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# Tragacanthic plant communities of Caucasian milk-vetch [*Astracantha caucasica* (Pall.) Podlech] in Tbilisi environs

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## ABSTRACT

Tragacanthic plant communities of Caucasian milk-vetch (*Astracantha caucasica*) of Tbilisi environs are studied for the first time. *Astracantha caucasica* fragmentary spread in Tbilisi environs. Its populations in many cases are not numerous. *A. caucasica* grows on skeleton soils and rocky ecotopes. In Tbilisi environs altitudinal range of *A. caucasica* is from foothills to middle mountain belt (400 to 1000 m a.s.l.). Plant communities of *A. caucasica* in Tbilisi environs were discovered on the foothills of Ialno ridge in the vicinities of village Martkopi. They are secondary origin. They are derived as a result of digressive successions of oak forest (*Querceta iberici*). Typological composition is poor. 2 plant communities were identified by us: (1) *Astragaletum* graminomixtoherbosum and (2) *Astragaletum* bothriochloosum. Phytocoenological characteristics of plant communities are presented. Principal 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. 63 species of vascular plants, which belongs to 23 families and 57 genera, were recorded. In the floristic spectrum leading families are: *Poaceae* – 12 species (19.1%), *Fabaceae* – 8 (12.7%), *Labiatae* – 8 (12.7%), *Asteraceae* – 7 (11.2%) and *Rosaceae* – 7 (11.2%). The life form spectrum is as follows: hemicryptophytes (including biennials) – 79.9%, phanerophytes – 7.9%, chamaephytes – 7.9%, therophytes – 3.2%, geophytes – 1.6%.

**Keywords:** *Astracantha caucasica*, Plant community, Phytosociological characteristics, Floristic composition, Life form, Tragacanthic plant.

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## Introduction

Tragacanthic shrubberies in Tbilisi environs do not belong to characteristic vegetation. But with its original phytosociological structure take distinguished position in the vegetation cover of Tbilisi surroundings.

Tragacanthic shrubberies in Tbilisi environs are represented by 3 formations: (1) small-headed milk-vetch formation (*Astracantheta microcephalae*), (2) Caucasian milk-vetch formation (*Astracantheta caucasici*) and (3) Tana's milk-vetch formation (*Astragaleta tanae*) [1-3]. Their plant communities are fragmentary distributed and are inserted in the area of various vegetations. From them the first formation is comparatively widespread. Plant communities of other formations have local distributed area.

Phytosociological structure, floristic composition and distributed regularities of small-headed milk-vetch formation (*Astracantheta microcephalae*) of Tbilisi environs are given in article by Lachashvili and Khetsuriani [3] and literary data about of rest formations are not.

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

## Objectives and Methods

The object of research is Caucasian milk-vetch tragacanthic shrubbery of Tbilisi environs.

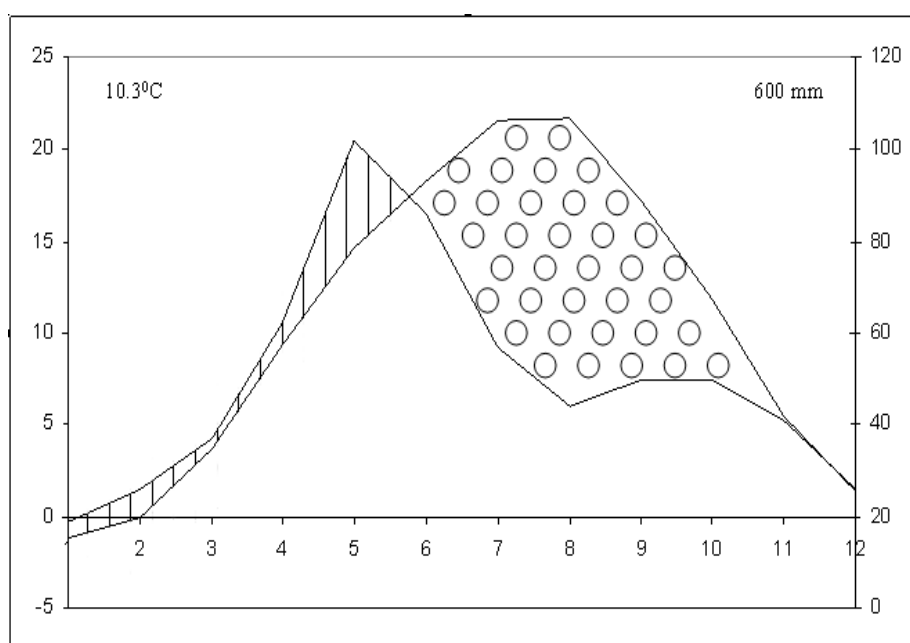
Phytosociological data was obtained by the route method. Geo-botanical surveys were carrying out on 25 m<sup>2</sup> plots. Number of species was quantifying on 1 m<sup>2</sup> plots also. During the geo-botanical surveys, studying the structure of plant communities and identification of syntaxa, we were guided by the traditional geo-botanical methods [4-10]. 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 [11] and I. Serebriakov classifications [12]. Soil types are founded on the modern classifications [13-15].

## Results and Analysis

### *I. Distributed area and short physical-geographical characteristics*

Caucasian milk-vetch formation (*Astracantha caucasici*) in Tbilisi surroundings is rare and is not appertaining to characteristic and widespread formations. Its plant communities have local distribution area. They are locally spread only in the surroundings of vil. Martkopi on the foothills of Ialno ridge, 900-950 m a.s.l. Territory is located in moderately humid climate zone with moderately warm long summer and moderately cold snowy winter; average annual temperature is 10.3°C, mean annual precipitation – 600 mm, precipitation-evaporation ratio – within the range 1 [16-18]. Climagraph (Fig. 1) is built according to the data of Martkopi meteo station is given below [19, 20]. Plant communities are formed on the skeletal cinnamonic soils.



**Fig. 1.** Climagraph of study area

### *II. Typological composition and geo-botanical characteristic*

Tragacanthic shrubberies of Caucasian milk-vetch (*Astracantha caucasica*) in Tbilisi environs are not distinguished by typological variety. Within the formation 2 plant communities were identified by us. They are: (1) *Astracanthetum graminoso-mixtoherbosum* and (2) *Astracanthetum bothriochloosum*. From them the second plant community is main.

Consolidated geo-botanical tables, which include main phytosociological characteristics, are given below.

**Abbreviations:**

m – Meter

cm – Centimeter

s. – Specimen

E – East

N – North

S – South

W – West

Th – Therophyte

H – Hemicryptophyte

G – Geophyte

Ch – Chamaephyte

Ph – Phanerophyte

**Table 1.** *Astragaletum gramino-mixtoherbosum*

|                                              |                                |
|----------------------------------------------|--------------------------------|
| <b>Exposure (macro)</b>                      | N                              |
| <b>Exposure (micro)</b>                      | N                              |
| <b>Inclination</b>                           | 30°                            |
| <b>General projective coverage (%)</b>       | 90-95                          |
| <b>Sodding degree (%)</b>                    | 15-20                          |
| <b>Shrubs</b>                                |                                |
| <b>Projective coverage (%)</b>               | 45-47                          |
| <b>Distribution</b>                          | More or less evenly            |
| <b>Average height (cm)</b>                   | 25-27                          |
| <b>Maximum height (cm)</b>                   | 35                             |
| <b>Grass cover</b>                           |                                |
| <b>Projective coverage (%)</b>               | 60-65                          |
| <b>Distribution</b>                          | evenly                         |
| <b>Average height (cm)</b>                   | 25-30                          |
| <b>Maximum height (cm)</b>                   | 80-90                          |
| <b>Species richness</b>                      |                                |
| <b>Species richness - 1 m<sup>2</sup></b>    | 16.8                           |
| <b>Species richness - 25 m<sup>2</sup></b>   | 35                             |
| <b>Floristic composition</b>                 |                                |
| <b>Species</b>                               | <b>Projective coverage (%)</b> |
| <b>Shrubs and trees (Ph)</b>                 |                                |
| <i>Astracantha caucasica</i>                 | 45-47                          |
| <i>Carpinus orientalis</i>                   | +                              |
| <i>Cotoneaster saxatilis</i>                 | +                              |
| <i>Quercus petraea</i> subsp. <i>iberica</i> | + (2 growing individes)        |
| <i>Ulmus minor</i>                           | + (1 growing individe)         |

|                                               |          |
|-----------------------------------------------|----------|
| <b>Semishrubs &amp; dwarf semishrubs (Ch)</b> |          |
| <i>Fumana procumbens</i>                      | +        |
| <i>Scutellaria orientalis</i>                 | +        |
| <i>Teucrium nuchense</i>                      | 3-4      |
| <i>Teucrium polium</i>                        | 1        |
| <i>Thymus coriifolius</i>                     | +        |
| <b>Perennial herbs (H)</b>                    |          |
| <i>Achillea setacea</i>                       | +        |
| <i>Agrimonia eupatoria</i>                    | +        |
| <i>Astragalus brachycarpus</i>                | +        |
| <i>Bothriochloa ischaemum</i>                 | +        |
| <i>Brachypodium pinnatum</i>                  | 20       |
| <i>Briza media</i>                            | 5        |
| <i>Calamagrostis epigejos</i>                 | 7        |
| <i>Carex humilis</i>                          | 25       |
| <i>Centaurea ovina</i>                        | 1        |
| <i>Convolvulus arvensis</i>                   | + (1 s.) |
| <i>Securigera varia</i>                       | +        |
| <i>Dactylis glomerata</i>                     | +        |
| <i>Dorycnium herbaceum</i>                    | 1        |
| <i>Echinops sphaerocephalus</i>               | + (1 s.) |
| <i>Echium rubrum</i>                          | +        |
| <i>Elytrigia intermedium</i>                  | +        |
| <i>Eryngium campestre</i>                     | +        |
| <i>Falcaria vulgaris</i>                      | +        |
| <i>Filipendula vulgaris</i>                   | +        |
| <i>Fragaria viridis</i>                       | +        |
| <i>Galium verum</i>                           | 1-2      |
| <i>Hypericum perforatum</i>                   | +        |
| <i>Inula aspera</i>                           | +        |
| <i>Jurinea blanda</i>                         | +        |
| <i>Koeleria macrantha</i>                     | +        |
| <i>Lotus caucasicus</i>                       | 3-4      |
| <i>Medicago caerulea</i>                      | 3-4      |
| <i>Origanum vulgare</i>                       | +        |
| <i>Phleum pratense</i>                        | +        |
| <i>Plantago lanceolata</i>                    | 2-3      |
| <i>Potentilla humifusa</i>                    | +        |
| <i>Potentilla recta</i>                       | +        |
| <i>Salvia nemorosa</i>                        | +        |
| <i>Salvia verticillata</i>                    | 1-2      |
| <i>Scabiosa columbaria</i>                    | 3-4      |

|                             |   |
|-----------------------------|---|
| <i>Stachys atherocalyx</i>  | + |
| <i>Stipa capillata</i>      | + |
| <i>Thalictrum minus</i>     | + |
| <i>Tragopogon serotinus</i> | + |
| <i>Trifolium ambiguum</i>   | + |
| <b>Perennial herbs (G)</b>  |   |
| <i>Allium pseudoflavum</i>  | + |
| <b>Annual plants (TH)</b>   |   |
| <i>Filago pyramidata</i>    | + |
| <i>Centaurium erythraea</i> | + |

**Table 2.** *Astragaletum bothriochloosum*

|                                               |                                |                     |                     |                     |                     |
|-----------------------------------------------|--------------------------------|---------------------|---------------------|---------------------|---------------------|
| <b>Surveys</b>                                | 1                              | 2                   | 3                   | 4                   | 5                   |
| <b>Exposure (macro)</b>                       | S                              | S                   | S                   | S                   | S                   |
| <b>Exposure (micro)</b>                       | S-E, S-W                       | S                   | S                   | S                   | S                   |
| <b>Inclination</b>                            | 5                              | 20                  | 15-17               | 18-20               | 16-18               |
| <b>General projective coverage (%)</b>        | 70                             | 70                  | 60                  | 65                  | 75                  |
| <b>Sodding degree (%)</b>                     | 15                             | 20                  | 20                  | 18-20               | 17-18               |
| <b>Shrubs</b>                                 |                                |                     |                     |                     |                     |
| <b>Projective coverage (%)</b>                | 45-50                          | 50                  | 35-40               | 40                  | 40-45               |
| <b>Distribution</b>                           | More or less evenly            | More or less evenly | More or less evenly | More or less evenly | More or less evenly |
| <b>Average height (cm)</b>                    | 22-27                          | 25-30               | 20                  | 25-30               | 25                  |
| <b>Maximum height (cm)</b>                    | 35                             | 35                  | 30                  | 35                  | 35                  |
| <b>Grass cover</b>                            |                                |                     |                     |                     |                     |
| <b>Projective coverage (%)</b>                | 60                             | 60-65               | 60                  | 60-65               | 60                  |
| <b>Distribution</b>                           | evenly                         | evenly              | evenly              | evenly              | evenly              |
| <b>Average height (cm)</b>                    | 10-15                          | 10                  | 10                  | 10                  | 12-15               |
| <b>Maximum height (cm)</b>                    | 60-80                          | 60-80               | 60-80               | 70-80               | 70-75               |
| <b>Species richness</b>                       |                                |                     |                     |                     |                     |
| <b>Species richness - 1 m<sup>2</sup></b>     | 15                             | 11                  | 14                  | 12                  | 13                  |
| <b>Species richness - 25 m<sup>2</sup></b>    | 24                             | 22                  | 26                  | 25                  | 26                  |
| <b>Floristic composition</b>                  |                                |                     |                     |                     |                     |
| <b>Species</b>                                | <b>Projective coverage (%)</b> |                     |                     |                     |                     |
| <b>Shrubs (Ph)</b>                            |                                |                     |                     |                     |                     |
| <i>Astracantha caucasica</i>                  | 50                             | 50                  | 35-40               | 40-45               | 40-45               |
| <b>Semishrubs &amp; dwarf semishrubs (Ch)</b> |                                |                     |                     |                     |                     |
| <i>Fumana procumbens</i>                      | +                              | -                   | -                   | +                   | -                   |
| <i>Scutellaria orientalis</i>                 | 5                              | -                   | 8-10                | +                   | +                   |

|                                                     |     |         |         |       |       |
|-----------------------------------------------------|-----|---------|---------|-------|-------|
| <i>Teucrium nuchense</i>                            | +   | 1       | 1       | +     | 1     |
| <i>Teucrium polium</i>                              | 2-3 | 5       | 3       | 3-4   | 4-5   |
| <i>Thymus coriifolius</i>                           | 2-3 | 2-3     | 3-4     | 3-4   | 4     |
| <b>Perennial herbs (H)</b>                          |     |         |         |       |       |
| <i>Astragalus brachycarpus</i>                      | +   | +       | +       | +     | +     |
| <i>Bothriochloa ischaemum</i>                       | 40  | 35      | 25      | 25-27 | 23-25 |
| <i>Campanula sibirica</i> subsp. <i>hohenackeri</i> | -   | -       | +       | +     | -     |
| <i>Carex humilis</i>                                | 5-7 | 4-5     | 10      | 6-7   | 5-6   |
| <i>Centaurea ovina</i>                              | +   | +       | -       | +     | +     |
| <i>Convolvulus lineatus</i>                         | -   | -       | +       | -     | -     |
| <i>Cynodon dactylon</i>                             | +   | -       | -       | -     | -     |
| <i>Dorycnium herbaceum</i>                          | +   | 2-3     | 8       | 1-2   | 3     |
| <i>Echium rubrum</i>                                | -   | -       | +       | -     | +     |
| <i>Eryngium campestre</i>                           | -   | +       | +       | +     | +     |
| <i>Falcaria vulgaris</i>                            | -   | -       | 1-2     | -     | +     |
| <i>Festuca pratensis</i>                            | -   | +       | -       | -     | -     |
| <i>Festuca valesiaca</i>                            | 2-3 | 9-10    | -       | 3     | 3-4   |
| <i>Galium humifusum</i>                             | -   | +(1 s.) | -       | -     | -     |
| <i>Galium verum</i>                                 | +   | -       | +       | -     | +     |
| <i>Inula aspera</i>                                 | -   | +(1 s.) | -       | -     | +     |
| <i>Jurinea blanda</i>                               | -   | -       | +       | +     | -     |
| <i>Linum tenuifolium</i>                            | +   | +       | 1-2     | +     | +     |
| <i>Lotus caucasicus</i>                             | +   | 2-3     | 1-2     | 1     | +     |
| <i>Medicago caerulea</i>                            | 3   | 8       | 1-2     | 3-4   | 4-5   |
| <i>Ononis pusilla</i>                               | -   | -       | +       | -     | -     |
| <i>Plantago lanceolata</i>                          | +   | -       | 1-2     | +     | +     |
| <i>Polygala transcaucasica</i>                      | -   | +(1 s.) | +(1 s.) | -     | -     |
| <i>Potentilla humifusa</i>                          | 5   | 2-3     | 8       | 4-5   | 3-4   |
| <i>Salvia nemorosa</i>                              | -   | +(1 s.) | -       | +     | +     |
| <i>Salvia verticillata</i>                          | +   | -       | +       | +     | -     |
| <i>Sanguisorba minor</i> subsp. <i>balearica</i>    | -   | +       | -       | +     | -     |
| <i>Scabiosa columbaria</i>                          | 3   | -       | +       | +     | 1     |
| <i>Stachys atherocalyx</i>                          | +   | +       | -       | -     | +     |
| <i>Stipa capillata</i>                              | +   | +       | -       | +     | +     |
| <i>Tragopogon serotinus</i>                         | +   | -       | +       | -     | +     |

Plant communities of *A. caucasica* in Tbilisi environs are secondary origin. 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 [21, 22]. Participation of characteristic species of forest vegetation (*Quercus petraea* subsp. *iberica*, *Carpinus orientalis*, *Ulmus minor*, *Carex humilis*, *Brachypodium pinnatum*) indicates

on this. In this regard participation of some mesophilic plants (*Briza media*, *Calamagrostis epigejos*, *Trifolium ambiguum*) is also interesting.

It is important that weeds almost do not participate in the plant communities.

### III. Floristic composition

63 species of vascular plants, which belong to 23 families and 57 genera, were recorded. All species belong to angiosperms. From them dominants are dicotyledons (49 species / 77.8%).

Number of species is disproportionally distributed by families. Most of families (15 families) are represented by only one species and 3 families contain 2 species each. Share of 1-5 leading families accounts 66.7% (42 species) of the total number of species (Fig. 2).

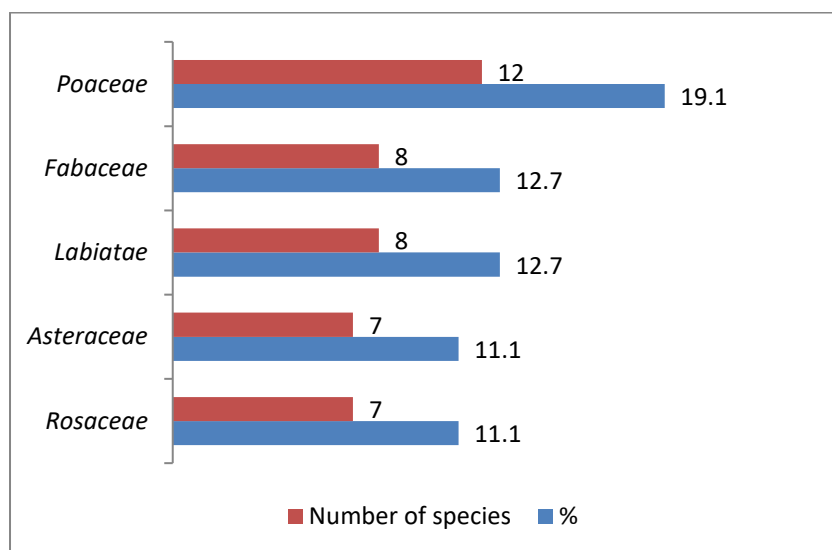


Fig. 2. Number of species by the leading families

The same families dominate by content number of genera, though more or less different sequence, are observed (Fig. 3).

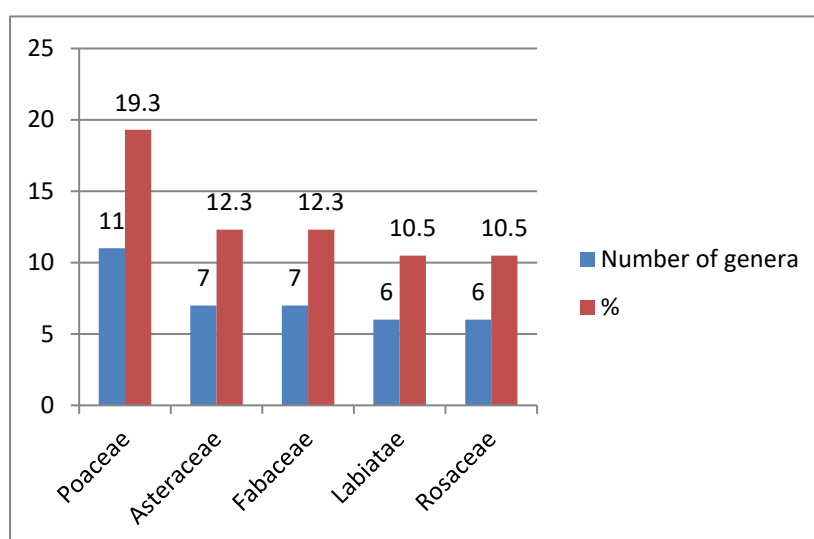


Fig. 3. Number of genera by the leading families

Among genera are not leading genera; they are represented by 1-2 species.

Full list of recorded plants is given below (Table 3). For each species life forms [11, 12] are indicated.

**Table 3.** List of floristic composition

| Family                       | Species                                                             | Life form       |                            |
|------------------------------|---------------------------------------------------------------------|-----------------|----------------------------|
| ANGIOSPERMAE                 |                                                                     |                 |                            |
| DYCOTYLEDONEAE               |                                                                     |                 |                            |
| Apiaceae                     | Eryngium campestre L.                                               | Hemicryptophyte | Perennial herb             |
|                              | Falcaria vulgaris Bernh.                                            | Hemicryptophyte | Biennial or perennial herb |
| Asteraceae (Compositae)      | Achillea setacea Waldst. & Kit.                                     | Hemicryptophyte | Perennial herb             |
|                              | Centaurea ovina Pall. ex Willd.                                     | Hemicryptophyte | Perennial herb             |
|                              | Echinops sphaerocephalus L.                                         | Hemicryptophyte | Perennial herb             |
|                              | Filago pyramidata L.                                                | Therophyte      | Annual                     |
|                              | Inula aspera Poir.                                                  | Hemicryptophyte | Perennial herb             |
|                              | Jurinea blanda (M.Bieb.) C.A.Mey.                                   | Hemicryptophyte | Perennial herb             |
|                              | Tragopogon serotinus Sosn.                                          | Hemicryptophyte | Perennial herb             |
| Boraginaceae                 | Echium rubrum Forssk.                                               | Hemicryptophyte | Perennial herb             |
| Campanulaceae                | Campanula sibirica subsp. hohenackeri (Fisch. & C.A.Mey.) Damboldt  | Hemicryptophyte | Biennial                   |
| Cistaceae                    | Fumana procumbens (Dunal) Gren. & Godr.                             | Chamaephyte     | Dwart semi-shrub           |
| Convolvulaceae               | Convolvulus arvensis L.                                             | Hemicryptophyte | Perennial herb             |
|                              | Convolvulus lineatus L.                                             | Hemicryptophyte | Perennial herb             |
| Corylaceae (Betulaceae)      | Carpinus orientalis Mill.                                           | Phanerophyte    | Shrub                      |
| Dipsacaceae (Caprifoliaceae) | Scabiosa columbaria L.                                              |                 | Perennial herb             |
| Fabaceae (Leguminosae)       | Astracantha caucasica (Pall.) Podlech (Astragalus caucasicus Pall.) | Phanerophyte    | Shrub                      |
|                              | Astragalus brachycarpus M.Bieb.                                     | Hemicryptophyte | Perennial herb             |
|                              | Securigera varia (L.) Lassen (Coronilla varia L.)                   | Hemicryptophyte | Perennial herb             |
|                              | Dorycnium herbaceum Villar                                          | Hemicryptophyte | Perennial herb             |
|                              | Lotus caucasicus Kuprian.                                           | Hemicryptophyte | Perennial herb             |
|                              | Medicago caerulea Less. ex Ledeb.                                   | Hemicryptophyte | Perennial herb             |
|                              | Ononis pusilla L.                                                   | Hemicryptophyte | Perennial herb             |
|                              | Trifolium ambiguum M.Bieb.                                          | Hemicryptophyte | Perennial herb             |
| Fagaceae                     | Quercus petraea subsp. iberica (Steven ex M.Bieb.) Krassiln.        | Phanerophyte    | Tree                       |
| Gentianaceae                 | Centaureum erythraea Rafn                                           | Therophyte      | Annual                     |
| Hypericaceae                 | Hypericum perforatum L.                                             | Hemicryptophyte | Perennial herb             |
| Lamiaceae (Labiatae)         | Origanum vulgare L.                                                 | Hemicryptophyte | Perennial herb             |
|                              | Salvia nemorosa L.                                                  | Hemicryptophyte | Perennial herb             |
|                              | Salvia verticillata L.                                              | Hemicryptophyte | Perennial herb             |

|                            |                                                                                                                                               |                 |                  |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
|                            | <i>Stachys atherocalyx</i> K.Koch                                                                                                             | Hemicryptophyte | Perennial herb   |
|                            | <i>Scutellaria orientalis</i> L.                                                                                                              | Chamaephyte     | Dwart semi-shrub |
|                            | <i>Teucrium nuchense</i> K.Koch<br>[ <i>Teucrium chamaedrys</i> subsp.<br><i>nuchense</i> (K.Koch) Rech. f.]                                  | Chamaephyte     | Dwart semi-shrub |
|                            | <i>Teucrium polium</i> L.                                                                                                                     | Chamaephyte     | Dwart semi-shrub |
|                            | <i>Thymus coriifolius</i> Ronniger                                                                                                            | Chamaephyte     | Dwart semi-shrub |
| <b>Linaceae</b>            | <i>Linum tenuifolium</i> L.                                                                                                                   | Hemicryptophyte | Perennial herb   |
| <b>Plantaginaceae</b>      | <i>Plantago lanceolata</i> L.                                                                                                                 | Hemicryptophyte | Perennial herb   |
| <b>Polygalaceae</b>        | <i>Polygala transcaucasica</i><br>Tamamsch.                                                                                                   | Hemicryptophyte | Perennial herb   |
| <b>Ranunculaceae</b>       | <i>Thalictrum minus</i> L.                                                                                                                    | Hemicryptophyte | Perennial herb   |
| <b>Rosaceae</b>            | <i>Agrimonia eupatoria</i> L.                                                                                                                 | Hemicryptophyte | Perennial herb   |
|                            | <i>Cotoneaster saxatilis</i> Pojark.                                                                                                          | Phanerophyte    | Shrub            |
|                            | <i>Filipendula vulgaris</i> Moench                                                                                                            | Hemicryptophyte | Perennial herb   |
|                            | <i>Fragaria viridis</i> Weston                                                                                                                | Hemicryptophyte | Perennial herb   |
|                            | <i>Potentilla humifusa</i> Willd.<br>( <i>Potentilla adenophylla</i> Boiss. &<br>Hohen.)                                                      | Hemicryptophyte | Perennial herb   |
|                            | <i>Potentilla recta</i> L.                                                                                                                    | Hemicryptophyte | Perennial herb   |
|                            | <i>Sanguisorba minor</i> subsp.<br><i>balearica</i> (Nyman) Muñoz Garm.<br>& C. Navarro ( <i>Poterium</i><br><i>polygamum</i> Waldst. & Kit.) | Hemicryptophyte | Perennial herb   |
| <b>Rubiaceae</b>           | <i>Galium humifusum</i> M.Bieb.                                                                                                               | Hemicryptophyte | Perennial herb   |
|                            | <i>Galium verum</i> L.                                                                                                                        | Hemicryptophyte | Perennial herb   |
| <b>Ulmaceae</b>            | <i>Ulmus minor</i> Mill.                                                                                                                      | Phanerophyte    | Tree             |
| <b>MONOCOTYLEDONEAE</b>    |                                                                                                                                               |                 |                  |
| <b>Amaryllidaceae</b>      | <i>Allium pseudoflavum</i> Vved.                                                                                                              | Geophyte        | Perennial herb   |
| <b>Cyperaceae</b>          | <i>Carex humilis</i> Leyss.                                                                                                                   | Hemicryptophyte | Perennial herb   |
| <b>Poaceae (Gramineae)</b> | <i>Bothriochloa ischaemum</i> (L.)<br>Keng                                                                                                    | Hemicryptophyte | Perennial herb   |
|                            | <i>Brachypodium pinnatum</i> (L.)<br>P.Beauv.                                                                                                 | Hemicryptophyte | Perennial herb   |
|                            | <i>Briza media</i> L.                                                                                                                         | Hemicryptophyte | Perennial herb   |
|                            | <i>Calamagrostis epigejos</i> (L.) Roth                                                                                                       | Hemicryptophyte | Perennial herb   |
|                            | <i>Cynodon dactylon</i> (L.) Pers.                                                                                                            | Hemicryptophyte | Perennial herb   |
|                            | <i>Dactylis glomerata</i> L.                                                                                                                  | Hemicryptophyte | Perennial herb   |
|                            | <i>Elytrigia intermedia</i> (Host) Nevski                                                                                                     | Hemicryptophyte | Perennial herb   |
|                            | <i>Festuca pratensis</i> Huds.                                                                                                                | Hemicryptophyte | Perennial herb   |
|                            | <i>Festuca valesiaca</i> Gaudin                                                                                                               | Hemicryptophyte | Perennial herb   |
|                            | <i>Koeleria macrantha</i> (Ledeb.)<br>Schult.                                                                                                 | Hemicryptophyte | Perennial herb   |
|                            | <i>Phleum pratense</i> L.                                                                                                                     | Hemicryptophyte | Perennial herb   |
|                            | <i>Stipa capillata</i> L.                                                                                                                     | Hemicryptophyte | Perennial herb   |

#### IV. Life forms

Herbs are basic of floristic composition (53 species / 84.1%) and woody and semi-woody plants are few (5 species each / 7.9% each). Except of *Astracantha caucasica* no one of woody plants belong to characteristic species. They were recorded only in one plant community. In contrast with them, frequency of occurrence of semi-woody plants (*Teucrium polium*, *T. nuchense*, *Scutellaria orientalis*, *Thymus coriifolius* and *Fumana procumbens*) is high and they belong to characteristic species of plant communities. The core of the floristic composition consists of hemicryptophytes (Fig. 2). Among them characteristic species are: *Bothriochloa ischaemum*, *Carex humilis*, *Astragalus brachycarpus*, *Centaurea ovina*, *Dorycnium herbaceum*, *Eryngium campestre*, *Festuca valesiaca*, *Linum tenuifolium*, *Lotus caucasicus*, *Medicago caerulea*, *Plantago lanceolata*, *Potentilla humifusa*, *Stipa capillata*, *Scabiosa columbaria*. Role of therophytes and geophytes is insignificant.

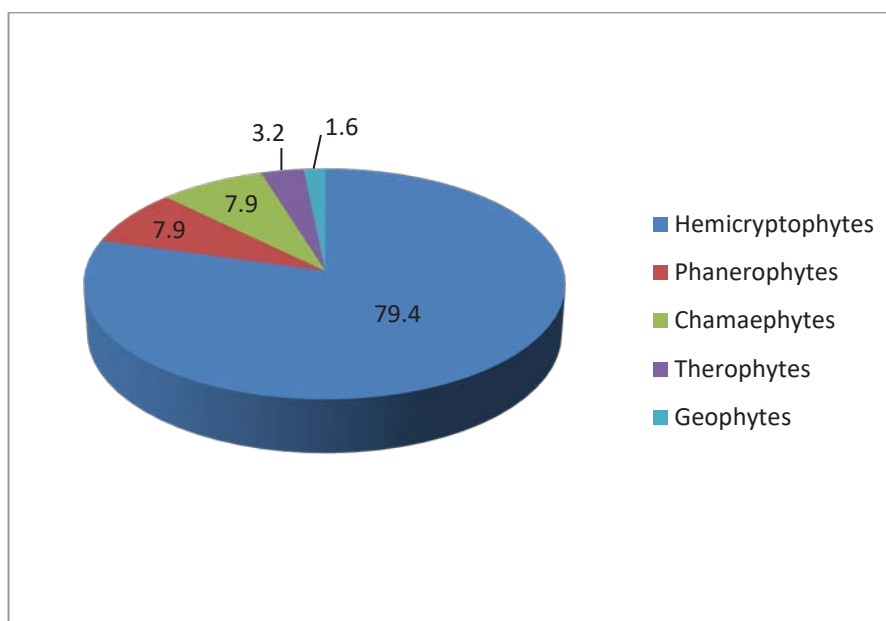


Fig. 4. Proportion (%) of life forms

#### Conclusion

Plant communities of Caucasian milk-vetch formation (*Astracantha microcephalae*) in Tbilisi environs have small and local area. They are distributed on the foothills of Ialno ridge in the vicinities of village Martkopi., 900-950 m a.s.l.. Plant communities are developed on slopes with cinnamonic skeletal soils.

In Tbilisi environs tragacanthic plant communities of *Astracantha caucasica* 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. 2 plant communities were identified by us: (1) *Astragaletum gramino-mixtoherbosum* and (2) *Astragaletum bothriochloosum*.

Layer structure is not well expressed: heights of shrubby stratum and grass cover are not sharply delimited. Floristic composition is not rich: 63 species of vascular plants, which belong to 23 families and 57 genera, were recorded. All species belong to angiosperms. From them dominants are dicotyledons (49 species / 77.8%). In the floristic spectrum leading families are: *Poaceae* – 12 species (19.1%), *Fabaceae* – 8 (12.7%), *Labiatae* – 8 (12.7%), *Asteraceae* – 7 (11.2%) and *Rosaceae* – 7 (11.2%). Total share of these leading families is 66.7% (42 species).

Herbs are basic of floristic composition (53 species / 84.1%) and quantity of woody and semi-woody plants is few (5 species each / 7.9% each). The life form spectrum is as follows: hemicryptophytes (including biennials) – 79.9%, phanerophytes – 7.9%, chamaephytes – 7.9%, therophytes – 3.2%, geophytes – 1.6%. Characteristic

species, of which frequency of occurrence is high, belong to chamaephytes and hemicryptophytes. Role of therophytes and geophytes in the structure of plant communities is insignificant.

## References

- [1] N.J. Lachashvili, M.N. Khachidze, L.D. Khetsuriani, N.V. Eradze, Typology and distribution regularities of the vegetation of Tbilisi environs (East Georgia, South Caucasus), *J. Ann. Agrar. Sci.* 13 (3) (2013) 55-62.
- [2] N. Lachashvili, N. Eradze, *Trees and Shrubs of Tbilisi Environs (East Georgia, South Caucasus)*, Universal, Tbilisi, 2017.
- [3] N.J. Lachashvili, L.D. Khetsuriani. Small-headed milk-vetch tragacanthic shrubberies (*Astracantha microcephalae*) in Tbilisi environs. *J. Ann. Agrar. Sci.* 18 (2) (2020) 155-180.
- [4] A.A. Korchagin, Species (floristic) composition of plant communities and the methods of its investigation. In: E.M. Lavrenko, A.A. Korchagin (Eds.), *Field Geobotany, III*, Nauka, Moscow-Leningrad, 1964, pp. 39-62 (in Russian).
- [5] V.M. Ponyatovskaya, Estimation of abundance and distribution of species in natural plant communities. In: E.M. Lavrenko, A.A. Korchagin (Eds.), *Field Geobotany, III*, Nauka, Moscow-Leningrad, 1964, pp. 209-299 (in Russian).
- [6] A.A. Yunatov, The types and the scope of geobotanical investigations, the selection of sample areas and the construction of ecological profiles. In: E.M. Lavrenko, A.A. Korchagin (Eds.), *Field Geobotany, III*, Nauka, Moscow-Leningrad, 1964, pp. 9-36 (in Russian).
- [7] A.P. Shennikov, *Introduction to Geobotany*, Publishing House of the Leningrad University, Leningrad, 1964 (in Russian).
- [8] Braun-Blanquet J., *Pflanzensoziologie. Grundzüge der Vegetationskunde*. 3 Aufl. Springer, Wien, New-York, 1964.
- [9] T.A. Rabotnov, *Phytocenology*, Publishing House of the Moscow University, Moscow, 1983 (in Russian).
- [10] V.Ch. Vasilevich, Concerning methods of vegetation classification. *Bot. Journal*. 70 (12) (1985) 1596-1604 (in Russian).
- [11] C. Raunkiaer, *The Life Form of Plants And Statistical Plant Geography*, Oxford, 1934.
- [12] I. Serebriakov, Life forms of higher plants and their investigation. In: E.M. Lavrenko, A.A. Korchagin (Eds.), *Field Geobotany, III*, Nauka, Moscow-Leningrad, 1964, pp. 146-205 (in Russian).
- [13] T. Urushadze (Ed.), *Soil Map of Georgia, Cartography*, Tbilisi, 1999.
- [14] T.F. Urushadze, V. Blum, *Soils of Georgia, Mtsignobari*, Tbilisi, 2014 (in Russian).
- [15] T. Urushadze, *Soils of Georgia, UNDP Georgia*, Tbilisi, 2016.
- [16] K.V. Kavrishvili, *Physical-Geographical Characteristics of Tbilisi Surroundings*, Metsniereba, Tbilisi, 1964 (in Russian).
- [17] D. Ukleba, *Physical-Geographical Zoning of East Georgia*, Metsniereba, Tbilisi, 1968 (in Georgian).
- [18] G. S. Dzotsenidze (Ed.-in-Chief) *Atlas of Georgian SSR*, 1964, Tbilisi-Moscow (in Russian).
- [19] Loladze, G. M. (ed.) 1967: *Spravochnik po klimatu SSSR 14 – Gruzinskaya SSR*, 2, *Temperatura vozdukha i pochvy*, Leningrad, 1967 (in Russian).
- [20] Loladze, G. M. (ed.) 1970: *Spravochnik po klimatu SSSR 14 – Gruzinskaia SSR*, 4 – *Vlazhnost' vozdukha, atmosferynye osadki, snezhnyi pokrov* – Leningrad (in Russian).
- [21] N. Lachashvili, M. Khachidze, L. khetsuriani, Successions of post-forest vegetation in Tbilisi environs, *Proceedings of National Botanical Garden of Georgia*, 99, Tbilisi (2013) 141-156 (in Georgian).
- [22] N. Lachashvili, M. Khachidze, L. khetsuriani, *Successions of Tbilisi Environs Post-Forest Vegetation*, Universal, Tbilisi, 2015.