Stoyan Stoyanov

The vascular flora of the catchment basin of the river Roussenski Lom (Bulgaria) in the beginning of the 21st century

Abstract

Stoyanov , S.: The vascular flora of the catchment basin of the river Roussenski Lom in the beginning of the 21st century. — Fl. Medit. 15: 351-383. 2005. — ISSN 1120-4052.

This article presents the current state of the vascular flora and phytogeographic relations in the catchment basin of the river Roussenski Lom (lower and middle course). The paper includes: List of flora in the catchment basin of the river Roussenski Lom; Distribution of flora by systematic indication, biological type, origin and eco-geographical relations; Analysis of the distribution of the rare and endemic plants. A historical survey of the floristic investigations in the region is made. In the beginning of the 21st century for the flora in the catchment basin of the river Roussenski Lom are found 877 species distributed in 87 families and 399 genera in the period 1998-2004. The floristic and phytogeographic analysis does not include about 130 species reported in relevant literature only. The species found in this area represent 23, 1 % of the flora of Bulgaria.

Introduction

The river Roussenski Lom is the last right tributary of the Danube River. It is located in the north-eastern part of Bulgaria and flows into the river Danube near the town of Rousse. The studied catchment basin has an area of about 10.000 ha of which 3.400 ha is the area of the Roussenski Lom Nature Park - one of the tenth nature parks in Bulgaria. This park "among the plain" is declared for the protection of characteristic biological diversity, cultural and historical heritage (Fig. 1).

The catchment basin of Roussenski Lom is part of the Ludogorsko-Dobrudja sub-region of the Danube plain. The relief is typical valley - with terraces, steep valley slopes and vast alluvial river beds. There are a lot of characteristic caves, rock niches, sheer cliffs high up to 80 m, and multitude meanders. The altitude of the study area is varies from 40 m to 300 m asl.

As regards climate, the study area is in the Ludogorsko-Dobrudja region of the Temperate-continental region (Nikolova & al. 2002). The climate characterizes with cold winter, hot summer, long, warm and dry autumn. The summer heats follow right after the short cool spring. The mean annual temperature is 11.5 ^{0}C. The mean January temperature

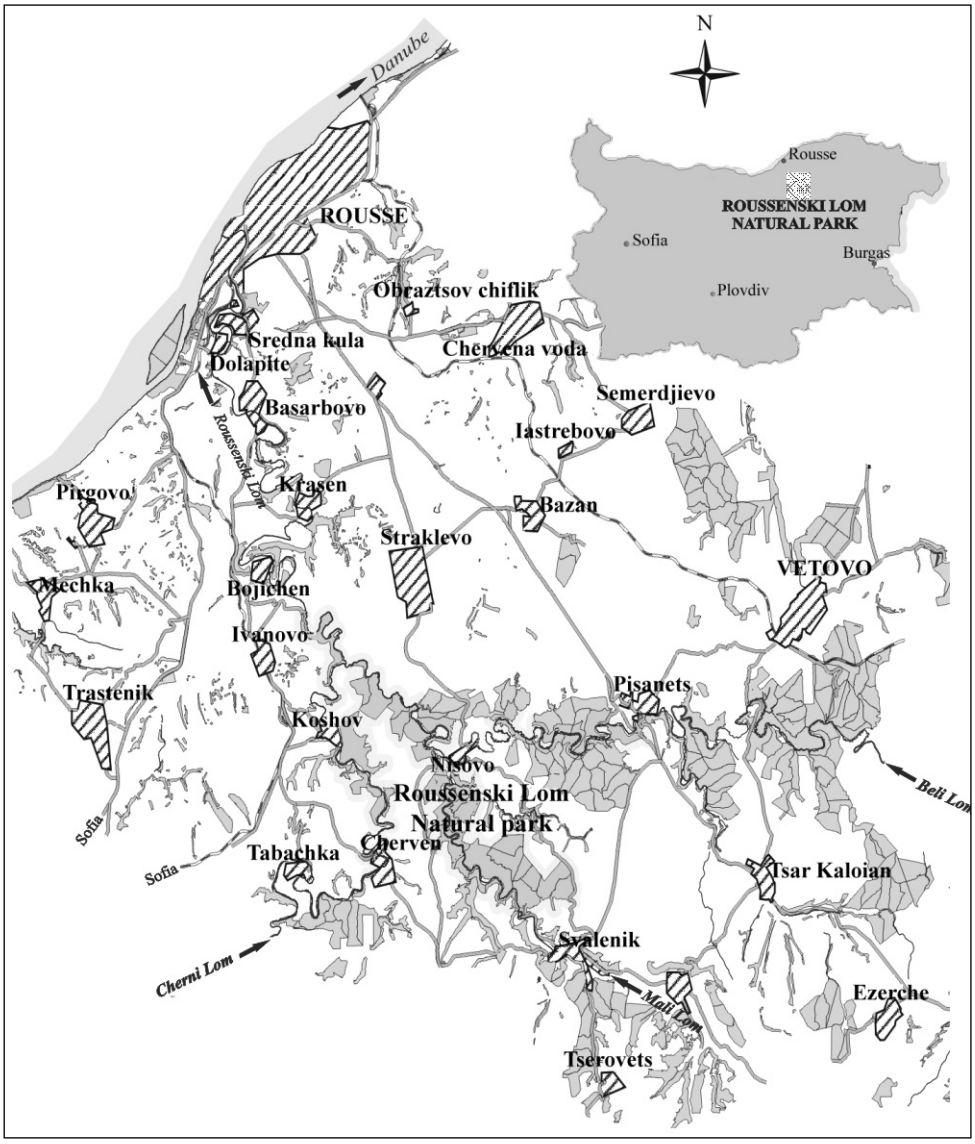

Fig. 1. Location of Roussenski Lom in North-eastern Bulgaria.

is -1.8 ^{0}C and mean July is 24 ^{0}C. The annual rainfall sum is 520-650 mm. The maximum of the rainfall is in June. There are two distinctive minimums - in February and in August. The snow-cover is unstable. The first snow-cover forms in December and the last - in the beginning of April. The average duration of the vegetation period is 8 months.

In the catchment basin of river Roussenski Lom there are varied soil types and sub-types, related to the configuration of the terrain, the climate features, the parent rock and

the vegetation. All the full developed soils in the region are formed over loess and loess clay.

The main soil types, following the FAO classification (FAO 1988), are: black earth (Chernozems) and alluvial soils (Fluvisols). The black earths are presented with two subtypes - leached black earth (Haplic Chernozems) and humus-carbonated (Calcic Chernozems).

The leached black earths are broadly presented and cover the gentle valley slopes. They have a massive humus layer (55-65 cm) and are colonized prevalently by forest formations. The humus-carbonated soils are shallow and with best expressed influence of the limestone base. They are occupied mainly by herbaceous or herbaceous-shrubs formations often open types. They are 5 to 20 cm deep and cover the highest parts of the catchment basin of the river Roussenski Lom. The alluvial soils occupy the waterside terraces of the catchment basin and are a base for the intrazonal vegetation. The distribution of the soil types in the Roussenski Lom valley is given according to Ninov (2002).

Historical survey

One of the earliest studies of the flora of the Rousse region are these of V. Kovačev (1900, 1903), who had visited the Roussenski Lom valley from 1897 to 1902. His report and the list of 787 species (657 witnessed in this study) represent the only one almost complete information about this region for the last 100 years. Kovačev noted an expressed presence of steppe elements in the flora of the Rousse region. According to him the vegetation of the region is a composite of south-Russian, Asian and mid-European elements, and the most numerous among them are the south-Russian steppe elements. He considered that the steppe vegetation had reached the north-east Bulgaria through Ukraine and Romania.

The features and problems of the vegetation cover in North Bulgaria were studied in detail by Daki Jordanov. In his work "On the distribution of steppe vegetation in Bulgaria" (1936) he had made a full review of published on that issue. From all the factors influencing the vegetation character, he considers the climatic one as first-rate. In particular, for the steppe character of the vegetation, determinative is the continental climate. And so is the climate in the cathchment basin of the river Roussenski Lom. According to D. Jordanov, there are remains of the primary type herbaceous-steppe vegetation in a lot of places in Bulgaria, but no fully preserved complexes of it still remain. The preserved small areas are with altered physiognomy and species composition due to grazing and mowing.

In his extensive review on the vegetation of different steppe regions in north Bulgaria D. Jordanov notes that *Andropogon gryllus* L. (=*Chrysopogon gryllus* (L.) Trin.) participates everywhere and in such a degree that the steppes can be called Andropogon gryllus steppes. According to him *Stipa pennata* L. and *Stipa capillata* L. are present on a small scale and even missing in some areas. He presumes that this two species of *Stipa*, which in Bulgaria inhabit almost only rocky and stony terrains, in the past had wider distribution in the plain areas and had greater presence in the composition of the herbaceous vegetation. Andropogon gryllus replaces the two species of *Stipa* in the areas where as a result of grazing and mowing they have reached a regressive distribution.

In "The vegetation of Bulgaria" (Bondev 1991) are presented the main vegetation formations in the catchment basin of river Roussenski Lom. The mixed forests of *Tilia platyphyllos* Scop. with *Carpinus betulus* L., *Quercus cerris* L., *Quercus dalechampi*i Ten., *Acer campestre* L. and others occupy mainly the northern slopes of the hills and very rarely the flat areas. The mixed forests of *Quercus cerris* and *Carpinus orientalis* Mill. are distributed mainly on limestone terrains. They must be considered as secondary or as a stage of the gradual formation of *Carpinus orientalis* forests and shrubs. The *Carpinus orientalis* formation colonizes vast areas in the valley of Roussenski Lom, mainly terrains with thin humus-carbonated soils. In most cases the *Carpinus orientalis* forests had emerged on the place of *Quercus pubescens* Willd. and *Quercus cerris* forests, or following the degradation of *Quercus frainetto* Ten. and *Quercus dalechampii* forests. The herbaceous formations in Roussenski Lom are dominated by *Dichanthium ischaemum* (L.) Roberty. (=*Bothriochloa ischaemum* (L.) Keng), *Poa bulbosa* L., *Chrysopogon gryllus* and ephemeres. They had secondary originated at the place of xerothermous forest formations and at the place of secondary shrub formations, which occupy eroded sites with more xerothermal conditions. (Bondev, l.c.)

Methods

For the determination of the floristic composition the method of routes investigation is used. The routes lie along the very bank of the river, on the valley slopes and in the high plateaux-like part over the rock wreath. The rocky limestone habitats, distinguished for their rich biodiversity, were explored too.

For the floristic analysis were valued the following indices: taxa numbers by categories (absolutely and percentage from the total number in Bulgaria and in the catchment basin), the richest in species families, life forms spectrum by Raunkiaer (1934) (biological spectrum), phytogeographic elements by B. Stefanov (1943) (chorological spectrum) and endemics and plants with conservation status. The inventory includes all spontaneous, local species and all permanent settled (naturalized) alien species.

The floristic list is arranged in ascending alphabetical order of the families . As regards the phytogeographic elements, the categories according to B. Stefanov are used with the following abbreviations (Med = Mediterranean, SCont = Southern-continental, NCont = Northern-continental, Mont = Mountain).

The number and the taxa distribution in categories are based on the Field Guide to the Bulgarian Vascular Plants (Delipavlov & Cheshmedjiev 2003), and in addition the last taxonomic revisions and nomenclature changes are taken in. The specimens are deposited at the SOM and the small herbarium collection at the Roussenski Lom Nature Park.

The scope of the families is in conformity with the Flora Europaea (Tutin & al. 1964-1980; 1993).

Floristic List

(Med = Mediterranean, SCont = Southern-continental, NCont = Northern-continental, Mont = Mountain, * = Balkan endemic taxa, ** = Bulgarian endemic taxa)

Taxa–Chorological type–Life-form

ACANTHACEAE
**Acanthus balcanicus* Heyw. & Richards. – Mont – H

ACERACEAE
Acer campestre L. – Mont – Ph
Acer platanoides L. – Boreal – Ph
Acer pseudoplatanus L. – Mont – Ph
Acer tataricum L.– NCont – Ph

ALISMATACEAE
Alisma plantago-aquatica L. – NCont – H

AMARANTHACEAE
Amaranthus graecizans L.– NAm – Th
Amaranthus retroflexus L.– NAm – Th

AMARYLLIDACEAE
Galanthus elwesii Hook. f. subsp. *elwesii* – Mont – G
**Galanthus elwesii* subsp. *minor* D.A.Webb
Sternbergia colchiciflora Waldst. & Kit. – Mont – G

ANACARDIACEAE
Cotinus coggygria Scop.– Mont – Ph

APIACEAE
Aegopodium podagraria L. – Boreal – H
Angelica sylvestris L.– Boreal – H
Anthriscus cerefolium (L.) Hoffm. – SCont – Th
Anthriscus nemorosa (M.Bieb.) Spreng. – Boreal – H
Anthriscus sylvestris (L.) Hoffm. – Boreal – H
Berula erecta (Huds.) Coville – NCont – H
Bupleurum affine Sadl. – NCont – Th
Bupleurum praealtum L. – Mont – Th
Bupleurum rotundifolium L. – SCont – Th
Caucalis platycarpos L. – SCont – Th
Chaerophyllum bulbosum L. – Boreal – H
Chaerophyllum temulum L. – Boreal – Th
Conium maculatum L. – SCont – Th
Daucus carota L. – SCont – Th
Eryngium campestre L. – NCont – H
Falcaria vulgaris Bernh . – NCont – H
Ferulago campestris (Besser) Grecescu – Mont – H
Ferulago sylvatica (Besser) Rchb. – NCont – H

Heracleum sphondylium subsp. *sibiricum* (L.) Simonk. – Boreal – H
Laser trilobum (L.) Borkh. – Mont – H
Malabaila graveolens (Spreng.) Hoffm. – NCont – H
Myrrhoides nodosa (L.) Cannon – SCont – Th
Oenanthe aquatica (L.) Poir. – Boreal – H
Oenanthe fistulosa L. – SCont – H
Oenanthe stenoloba Schur. – Mont – H
Orlaya grandiflora (L.) Hoffm. – Med – Th
Orlaya kochii Heywood – SCont – Th
Pastinaca sativa L. – NCont – H
Peucedanum alsaticum L. – NCont – H
Peucedanum officinale L. – Mont – H
Physospermum cornubiense (L.) DC. – Mont – H
Pimpinella saxifraga L. – NCont – H
Seseli annuum L. – NCont – H
Seseli rigidum Waldst. & Kit. – Mont – H
Seseli tortuosum L. – NCont – H
Sium latifolium L. – Boreal – H
Tordylium maximum L. – SCont – Th
Torilis arvensis (Huds.) Link. – SCont – Th
Torilis japonica (Houtt.) DC. – SCont – Th

Apocynaceae
Vinca herbacea Waldst. & Kit. – Mont – H

Araceae
Arum maculatum L. – Mont – G

Araliaceae
Hedera helix L. – Mont – Ph

Aristolochiaceae
Aristolochia clematitis L. – NCont – H
Asarum europaeum L. – Boreal – H

Asclepiadaceae
Vincetoxicum hirundinaria Medic. – NCont – H

Aspidiaceae
Dryopteris filix-mas (L.) Schott – Boreal – H

Aspleniaceae
Asplenium adianthum-nigrum L. – Mont – H
Asplenium ruta-muraria L. – Boreal – H
Asplenium trichomanes L. – Boreal – H

Ceterach officinarum DC. – Mont – H
Phyllitis scolopendrium (L.) Newman – Mont – H

ASTERACEAE
**Achillea clypeolata* Sibth. & Sm. – Mont – H
Achillea coarctata Poir. – Mont – H
Achillea collina J.Becker ex Reichb. – NCont – H
Achillea crithmifolia Waldst. & Kit. – Mont – H
Achillea nobilis L. – NCont – H
Achillea setacea Waldst. & Kit. – NCont – H
Anthemis arvensis L. – Med – Th
Anthemis austriaca Jacq. – Mont – Th
Anthemis tinctoria L. – SCont – H
Arctium lappa L. – SCont – Th
Arctium minus (Bernh.) Hill. – NCont – H
Arctium tomentosum Mill. – SCont – Th
Artemisia absinthium L. – SCont – H
Artemisia annua L. – SCont – Th
Artemisia austriaca Jacq. – NCont – H
Artemisia campestris L. – NCont – H
Artemisia scoparia Waldst. & Kit. – SCont – Th
Artemisia vulgaris L. – NCont – H
Bellis perennis L. – Mont – H
Bidens cernua L. – NCont – Th
Bidens tripartita L. – NCont – Th
Carduus acanthoides L. – NCont – H
Carduus thoermeri Weinm. – Boreal – H
Carlina vulgaris L. – NCont – H
Carthamus lanatus L. – SCont – Th
Centaurea apiculata subsp. *spinulosa* (Rochel ex Spreng.) Dostál – NCont – H
Centaurea biebersteinii DC. – NCont – H
Centaurea calcitrapa L. – SCont – Th
**Centaurea cuneifolia* Sibth. & Sm. – Med – H
Centaurea diffusa Lam. – SCont – Th
Centaurea jacea L. – Boreal – H
Centaurea orientalis L. – NCont – H
**Centaurea rutifolia* Sibth. & Sm. subsp. *rutifolia* – Med – H
**Centaurea rutifolia* subsp. *jurineifolia* (Boiss.) Nyman
Centaurea salonitana var. *macracantha* (DC.) Boiss. & Heldr. – NCont – H
Centaurea solstitialis L. – SCont – Th
Centaurea stenolepis A.Kern. – Mont – H
Centaurea stoebe L. – NCont – H
Chondrilla juncea L. – SCont – Th
Cichorium intybus L. – SCont – H
Cirsium arvense (L.) Scop. – SCont – H

Cirsium creticum (Lam.) d'Urv. – NCont – H
Cirsium vulgare (Savi) Ten. – NCont – H
Conyza canadensis (L.) Cronquist – NAm – Th
Crepis foetida L. – SCont – Th
Crepis pulchra L. – SCont – Th
Crepis setosa Haller f. – Med – Th
Crepis tectorum L. – SCont – Th
Crinitaria villosa (L.) Grossh. – NCont – H
Crupina vulgaris Cass. – Mont – Th
Cyanus segetum Hill – SCont – Th
Cyanus triumfettii (All.) Dostál ex Á.et D. Löve – Mont – H
Doronicum hungaricum Rchb.f. – Mont – H
Echinops ritro L. – NCont – H
Echinops sphaerocephalus L. – NCont – H
Erigeron annuus (L.) Pers. – NAm – H
Eupatorium cannabinum L. – NCont – H
Galinsoga parviflora Cav. – NAm – Th
Hieracium cymosum L. – NCont – H
Hieracium echioides Lumn. – NCont – H
Hieracium hoppeanum Schult. – Mont – H
Hieracium pilosella L. – Mont – H
Hieracium piloselloides Vill. – Mont – H
Hieracium praealtum Vill. ex Gochnat – NCont – H
Hieracium racemosum Waldst. & Kit. ex Willd. – Mont – H
Hieracium umbellatum L. – Boreal – H
Inula bifrons (L.) L. – Mont – Th
Inula britannica L. – SCont – H
Inula conyza DC – Mont – H
Inula ensifolia L. – NCont – H
Inula germanica L. – NCont – H
Inula hirta L. – NCont – H
Inula salicina subsp. *aspera* (Poir.) Hayek – SCont – H
Jurinea consanguinea subsp. *arachnoidea* (Bunge) Kozuharov – NCont – H
**Jurinea consanguinea* subsp. *bulgarica* (Velen.) Kozuharov
Lactuca perennis L. – Mont – H
Lactuca quercina L. – Mont – Th
Lactuca saligna L. – SCont – Th
Lactuca serriola L. – SCont – Th
Lactuca viminea (L.) J.Presl & C.Presl – SCont – Th
Lapsana communis L. – NCont – Th
Leontodon crispus Vill. – SCont – H
Leucanthemum vulgare Lam. – Boreal – H
Logfia arvensis (L.) Holub – SCont – Th
Matricaria perforata Merat. – NCont – Th
Matricaria trichophylla (Boiss.) Boiss. – Mont – H

Mycelis muralis (L.) Dumort. – Mont – H
Onopordum acanthium L. – SCont – Th
Picris hieracioides L. – NCont – Th
Scolymus hispanicus L. – Med – Th
Scorzonera hispanica L. – NCont – H
Senecio jacobaea L. – NCont – H
Senecio vernalis Waldst. & Kit. – SCont – Th
Senecio vulgaris L. – SCont – Th
Serratula radiata (Waldst. & Kit.) M.Bieb. – NCont – H
Serratula tinctoria L. – NCont – H
Silybum marianum (L.) Gaertn. – SCont – Th
Solidago virgaurea L. – Boreal – H
Sonchus arvensis subsp. *uliginosus* (M.Bieb.) Nyman – NCont – H
Sonchus asper (L.) Hill subsp. *asper* – SCont – Th
Sonchus asper subsp. *glaucescens* (Jord.) Ball
Sonchus oleraceus L. – SCont – Th
Tanacetum corymbosum Scultz-bip. – Mont – H
Tanacetum vulgare L. – NCont – H
Taraxacum Sect. *Erythrosperma* Dahlst. *erythrospermum* gr. – Boreal – H
Taraxacum serotinum (Waldst. & Kit.) Poir. – NCont – H
Taraxacum Sect. *Taraxacum* Dahlst. *officinale* gr. – Boreal – H
Tragopogon dubius Scop. – NCont – Th
Tragopogon pratensis L. – NCont – Th
Tussilago farfara L. – NCont – H
Xanthium spinosum L. – NAm – Th
Xanthium strumarium L. subsp. *strumarium* – NAm – Th
Xanthium strumarium subsp. *italicum* (Moretti) D.Leve
Xeranthemum annuum L. – NCont – Th

Berberidaceae
Berberis vulgaris L. – SCont – Ph

Betulaceae
Carpinus betulus L. – Mont – Ph
Carpinus orientalis Mill. – Mont – Ph
Corylus avellana L. – Boreal – Ph

Boraginaceae
Anchusa azurea Mill. – SCont – H
Anchusa barrelieri (All.) Vitm – Mont – H
Anchusa officinalis L. – NCont – H
Asperugo procumbens L. – SCont – Th
Buglossoides arvensis (L.) I.M.Johnst. – SCont – Th
Buglossoides purpurocàerulea (L.) I.M.Johnst. – Mont – H
Cerinthe minor L. – SCont – H

Cynoglossum creticum Mill. – Med – H
Cynoglossum hungaricum Simonk. – Mont – H
Cynoglossum officinale L. – Mont – H
Echium italicum L. – SCont – H
Echium russicum J.F.Gmel. – NCont – H
Echium vulgare L. – NCont – H
Heliotropium europaeum L. – SCont – Th
Lappula squarrosa (Retz.) Dumort. – SCont – Th
Lithospermum officinale L. – NCont – H
Myosotis arvensis (L.) Hill – SCont – Th
Myosotis ramosissima Rochel – SCont – Th
Myosotis sparsiflora J.G.Mikan ex Pohl – Boreal – Th
Myosotis stricta Link ex Roem. & Schult. – SCont – Th
Nonea pulla (L.) DC. – NCont – H
Onosma taurica Pall. ex Willd. – NCont – H
Onosma visianii Clementi – Mont – H
Pulmonaria mollis Wulfen ex Hornem. – Mont – H
Pulmonaria obscura Dumort. – Mont – H
Symphytum officinale L. – NCont – H
**Symphytum ottomanum* Friv. – Mont – H

Brassicaceae
Alliaria petiolata (M.Bieb.) Cavara & Grande – Boreal – H
Alyssum alyssoides L. – SCont – Th
Alyssum desertorum Stapf. – SCont – Th
Alyssum strigosum Banks & Sol. – Mont – Th
Arabidopsis thaliana (L.) Heynh. – SCont – Th
Arabis hirsuta (L.) Scop. – Mont – H
Arabis hornungiana Schur. – Mont – Th
Arabis recta Vill. – Mont – Th
Arabis turrita L. – Mont – H
Aurinia saxatilis subsp. *orientalis* (Ard.) Dudley – Mont – H
Barbarea vulgaris R. Br. – NCont – H
Berteroa incana (L.) DC. – NCont – H
Brassica rapa L. – SCont – Th
Calepina irregularis (Asso) Thell. – SCont – Th
Camelina microcarpa Andrz. ex DC. – Boreal – Th
Capsella bursa-pastoris (L.) Medik. – SCont – Th
Cardamine bulbifera (L.) Crantz – Mont – H
Cardaria draba Desv. – Scont – H
Descurainia sophia (L.) Webb ex Prantl – SCont – Th
Erophila verna (L.) Chevall. – SCont – Th
Erysimum cuspidatum (M.Bieb.) DC. – SCont – Th
Erysimum diffusum Ehrh. – NCont – H
Hesperis sylvestris Cranz. – SCont – H

Lepidium campestre (L.) R.Br. – Med – Th
Lunaria annua L. – Mont – Th
Rorippa amphibia (L.) Besser – Boreal – H
Rorippa sylvestris (L.) Besser – Boreal – H
Sinapis arvensis L. – SCont – Th
Sisymbrium loeselii L. – SCont – Th
Sisymbrium officinale (L.) Scop. – Med – Th
Sisymbrium orientale L. – SCont – Th
Sisymbrium strictissimum L. – NCont – H
Thlaspi arvense L. – SCont – Th
Thlaspi perfoliatum L. – SCont – Th
Turritis glabra L. – Boreal – Th

Butomaceae
Butomus umbellatus L. – SCont – H

Campanulaceae
Campanula bononiensis L. – Mont – H
**Campanula grossekii* Heuff. – Mont – H
**Campanula lingulata* Waldst. & Kit. – Mont – H
Campanula macrostachya Waldst. & Kit. ex Willd. – NCont – H
Campanula persicifolia L. – Boreal – H
Campanula rapunculoides L. – Mont – H
Campanula sibirica L. – NCont – H
Legousia speculum-veneris (L.) Chaix – SCont – Th

Cannabaceae
Humulus lupulus L. – NCont – H

Caprifoliaceae
Sambucus ebulus L. – SCont – H
Sambucus nigra L. – Mont – Ph
Viburnum lantana L. – Mont – Ph

Caryophyllaceae
Agrostemma githago L. – SCont – Th
Arenaria serpyllifolia L. – SCont – Th
Cerastium brachypetalum Pers. – Med – Th
Cerastium fontanum Baumg. – Boreal – H
Cerastium pumilum Curtis – SCont – Th
Cerastium semidecandrum L. – Med – Th
Cucubalus baccifer L. – NCont – H
Dianthus armeria L. – Boreal – Th
**Dianthus giganteus* D' Urv. – Mont – H
**Dianthus monadelphus* subsp. *pallens* (Sm.) Greuter & Burdet – SCont – H

**Dianthus petraeus* subsp. *noaeanus* (Boiss.) Tutin – Boreal – H
Dianthus pseudarmeria M. Bieb. – NCont – Th
Gypsophila glomerata Pall. ex M.Bieb. – NCont – H
Herniaria incana Lam. – SCont – H
Holosteum umbellatum L. – SCont – Th
Lychnis coronaria (L.) Desr. – Mont – H
Minuartia glomerata (M.Bieb.) Degen – NCont – Th
Minuartia setacea (Thuill.) Hayek – NCont – H
Moehringia trinervia (L.) Clairv. – Boreal – Th
Myosoton aquaticum (L.) Moench. – NCont – H
Paronychia cephalotes (M.Bieb.) Besser – NCont – H
Petrorhagia prolifera (L.) P.W.Ball & Heywood – NCont – Th
Saponaria glutinosa M.Bieb. – Mont – H
Saponaria officinalis L. – NCont – H
Scleranthus annuus L. – SCont – Th
Scleranthus perennis L. – NCont – H
Silene alba (Mill.) E.H.L.Krause – NCont – H
Silene bupleuroides L. – NCont – H
Silene dichotoma Ehrh. – SCont – Th
Silene italica (L.) Pers. – Mont – H
Silene noctiflora L. – NCont – Th
Silene otites (L.) Wibel – NCont – H
Silene vulgaris (Moench) Garcke – Boreal – H
Spergularia rubra (L.) J.Presl & C.Presl – SCont – Th
Stellaria graminea L. – Boreal – H
Stellaria media (L.) Vill. – SCont – Th

Celastraceae
Euonymus europaeus L. – Boreal – Ph
Euonymus verrucosus Scop. – Mont – Ph

Chenopodiaceae
Atriplex patula L. – SCont – Th
Bassia scoparia (L.) A.J. Scott – NCont – Th
Beta trigyna Waldst. & Kit. – NCont – H
Chenopodium album L. – SCont – Th
Chenopodium botrys L. – SCont – Th
Chenopodium hybridum L. – SCont – Th
Chenopodium polyspermum L. – NCont – Th
Chenopodium urbicum L. – SCont – Th

Cistaceae
Helianthemum nummularium (L.) Mill. – Mont – H

Clusiaceae
Hypericum elegans Stephan ex Willd. – NCont – H
Hypericum hirsutum L. – Boreal – H
Hypericum perforatum L. – SCont – H
Hypericum tetrapterum Fr. – SCont – H

Convolvulaceae
Calystegia sepium (L.) R.Br. – NCont – H
Calystegia silvatica (Kit.) Griseb. – Mont – H
Convolvulus arvensis L. – SCont – H
Convolvulus cantabrica L. – Med – H

Cornaceae
Cornus mas L. – Mont – Ph
Cornus sanguinea L. – Mont – Ph

Crassulaceae
Sedum acre L. – Boreal – H
Sedum album L. – Mont – H
Sedum hispanicum L. – SCont – Th
Sedum telephium subsp. maximum (L.) Krock. – Boreal – H

Cucurbitaceae
Bryonia alba L. – SCont – H

Cuscutaceae
Cuscuta europaea L. – SCont – Th

Cyperaceae
Bolboschoenus maritimus (L.) Palla – NCont – H
Carex acuta L. – Boreal – H
Carex acutiformis Ehrh. – Boreal – H
Carex caryophyllea Latourr. – Boreal – H
Carex depauperata Curtis ex With. – Mont – H
Carex digitata L. – Boreal – H
Carex divulsa Stokes subsp. divulsa – Boreal – H
Carex divulsa subsp. leersii (Kneuck.) W.Koch
Carex halleriana Asso. – Mont – H
Carex hirta L. – Boreal – H
Carex hordeistichos Vill. – SCont – H
Carex melanostachya M.Bieb. ex Willd. – NCont – H
Carex michelii Host. – Mont – H
Carex montana L. – Boreal – H
Carex muricata L. – Boreal – H
Carex pilosa Scop. – Mont – H

Carex praecox Schreb. – NCont – H
Carex riparia Curtis – Boreal – H
Carex spicata Huds. – Boreal – H
Carex tomentosa L. – Mont – H
Carex vulpina L. – Boreal – H
Cyperus fuscus L. – SCont – Th
Eleocharis acicularis (L.) Roem. & Schult. – Boreal – H
Eleocharis palustris (L.) Roem. & Schult. – Boreal – H
Juncellus serotinus (Rottb.) C.B. Clarke – NCont – H
Schoenoplectus tabernaemontani (C.C. Gmel.) Palla – SCont – H

Dioscoreaceae
Tamus communis L. – Med – G

Dipsacaceae
**Cephalaria laevigata* (Waldst. & Kit.) Schrad. – NCont – H
Cephalaria transylvanica (L.) Roem. & Schult. – SCont – Th
Cephalaria uralensis (Murray) Roem. & Schult. – NCont – H
Dipsacus fullonum L. – SCont – H
Dipsacus laciniatus L. – SCont – H
Knautia arvensis (L.) Coult. – Boreal – H
Knautia integrifolia (L.) Bertol. – SCont – Th
**Knautia macedonica* Griseb. – Mont – H
Scabiosa argentea L. – SCont – H
Scabiosa ochroleuca L. – NCont – H

Equisetaceae
Equisetum arvenså L. – NCont – H
Equisetum telmateia Ehrh. – Med – H

Euphorbiaceae
Euphorbia agraria M.Bieb. – NCont – H
Euphorbia amygdaloides L. – Mont – H
Euphorbia esula L. – NCont – H
Euphorbia helioscopia L. – SCont – Th
Euphorbia nicaeensis All. – NCont – H
Euphorbia serrulata Thuill. – Med – Th
Mercurialis perennis L. – Mont – H

Fabaceae
Anthyllis vulneraria L. – Mont – Th
Astragalus austriacus Jacq. – NCont – H
Astragalus cicer L. – NCont – H
Astragalus glycyphyllos L. – Boreal – H
Astragalus hamosus L. – Med – Th

Astragalus onobrychis L. – NCont – H
**Astragalus suberosus* subsp. *haarbachii* (Spruner) V.Matthews – Med – Th
Astragalus vesicarius L. – NCont – H
Bituminaria bituminosa (L.) E.H. Stirton – SCont – H
Cercis siliquastrum L. – Mont – Ph
Chamaecytisus austriacus (L.) Link. – Mont – Ph
Chamaecytisus hirsutus Link. – Mont – Ph
**Chamaecytisus jankae* (Velen.) Rothm. – Mont – Ph
***Chamaecytisus kovacevii* (Velen.) Rothm. – Mont – Ph
Coronilla scorpioides Koch. – SCont – Th
Coronilla varia L. – Mont – H
Cytisus nigricans L. – Mont – Ph
Cytisus procumbens (Waldst. & Kit. ex Willd.) Spreng. – Mont – H
Dorycnium herbaceum Vill. – Mont – H
Galega officinalis L. – SCont – H
Genista januensis Viv. – NCont – H
Genista tinctoria L. – NCont – H
**Genista sessilifolia* subsp. trifoliata (Janka) Kuzmanov – Mont – H
Lathyrus aphàca L. – SCont – Th
Lathyrus cicera L. – SCont – Th
Lathyrus latifolius L. – SCont – H
Lathyrus laxiflorus (Desf.) Kuntze – Mont – H
Lathyrus niger (L.) Bernh. – Mont – H
Lathyrus nissolia L. – Mont – Th
Lathyrus pannonicus (Jacq.) Garcke – NCont – H
Lathyrus pratensis L. – Boreal – H
Lathyrus sphaericus Retz. – Med – Th
Lathyrus sylvestris L. – NCont – H
Lathyrus venetus (Mill.) Wohlf. – Mont – H
Lathyrus vernus (L.) Bernh. – Boreal – H
Lens nigricans (M.Bieb.) Godr. – SCont – Th
Lotus corniculatus L. – SCont – H
Lotus tenuis Waldst. & Kit. ex Willd. – SCont – H
Medicago arabica (L.) Huds. – SCont – Th
Medicago lupulina L. – SCont – Th
Medicago minima (L.) Bartal. – SCont – Th
Medicago orbicularis (L.) Bartal. – SCont – Th
Medicago rigidula (L.) All. – SCont – Th
Medicago sativa subsp. falcata (L.) Arcang. – NCont – H
Melilotus alba Medik. – SCont – Th
Melilotus officinalis (L.) Pall. – SCont – Th
Onobrychis arenaria (Kit.) DC. subsp. arenaria – NCont – H
Onobrychis arenaria subsp. lasiostachya (Boiss.) Hayek
Ononis arvensis L. – NCont – H
Ononis pusilla L. – Mont – H

Ononis spinosa L. – NCont – H
Trifolium alpestre L. – NCont – H
Trifolium arvense L. – SCont – Th
Trifolium campestre Schreb. – Mont – Th
Trifolium ochroleucon Huds. – Mont – H
Trifolium pannonicum Jacq. – Mont – H
Trifolium pratense L. – NCont – H
Trifolium repens L. – SCont – H
Trifolium scabrum L. – Med – Th
Trigonella gladiata Steven ex M.Bieb. – Mont – Th
Vicia cracca L. – Boreal – H
Vicia grandiflora Scop. – Mont – Th
Vicia hirsuta (L.) Gray – NCont – Th
Vicia lathyroides L. – Med – Th
Vicia narbonensis L. – SCont – Th
Vicia pannonica Crantz. subsp. *pannonica* – SCont – Th
Vicia pannonica subsp. *striata* (M.Bieb.) Nyman
Vicia peregrina L. – SCont – Th
Vicia sativa L. – SCont – Th
Vicia villosa Roth. subsp. *villosa* – SCont – Th
Vicia villosa subsp. *varia* (Host.) Corb.

Fagaceae
Fagus sylvatica L. – Mont – Ph
Quercus cerris L. – Mont – Ph
Quercus dalechampii Ten. – Mont – Ph
Quercus frainetto Ten. – Mont – Ph
Quercus pedunculiflora K. Koch. – Mont – Ph
Quercus pubescens Willd. – Med – Ph

Gentianaceae
Centaurium erythraea Rafn. – SCont – Th

Geraniaceae
Erodium cicutarium (L.) L`Her. – SCont – Th
Erodium hoefftianum subsp. *neilreichii* (Janka) Davis. – SCont – Th
Geranium columbinum L. – SCont – Th
Geranium dissectum L. – SCont – Th
Geranium molle L. – SCont – Th
Geranium pusillum L. – SCont – Th
Geranium pyrenaicum Burm.f. – Mont – H
Geranium robertianum L. – Boreal – H
Geranium rotundifolium L. – SCont – Th
Geranium sanguineum L. – Mont – H

Hypolepidaceae
Pteridium aquilinum (L.) Kuhn – Med – H

Iridaceae
Crocus flavus Weston – Mont – G
Crocus pallasii Goldb. – NCont – G
Crocus reticulatus Steven ex Adams – Mont – G
Iris graminea L. – Mont – H
Iris pseudacorus L – Med – H
Iris pumila L. – NCont – H
Iris sintenisii Janka. – Mont – H
Iris variegata L. – Mont – H

Juncaceae
Juncus articulatus L. – SCont – H
Juncus compressus Jacq. – NCont – H
Juncus inflexus L. – SCont – H
Luzula campestris (L.) DC. – Boreal – H

Lamiaceae
Acinos alpinus subsp. *majoranifolius* (Mill.) P.W.Ball – Mont – H
Acinos arvensis (Lam.) Dandy – Mont – Th
Acinos rotundifolius Pers. – SCont – Th
Ajuga chia (Poir.) Schreb. – SCont – H
Ajuga genevensis L. – NCont – H
Ajuga laxmannii (L.) Benth. – Mont – H
Ajuga reptans L. – Mont – H
Ballota nigra L. – SCont – H
Betonica officinalis L. – NCont – H
Calamintha nepeta (L.) Savi – Mont – H
Calamintha sylvatica Bromf. – Mont – H
Chaiturus marrubiastrum (L.) Spenn. – NCont – H
Clinopodium vulgare L. – Mont – H
Galeopsis speciosa Mill. – Boreal – Th
Glechoma hederacea L. – Boreal – H
Glechoma hirsuta Waldst. & Kit. – Mont – H
Lamiastrum galeobdolon (L.) Ehrend. & Polatschek – Mont – H
Lamium amplexicaule L. – SCont – Th
Lamium maculatum L – Mont – H
Lamium purpureum L. – SCont – Th
Leonurus cardiaca L. – SCont – Th
Lycopus europaeus L. – Boreal – H
Lycopus exaltatus L.f. – NCont – H
Marrubium peregrinum L. – NCont – H
Marrubium pestalozzae Boiss. – NCont – H

Marrubium vulgare L. – SCont – H
Melissa officinalis L. – SCont – H
Mentha aquatica L. – NCont – H
Mentha arvensis L. – Mont – H
Mentha longifolia (L.) Huds. – SCont – H
Mentha pulegium L. – SCont – H
Mentha spicata L. – Mont – H
Nepeta cataria L. – SCont – H
Origanum vulgare L. – Mont – H
Phlomis tuberosa L. – NCont – H
Prunella laciniata (L.) L. – NCont – H
Prunella vulgaris L. – Boreal – H
Salvia aethiopis L. – SCont – H
Salvia nemorosa L. – NCont – H
Salvia nutans L. – NCont – H
Salvia pratensis L. – NCont – H
**Salvia ringens* Sibth. & Sm. – Mont – H
Salvia sclarea L. – SCont – H
Salvia verticillata L. – SCont – H
Salvia virgata Jacq. – SCont – H
**Satureja coerulea* Janka – Mont – H
Scutellaria albida L. – Mont – H
Scutellaria altissima L. – Mont – H
Scutellaria galericulata L. – Boreal – H
Scutellaria hastifolia L. – NCont – H
Scutellaria orientalis L. – SCont – H
Sideritis montana L – SCont – Th
Stachys annua (L.) L. – SCont – Th
**Stachys atherocalyx* K.Koch – NCont – H
Stachys germanica L. – NCont – H
Stachys palustris L. – NCont – H
Stachys recta L. – NCont – H
Stachys sylvatica L. – Boreal – H
Teucrium chamaedrys L. – NCont – H
Teucrium montanum L. – Mont – H
Teucrium polium L. – SCont – H
Thymus glabrescens Willd. – Mont – H
**Thymus sibthorpii* Benth. – Mont – H
Ziziphora capitata L. – SCont – Th

Lemnaceae
Lemna minor L. – SCont – H

Liliaceae
Allium atropurpureum Waldst. & Kit. – SCont – G

Allium atroviolaceum Boiss. – SCont – G
Allium carinatum subsp. pulchellum Bonnier & Layens – Mont – G
Allium flavum L. – NCont – G
Allium moschatum L. – NCont – G
Allium scorodoprasum subsp. rotundum (L.) Stearn – SCont – G
Allium sphaerocephalon L. – NCont – G
Anthericum ramosum L.. – NCont – H
Asparagus officinalis L – SCont – H
Asparagus tenuifolius Lam. – Mont – G
Asparagus verticillatus L. – SCont – H
Colchicum autumnale L. – Mont – G
Colchicum triphyllum Kunze – SCont – G
Convallaria majalis L. – Boreal – G
Gagea arvensis (Pers.) Dumort. – SCont – G
Gagea bohemica (Zauschn.) Schult. & Schult.f. – SCont – G
Gagea minima (L.) Ker Gawl. – NCont – G
Gagea pratensis (Pers.) Dumort. – SCont – G
Hyacinthella leucophaea (K.Koch) Schur – NCont – G
Lilium martagon L. – Boreal – G
Muscari botryoides (L.) Mill. – Mont – G
Muscari comosum (L.) Mill. – SCont – G
Muscari neglectum Guss. ex Ten. – SCont – G
Muscari tenuiflorum Tausch. – NCont – G
Ornithogalum boucheanum Asch. – SCont – G
Ornithogalum narbonense L. – SCont – G
Ornithogalum nutans L. – SCont – G
Ornithogalum umbellatum L. – SCont – G
Polygonatum latifolium (Jacq.) Desf. – Mont – G
Polygonatum multiflorum (L.) All. – Boreal – G
Polygonatum odoratum (Mill.) Druce – Boreal – G
Ruscus aculeatus L. – Med – Ph
Ruscus hypoglossum L. – Mont – H
Scilla bifolia L. – Mont – G

Linaceae
Linum austriacum L. – NCont – H
Linum hirsutum L. – NCont – H
Linum tenuifolium L. – NCont – H

Lythraceae
Lythrum salicaria L. – SCont – H
Lythrum virgatum L. – NCont – H

Malvaceae
Abutilon theophrasti Medik. – SCont – Th

Alcea pallida (Willd.) Waldst. & Kit. – NCont – H
Althaea cannabina L. – SCont – H
Althaea hirsuta L. – Med – Th
Althaea officinalis L. – NCont – H
Hibiscus trionum L. – SCont – Th
Malva neglecta Wallr. – SCont – Th
Malva sylvestris L. – SCont – Th

Oleaceae
Fraxinus angustifolia subsp. *oxycarpa* (M.Bieb. ex Willd.) Franco & Rocha Afonso – SCont – Ph
Fraxinus excelsior L. – Mont – Ph
Fraxinus ornus L. – Mont – Ph
Ligustrum vulgare L – Mont – Ph
Syringa vulgaris L. – Mont – Ph

Onagraceae
Epilobium hirsutum L. – NCont – H
Epilobium parviflorum Schreb. – Boreal – H

Orchidaceae
Anacamptis pyramidalis (L.) Rich. – Mont – G
Cephalanthera damasonium (Mill.) Druce – Mont – H
Cephalanthera longifolia (L.) Fritsch. – Mont – H
Epipactis microphylla (Ehrh.) Sw. – Mont – H
Himantoglossum caprinum (Bieb.) Spreng. – Med – G
Orchis morio L. – Boreal – G
Orchis purpurea Huds. – Mont – G
Orchis simia Lam. – Mont – G
Orchis tridentata Scop. – Med – G

Orobanchaceae
Orobanche arenaria Borkh. – NCont – Th
Orobanche caryophyllacea Sm. – NCont – Th
Orobanche lutea Baumg. – NCont – Th
Orobanche minor Sm. – Med – Th

Papaveraceae
Chelidonium majus L. – NCont – H
Corydalis cava subsp. *marschalliana* (Pall.) Chater – Mont – G
Corydalis solida (L.) Clairv. subsp. *solida* – Boreal – G
**Corydalis solida* subsp. *slivenensis* (Vel.) Hayek
Fumaria officinalis L. – Med – H
Fumaria vaillantii Loisel. – SCont – Th
Glaucium corniculatum (L.) Rudolph – SCont – Th

Glaucium flavum Crantz. – SCont – Th
Papaver dubium L. – SCont – Th
Papaver rhoeas L. – SCont – Th

Plantaginaceae
Plantago lanceolata L. – SCont – H
Plantago major L. – SCont – H
Plantago media L. – NCont – H

Plumbaginaceae
Plumbago europaea L. – SCont – H

Poaceae
Aegilops cylindrica Host. – NCont – Th
Aegilops geniculata Roth. – Boreal – Th
Agrostis stolonifera L. – Boreal – H
Aira elegantissima Schur. – Med – Th
Alopecurus aequalis Sobol. – Boreal – Th
Alopecurus myosuroides Huds. – SCont – Th
Alopecurus pratensis L. – Boreal – H
Anthoxanthum odoratum L – Boreal – H
Arrhenatherum elatius (L.) P.Beauv. ex J.Presl & .Presl – Mont – H
Bothriochloa ischaemum (L.) Keng – SCont – H
Brachypodium pinnatum (L.) P.Beauv. – Boreal – H
Brachypodium sylvaticum (Huds.) P.Beauv. – Boreal – H
Bromus arvensis L. – SCont – Th
Bromus commutatus Schrad. – Med – Th
Bromus erectus Huds. – SCont – H
Bromus hordeaceus L. – Med – Th
Bromus inermis Leyss. – Boreal – H
Bromus ramosus Huds. – Boreal – H
Bromus recemosus L. – Boreal – Th
Bromus squarrosus L. – SCont – Th
Bromus sterilis L. – SCont – Th
Bromus tectorum L. – SCont – Th
Calamagrostis epigejos (L.) Roth – Boreal – H
Catabrosa aquatica L. (Beauv.) – Boreal – H
Chrysopogon gryllus (L.) Trin. – SCont – H
Cleistogenes serotina (L.) Keng – NCont – H
Cynodon dactylon (L.) Pers. – SCont – H
Cynosurus cristatus L. – Boreal – H
Dactylis glomerata L. – Boreal – H
Dasypyrum villosum (L.) P.Candargy – Med – Th
Digitaria sanguinalis (L.) Scop. – SCont – Th
Echinochloa crus-galli (L.) P.Beauv. – SCont – Th

Elymus elongatus (Host) Runemark – NCont – H
Elómus repens (L.) Gould – Boreal – H
Eragrostis cilianensis (All.) F.T.Hubb. – SCont – Th
Eragrostis minor Host. – SCont – Th
Festuca drymeja Mert. & W.D.J. Koch – Mont – H
Festuca heterophylla Lam. – Mont – H
Festuca pratensis Huds. – Boreal – H
Festuca valesiaca Schleich. ex Gaudin – NCont – H
Glyceria arundinacea Kunth – NCont – H
Glyceria fluitans (L.) R.Br. – Boreal – H
Glyceria maxima (Hartm.) Holmb. – Boreal – H
Glyceria notata Chevall. – Boreal – H
Hierochloe repens (Host) P. Beauv. – NCont – H
Hordeum bulbosum L. – SCont – H
Hordeum murinum L. – SCont – Th
Koeleria macrantha (Ledeb.) Schult. – NCont – H
Koeleria nitidula Velen. – NCont – H
**Koeleria simonkaii* Adam. – NCont – H
Lolium perenne L. – Boreal – H
Melica ciliata L. – NCont – H
Melica nutans L. – Boreal – H
Melica uniflora Retz. – Mont – H
Phalaris arundinacea L. – Boreal – H
Phleum pratense L. – Boreal – H
Phragmites australis (Cav.) Trin. ex Steud. – SCont – H
Piptatherum virescens (Trin.) Boiss. – Mont – H
Poa annua L. – Med – Th
Poa bulbosa L. – NCont – H
Poa nemoralis L. – Boreal – H
Poa pratensis L. – Boreal – H
Poa trivialis subsp. sylvicola (Guss.) H.Lindb. – Boreal – H
Sclerochloa dura (L.) P.Beauv. – SCont – Th
**Sesleria latifolia* (Adamovic) Degen – Mont – H
Setaria verticillata (L.) P.Beauv. – SCont – Th
Setaria viridis (L.) P.Beauv. – SCont – Th
Sorghum halepense (L.) Pers. – Boreal – H
Stipa capillata L. – NCont – H
Stipa tirsa Steven – NCont – H
Taeniatherum caput-medusae (L.) Nevski – SCont – Th
Tragus racemosus (L.) All. – SCont – Th
Trisetum flavescens (L.) P.Beauv. – Boreal – H
Vulpia myuros (L.) C.C.Gmel. – SCont – Th

Polygalaceae
**Polygala anatolica* Boiss. & Heldr. – NCont – H

Polygala major Jacq. – Mont – H
Polygala sibirica L. – NCont – H

Polygonaceae
Fallopia convolvulus (L.) Á. Löve – SCont – Th
Polygonum amphibium L. – NCont – H
Polygonum aviculare L – SCont – Th
Polygonum hydropiper L. – NCont – Th
Polygonum mite Schrank – SCont – Th
Polygonum rurivagum Jord. ex Boreau – SCont – Th
Rumex obtusifolius L. – Boreal – H
Rumex palustris Sm. – NCont – H
Rumex patientia L. – SCont – H
Rumex sanguineus L. – Med – H
Rumex tuberosus L – Med – H

Polypodiaceae
Polypodium vulgare L. – Boreal – H

Portulacaceae
Portulaca oleraceae L. – SCont – Th

Primulaceae
Anagallis arvensis L. – SCont – Th
Anagallis foemina Mill. – SCont – Th
Androsace maxima L. – SCont – Th
Cyclamen hederifolium Aiton – Med – G
Lysimachia nummularia L. – Mont – H
Lysimachia punctata L. – Mont – H
Lysimachia vulgaris L. – Boreal – H

Ranunculaceae
Adonis aestivalis L. – SCont – Th
Adonis flammea Jacq. – SCont – Th
Adonis vernalis L. – NCont – H
Anemone ranunculoides L. – Boreal – G
Anemone sylvestris L. – NCont – H
Clematis integrifolia L. – NCont – H
Clematis vitalba L. – Mont – Ph
Consolida hispanica (Costa) Greuter & Burdet – SCont – Th
Consolida regalis Gray – NCont – Th
Helleborus odorus Waldst. & Kit. – Mont – H
Isopyrum thalictroides L – Mont – G
Nigella arvensis L. – Med – Th
Pulsatilla vulgaris Mill. – Mont – H

Ranunculus acris L. – Boreal – H
Ranunculus auricomus L. – Boreal – H
Ranunculus bulbosus L. – Mont – H
Ranunculus cassubicus L. – Boreal – H
Ranunculus constantinopolitanus (DC.) d'Urv. – Mont – H
Ranunculus ficaria L. – Boreal – H
Ranunculus illyricus L. – SCont – G
Ranunculus lanuginosus L. – Boreal – H
Ranunculus millefoliatus Vahl. – Mont – G
Ranunculus oxyspermus Willd. – SCont – G
Ranunculus polyanthemos L. – Boreal – H
Ranunculus repens L. – Boreal – H
Ranunculus sardous Grantz – Med – Th
Ranunculus sceleratus L. – SCont – Th
Ranunculus trichophyllus Chaix. – Boreal – H
Thalictrum aquilegiifolium L. – Boreal – H
Thalictrum flavum L. – Boreal – H
Thalictrum lucidum L. – Mont – H
Thalictrum minus L. – NCont – H

Resedaceae
Reseda inodora Rchb. – NCont – H
Reseda lutea L. – SCont – H

Rhamnaceae
Paliurus spina-christi Mill. – SCont – Ph
Rhamnus saxatilis Jacq. – Mont – Ph

Rosaceae
Agrimonia eupatoria L. – Boreal – H
Cotoneaster integerrimus Medik. – Mont – Ph
Crataegus monogyna Jacq. – Mont – Ph
Crataegus pentagyna Waldst. & Kit. ex Willd. – Mont – Ph
Filipendula vulgaris Moench – NCont – H
Fragaria vesca L. – Boreal – H
Fragaria viridis Duchesne – Boreal – H
Geum urbanum L. – Boreal – H
Malus dasyphylla Borkh. – Mont – Ph
Potentilla argentea L. – Boreal – H
Potentilla astracanica Jacq. – SCont – H
**Potentilla emili-popii* Nyar. – NCont – H
Potentilla inclinata Vill. – NCont – H
Potentilla micrantha Ramond ex DC. – Mont – H
Potentilla neglecta Baumg. – Mont – H
Potentilla obscura Willd. – NCont – H

Potentilla pedata Nestl. – SCont – H
Potentilla pilosa Willd. – NCont – H
Potentilla reptans L. – SCont – H
Potentilla sulfurea Lam. – NCont – H
Potentilla supina L – SCont – H
Prunus avium L. – Mont – Ph
Prunus cerasifera Ehrh. – NCont – Ph
Prunus domestica subsp. *insititia* (L.) C.K.Schneid. – SCont – Ph
Prunus fruticosa Pall. – NCont – Ph
Prunus mahaleb L. – Mont – Ph
Prunus spinosa L. – SCont – Ph
Prunus tenella Batsch – NCont – Ph
Pyrus amygdaliformis Vill. – Med – Ph
Pyrus pyraster Burgsd. – Mont – Ph
Rosa agrestis Savi – Mont – Ph
Rosa canina L. – Boreal – Ph
Rosa gallica L. – Mont – Ph
Rosa pimpinellifolia L. – NCont – Ph
Rosa squarrosa (A.Rau) Boreau – Boreal – Ph
Rubus caesius L. – Boreal – Ph
Rubus canescens DC. – Mont – Ph
Sanguisorba minor Scop. – SCont – H
Sorbus domestica L. – Mont – Ph
Sorbus torminalis (L.) Crantz – Mont – Ph

Rubiaceae
Asperula cynanchica L. – Mont – H
Asperula tenella Heuff. ex Deg. – Mont – H
Crucianella angustifolia L. – Mont – Th
Cruciata laevipes Opiz. – Boreal – H
Cruciata pedemontana (Bellardi) Ehrend. – Mont – Th
Galium album Mill. – NCont – H
Galium aparine L. – SCont – Th
Galium debile Banks & Sol. ex Hook. f. – Boreal – H
**Galium flavescens* Borb. – Mont – H
**Galium heldreichii* Hal. – Mont – H
Galium humifusum M.Bieb. – NCont – H
Galium octonarium (Klokov) Pobed. – SCont – H
Galium paschale Forssk. – Mont – H
Galium pseudaristatum Schur. – Mont – H
Galium rubioides L. – Mont – H
Galium verum L. – NCont – H
Galium volhynicum Pobed. – NCont – H
Sherardia arvensis L – SCont – Th

Rutaceae
Dictamnus albus L. – NCont – H
Haplophyllum suaveolens (DC.) G.Don – NCont – H

Salicaceae
Populus alba L. – SCont – Ph
Populus canescens (Aiton) Sm. – SCont – Ph
Salix alba L. – Boreal – Ph
Salix cinerea L. – Boreal – Ph
Salix fragilis L. – Boreal – Ph
Salix purpurea L. – Boreal – Ph
Salix triandra L. – Boreal – Ph

Santalaceae
**Comandra elegans* (Rochel ex Rchb.) Rchb.f. – Mont – H
Thesium arvense Horv. – NCont – H
Thesium dollineri subsp. *simplex* (Vel.) Stoj. & Stef. – Mont – Th

Saxifragaceae
Saxifraga tridactylites L. – Mont – Th

Scrophulariaceae
Digitalis lanata Ehrh. – Mont – H
Euphrasia rostkoviana Hayne – Boreal – Th
Gratiola officinalis L. – NCont – H
Lathraea squamaria L. – Boreal – G
Linaria genistifolia (L.) Mill. – SCont – H
Linaria vulgaris Mill. – SCont – H
Melampyrum arvense L. – SCont – Th
Melampyrum cristatum L. – Boreal – Th
Odontites verna subsp. *serotina* (Dumort.) Corb. – NCont – Th
Rhinanthus rumelicus Velen. – SCont – Th
Scrophularia scopolii Hoppe – Mont – H
Scrophularia umbrosa Dumort. – SCont – H
Verbascum blattaria L. – SCont – H
Verbascum chaixii subsp. *austriacum* (Schott ex Roem. & Schult.) Hayek – Mont – H
Verbascum densiflorum Bertol (V. thapsiforme) – Mont – H
**Verbascum dieckianum* Borb. & Degen – Mont – H
Verbascum lychnitis L. – Mont – H
Verbascum nigrum L. – NCont – H
Verbascum phlomoides L. – Mont – H
Verbascum phoeniceum L. – NCont – H
Verbascum speciosum Schrad. – Mont – H
Veronica anagallis-aquatica L. – NCont – H
Veronica arvensis L. – NCont – Th

Veronica beccabunga L. – SCont – H
Veronica chamaedrys L. – Boreal – H
Veronica hederifolia L. subsp. *hederifolia* – SCont – Th
Veronica hederifolia subsp. *triloba* (Opiz) Celak.
Veronica jacquinii Baumg. – Mont – H
Veronica paniculata L. – NCont – H
Veronica persica Poir. – SCont – Th
Veronica polita Fr. – SCont – Th
Veronica praecox All. – Med – Th
Veronica prostrata L. – NCont – H
Veronica serpyllifolia L. – Boreal – Th
Veronica spicata subsp. *barrelieri* (Schott ex Roem. & Schult.) Murb. – NCont – H
Veronica spicata subsp. *orchidea* (Crantz) Hayek
Veronica teucrium L. – Boreal – H
Veronica triphyllos L. – SCont – Th

Solanaceae
Datura stramonium L. – NAm – Th
Hyoscyamus niger L. – SCont – Th
Physalis alkekengi L. – NCont – H
Solanum dulcamara L. – SCont – H
Solanum nigrum L. – SCont – Th

Sparganiaceae
Sparganium erectum L. – Boreal – H

Staphylleaceae
Staphylea pinnata L. – Mont – Ph

Thymelaeaceae
Thymelaea passerina (L.) Coss. & Germ. – SCont – Th

Tiliaceae
Tilia cordata Mill. – Boreal – Ph
Tilia platyphyllos Scop. – Mont – Ph
Tilia tomentosa Moench – Mont – Ph

Typhaceae
Typha angustifolia L. – NCont – H
Typha latifolia L. – Boreal – H

Ulmaceae
Celtis glabrata Steven ex Planchon – Mont – Ph
Ulmus glabra Huds. – Boreal – Ph
Ulmus laevis Pall. – NCont – Ph

Ulmus minor Mill. – SCont – Ph

URTICACEAE
Parietaria lusitanica L. – Mont – Th
Parietaria officinalis L. – Med – H
Urtica dioica L. – NCont – H
Urtica urens L. – SCont – Th

VALERIANACEAE
Valeriana officinalis L. – Boreal – H
Valerianella coronata L. (DC) – SCont – Th
Valerianella costata (Steven) Betcke – Mont – Th

VERBENACEAE
Verbena officinalis L. – SCont – H

VIOLACEAE
Viola arvensis Murray – SCont – Th
Viola elatior Fr. – NCont – H
Viola jordanii Hanry – Mont – H
Viola kitaibeliana Schult. – SCont – Th
Viola mirabilis L. – Boreal – H
Viola odorata L. – Mont – H
Viola reichenbachiana Jord. ex Boreau – Boreal – H
Viola riviniana Rchb. – Mont – H

VITACEAE
Vitis vinifera L. – Med – Ph

ZYGOPHYLLACEAE
Tribulus terrestris L. – SCont – Th

Results and notes on the flora

The vascular flora of the catchment basin of river Roussenski Lom includes 877 species distributed over 87 families and 399 genera (Table 1). At the territory of about 100 sq. km are found 23, 1 % of the Bulgarian flora species.

In the study area the ten families with the greatest number of entities are shown in figure 2. For a comparison, figure 3 shows the first ten most numerous families of the Bulgarian flora. On both figures the families *Asteraceae*, *Poaceae* and *Fabaceae* are at the first three places by the species number and in the same order. The most abrupt is the leap of the *Lamiaceae* family, which from 9th place for Bulgaria goes to 4th place in the flora of Roussenski Lom. In figure 2 strikes the almost equal species number of the families

Table 1. Numbers of vascular plant taxa in the flora of Roussenski Lom (BG = Bulgaria, RL = Roussenski Lom).

Taxa	Families			Genera			Species		
	in BG	in RL	%	in BG	in RL	%	in BG	in RL	%
Lycopodiophyta	4	0	0	6	0	0	8	0	0
Equisetophyta	1	1	100,0	1	1	100,0	7	2	28,6
Polypodiophyta	15	4	26,7	23	6	26,1	42	8	19,0
Pinophyta	4	0	0	6	0	0	17	0	0
Magnoliophyta:	124	82	66,1	835	392	46,9	3721	867	23,3
Magnoliopsida	102	68	66,7	639	313	49,0	3001	703	23,4
Liliopsida	22	14	63,6	196	79	40,3	720	164	22,8
Total	148	87	58,8	871	399	45,8	3795	877	23,1

Rosaceae and *Apiaceae* (5th and 6th places), 40 and 39 respectively. The *Rosaceae* comes by species number right after the *Asteraceae* and the *Poaceae* in the mountain regions in Bulgaria. This owes to the fact that the mountain territories are preferred by a great number of species with alpine or boreal origin (in which family *Rosaceae* is rich), and also the Middle Stara Planina Mts. is a speciation center for the genus *Alchemilla*. In the flora of Roussenski Lom is just the opposite - the family *Rosaceae* (4,6%) is less presented, but *Apiaceae* and especially *Lamiaceae* (4,4% and 7,3% respectively) have significantly higher values than the mean for the country. The high percent of species of the families Lamiaceae and Apiaceae is due to specific geographical position of the study area, i.e. to the closeness to the eastern-Mediterranean and Pontic phytogeographic centers, sources of species of these two families. Not less important is the fact that the entities of the *Lamiaceae* and *Apiaceae* families are mainly thermophilous and xerophilous species, which find appropriate ecological conditions in the catchment basin of the river Roussenski Lom.

The biological spectrum (Table 2) of the flora shows great share of the hemicriptophytes, which together with the chamaephytes constitute 57 % of the flora of the Lom

Table 2. Biological spectrum of the flora of Roussenski Lom.

Life-forms		Number of taxa	%
Phanerophytes	Ph	75	9
Chamaephytes & Hemicryptophytes	H	503	57
Geophytes	G	51	6
Therophytes	Th	248	28
Total		877	100

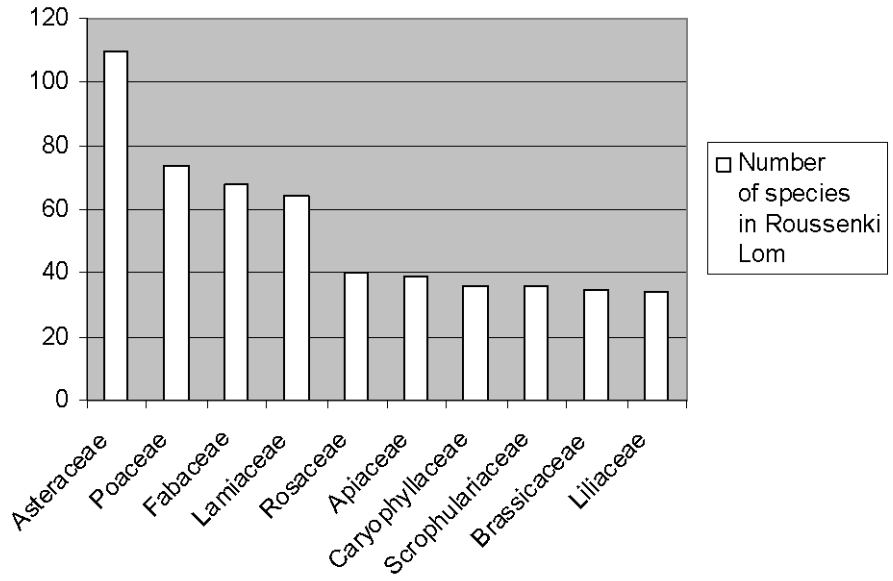

Fig. 2. Families the richest of species in the flora of Roussenski Lom.

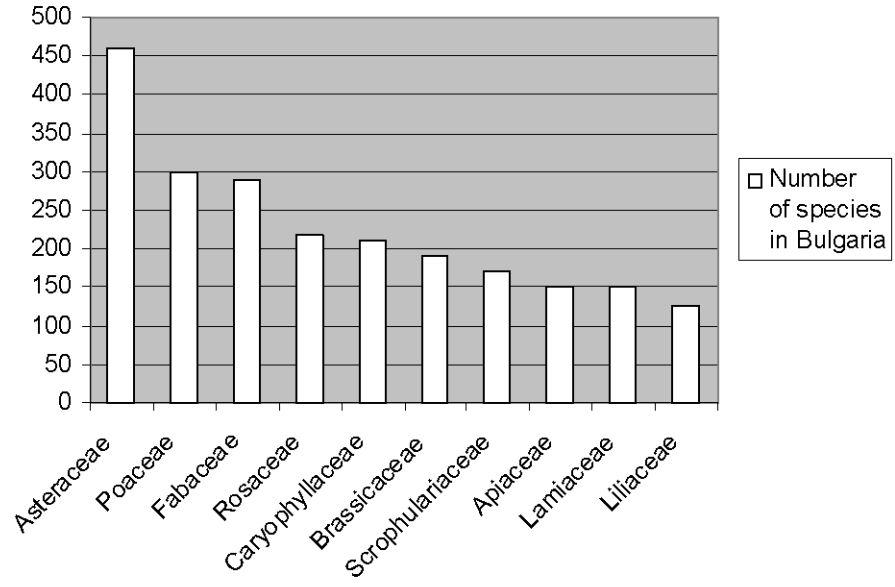

Fig. 3. Families the richest of species in the flora of Bulgaria.

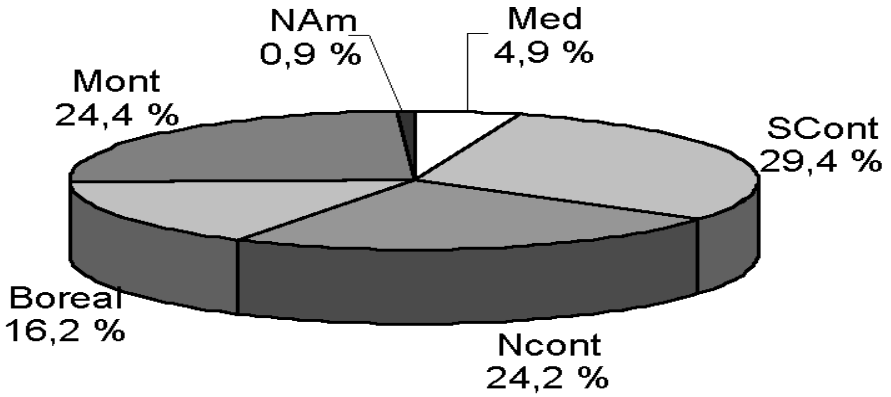

Fig. 4. Chorological spectrum.

Rivers. The richness of the hemicriptophytes is due to the temperate-continental climate as well as the nearness of the steppe zone - a product of this climate. Not by chance, the steppe zone is called hemicriptophytic. The therophytes (28%), although less presented, show the Mediterranean influence.

The chorological spectrum (Fig. 4) follows the proposed by Stefanov (1943) in a broad sense (sensu lato) five phytogeographic centers - Mediterranean, Southern-continental, Northern-continental, Boreal and Mountain.

The Mediterranean center corresponds to the present Mediterranean lands as an initial area for irradiation of species. Only 4,9% of the flora in the catchment basin of Roussenski Lom River is formed by species belonging to this phytogeographic center.

With it's almost 30% the Southern-continental center elements have the biggest share in the flora of the catchment basin. This elements initial area is Asia Minor and part of Central Asia (Stefanov, 1943). The species of the Southern-continental center are too close to the species of the Mediterranean center geographical, ecological and systematic. Their origin is connected with the eastern territories of the Ancient Mediterranean lands. In the contemporary classifications the species of the Southern-continental center can be assigned to the eastern-Mediterranean group of florae elements. In Bulgaria the way of penetration of this center species is from south to north, following the line of the Bulgarian Black Sea coast.

The Northern-continental center, covering the territories north of Black Sea (Ukraine) and part of South Russia, represents the steppe or Pontic element of the flora of the catchment basin of river Roussenski Lom. The assessed 212 species (24,2%) are an indicative for the strong influence of the Pontic center, and north-eastern Bulgaria comes as a natural continuation of the steppe zone. The flow of the species of the Northern-continental center is done freely over the whole northern Bulgaria from east to the west.

For the formation of the flora in the catchment basin of the river Roussenski Lom the influence of the Mountain center is the same as this of the Northern-continental center and is represented with 214 species. These species form a very heterogenic group. Stefanov

(l.c.) assumes that this group of species has its territory of origin and differentiation in the mountain regions of the north-western Balkans. These are mountains which have direct relation with the low mountains of the western Bulgaria, and ensure a certain way for the flow of the species with origin in the Alps and the Carpathians. A large part of the Mountain center elements are Balkan endemics. This group of species is geographically and ecologically close to the species of the mid-European deciduous zone.

The Boreal element in the Roussenski Lom flora is poorly represented (16,2%). The distribution areas of this species have a wider Euro-Asiatic range. The most insignificant part is for the north-American species (NAm) - about 1%. They constitute the adventitious element of the flora in the region.

In conclusion it can be said that in the main the flora of Roussenski Lom is formed of species from three phytogeographic regions - eastern-Mediterranean (Asia-minor), Pontic (steppe) and western-Balkan, and of them the last is essential for the formation of the Balkan endemic element.

Rare and endemic species

The endemic element of the flora of the catcment basin of the river Roussenski Lom is poorly represented (30 taxa Balkan endemics and 1 taxon Bulgarian endemic). It forms about 3% of the species composition. The low endemism is due to the lack of isolation of the region and the active penetration of species from neighboring territories.

For the only one Bulgarian endemic species, *Chamaecytisus kovacevii* (Velen.) Rothm., the catchment basin of the river Roussenski Lom appears to be the eastern boundary of its distribution area. This species is distributed in the Western and Middle Danube Plain and inhabits the loess zone still preserved in some hills and plateaus. From the three populations found, two has less than 100 specimens and only one population numbers about 500 specimens. All three populations are, more or less, subject to the influence of the grazing of the domestic animals from the nearby villages.

Balkan endemics with most limited distribution are *Verbascum dieckianum* Borbas & Degen, which Bulgarian populations are only in the catchment basin of the river Roussenski Lom, and *Potentilla emili-popii* Nyarady distributed in north-eastern Bulgaria and Romanian Dobrudja. In the survey area the populations of this two species are high in numbers with over 2000 specimens. However, the lack of appropriate habitats in neighbour prevents the increasing of their areas, as well as the contact with the neighbouring populations.

Another rare taxon of the Balkan endemics is *Astragalus suberosus* Banks & Sol. subsp. *haarbachii* (Spruner) V.Matthews presented with small populations in north-eastern Bulgaria and at the Black Sea coast. In the Roussenski Lom Nature Park are known three populations with total number about 250 specimens.

One of the rarest plants in the catchment basin of the river Roussenski Lom is *Polygala sibirica* L. This species is found in Bulgaria for the first time in 1997 (Stoyanov 1998). Its population of about 150 specimens is the only one in Bulgaria and the Balkan Peninsula. The species is distributed from the central and eastern Romania to China and has a pronounced relation to the steppe type habitats.

According to the IUCN Red Data Book categories (IUCN 1994) *Polygala sibirica*,

Verbascum dieckianum and *Potentilla emili-popii* are CR; *Chamaecytisus kovacevii* and *Astragalus suberosus* subsp. *haarbachii* are EN.

During the floristic inventory was accumulated considerable data, which had served for the preparation of the Management Plan of the Roussenski Lom Nature Park. In future the available information will help the conservation work of the experts of the Park Directorate and the better management of the vegetation resources in the catchment basin of the river Roussenski Lom.

Acknowledgments

The author expresses his gratitude to the Roussenski Lom Nature Park Directorate for the cooperation with the field studies and the map. Gratefully acknowledged are the critical reading and the advices of V. Goranova, as well as the R. Dimova's corrections in English.

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Address of the author:
Stoyan Stoyanov,
Institute of Botany, Bulgarian Academy of Science
Acad. G. Bonchev Str., bl. 23 - 1113 Sofia, Bulgaria
e-mail: stoyanov@bio.bas.bg