P. / H
Potentilla humifusa Willd. ex Schltdl. (*Potentilla adenophylla* Boiss.) / P. / H
Potentilla recta L. / P. / H
Prunus incana (Pall.) Batsch [*Cerasus incana* (Pall.) Spach] / S. / Ph
Rosa canina L. / S. / Ph
Rosa spinosissima L. / S. / Ph
Sanguisorba minor subsp. *balearica* (Bourg. ex Nyman) Mu¤oz Garm. & C.Navarro (*Poterium polygamum* Waldst. & Kit.) / P. / H
Spiraea hypericifolia L. / S. / Ph

Rubiaceae
Asperula arvensis L. / An. / Th
Asperula glomerata (M.Bieb.) Griseb. / P. / H
Asperula prostrata (Adams.) K.Koch / P. / H
Crucianella angustifolia L. / An. / Th
Cruciata pedemontana (Bellardi) Ehrend. / An. / Th
Galium album Mill. / P. / H
Galium humifusum M.Bieb. [*Asperula humifusa* (M.Bieb.) Besser] / P. / H
Galium verum L. / P. / H

Santalaceae
Thesium arvense Horv. / P. / H

Scrophulariaceae
Verbascum formosum Fisch. ex Schrank / Bien. / H
Verbascum orientale (L.) All. (*Celsia orientalis* L.) / An. / Th

Violaceae
Viola kitaibeliana Schult. / An. / Th

MONOCOTYLEDONEAE
Amaryllidaceae (*Alliaceae*)
Allium atroviolaceum Boiss. / P. / G
Allium gramineum K.Koch / P. / G
Allium pseudoflavum Vved. / P. / G
Allium rotundum L. / P. / G

Asparagaceae (*Hyacinthaceae*)
Bellevalia speciosa Woronow ex Grossh. / P. / G
Muscari szovitsianum Baker / P. / G

Cyperaceae
Carex humilis Leyss. / P. / H
Carex liparocarpos subsp. *bordzilowskii* (V.I.Krecz.) T.V.Egorova / P. / H

Iridaceae
Iris caucasica Steven (*Iris caucasica* Hoffm.) / P. / G

Liliaceae
Gagea chlorantha (M.BIeb.) Schult. & Shult.f. / P. / G
Gagea tenuifolia (Boiss.) Fomin / P. / G

Poaceae (*Graminae*)
Agropyron cristatum (L.) Gaertn. / P. / H
Bothriochloa ischaemum (L.) Keng / P. / H

Bromus biebersteinii Roem. & Schult. / P. / H
Bromus japonicus Thunb. / An. / Th
Bromus squarrosus L. / An. / Th
Cleistogenes serotina (L.) Keng / P. / H
Dactylis glomerata L. / P. / H
Elymus repens (L.) Gould / P. / G
Festuca valesiaca Schleich. ex Gaudin / P. / H
Koeleria macrantha (Ledeb.) Schult. [*Aira macrantha* Ledeb; *Aira cristata* L.; *Koeleria cristata* (L.) Pers.] / P. / H
Lolium rigidum Gaudin / An. / Th
Melica transsilvanica Schur / P. / H
Phleum phleoides (L.) H.Karst. / P. / H
Poa angustifolia L. / P. / H
Poa bulbosa subsp. *vivipara* (Koeler) Arcang. / P. / G
Psilurus incurvus (Gouan) Schinz & Thell. / An. / Th
Stipa arabica Trin. & Rupr. / P. / H
Stipa capillata L. / P. / H

Conclusion

Plant communities of small-headed milk-vetch formation (Astracantheta microcephalae) in Tbilisi environs are fragmentary distributed. Their altitudinal range is from foothills to middle mountain belt (800 to 1400 m a.s.l.). They are developed on slopes with various exposure and inclination, on the cinnamonic skeletal soils. Not rare surface of soils are covered with stones. Sometimes soil is not formed and substrate is presented with bare mother rocks and its scree.

In Tbilisi environs tragacanthic plant communities of Astracantha microcephala mostly are secondary origin and derived as a result of digressive successions of oak forest (Querceta iberici). Primary plant communities are rare.

Typological composition of formation is poor. 3 plant communities were identified in Tbilisi environs by us: (1) Astragaletum graminoso-mixtoherbosum, (2) Astragaletum festucosum valesiaci and (3) Astracantheto-Paliuroso-Rhamnosum. The first plant community is comparatively widespread and presented by different variants. The rest plant communities are rare and have local distribution area.

In the phytocenological structure of plant communities 2 layer are expressed: I layer - shrubbery stratum, II layer – grass cover. Moss and lichen cover is not always developed. Average height of shrubbery stratum vary in (20)30-80(120) cm (mostly in 40-50 cm) and density of canopy from (20)30-35% to 45-50%. Layer structure in several cases is not expressed.

Floristic composition is rich – 200 species of vascular plants, which belong to 38 families and 133 genera, were recorded. In the floristic spectrum leading families are: 1. *Asteraceae* - 27 species (13,5%%), 2. *Fabaceae* – 19 (9,5%), 3. *Poaceae* – 18 (9%), 4. *Caryophyllaceae* – 17 (8,5%), 5-6. *Lamiaceae* and *Rosaceae* – 16-16 (8-8%), 7. *Brassicaceae* – 12 (6%), 8. *Rubiaceae* – 8 (4%), 9. *Apiaceae* – 7 (3,5%), 10. *Cistaceae* – 5 (2,5%).

Herbs are basic of floristic composition (169 species – 84,5%) and woody and semi-woody plants are few (accordingly, 16 species – 8% and 14 – 7,5%). The life form spectrum is as follows: hemicryptophytes (including biennials) – 99 species (49,5%), therophytes – 55 (27,5%), phanerophytes – 16 (8/%), chamaephytes – 15 (7,5%), geophytes – 15 (7,5%).

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