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High mountain flora of Pirikiti Khevsureti and Tusheti (NE Greater Caucasus)

Abstract

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Botanical-geographic diversity of the northeastern part of the Caucasian high mountains was studied. High mountain flora of Pirikiti Khevsureti and Tusheti comprises 595 species, 246 genera and 67 families. 212 species are endemic. They compose 35.3% of the flora on the studied area. Different numbers of endemic species are present in different floristic complexes. Caucasian and Eucaucasian (occurring on the Greater Caucasus) species predominate in the chorological spectrum, which is an indication of the autochthonous nature of the high mountain flora. Besides the endemic species, the presence of elements of the Palearctic (11.4%), Holarctic (10.4%), European (6.4%), Mediterranean (4.0%), Pancontinental (2.4%), Minor Asian (1.2 %), West Asian (0.3%) floras is important.

Introduction

The studied territory embraces typical high mountainous region of north-facing macro-slopes of the Eastern Greater Caucasus and belong only to Georgia – subalpine, alpine and subnival belts. Particularly, it covers a hiphsometric area from 1900 to 3800 (4000) m, i.e. from the treeline to the subnival zone inclusive. This territory is a northeastern part of Georgia and belongs to historical-geographic districts of Pirikiti Khevsureti (gorges of the rivers Assa and Arghuni) and Tusheti (gorges of the rivers Tushetis or Gometsris Alazani and Pirikiti Alazani).

Hiphsometrically the Eastern Caucasus is formed weakly compared with the Central Caucasus and strongly compared with the Western part of this mountain system. Mt. Tebulo (4493 m) is the highest mountain on the area. Mt. Shavana, Mt. Kuro, Mt. Kidegana, Mt. Komito, Mt. Dano and Mt. Diklo reach 4000 m a. s. l. (Fig.1).

Pirikiti Khevsureti (gorges of the rivers Assa and Arghuni), where the presented survey was conducted, is situated on north-facing slopes of the Eastern Caucasus and directly borders Chechnya-Ingushetia. These gorges form the extreme eastern part of the Northern Caucasus entering Georgia. A village Arkhoti is located in the Assa gorge and villages Shatili, Mutso, Ardoti are located in the Arghuni gorge. There are no old crys-

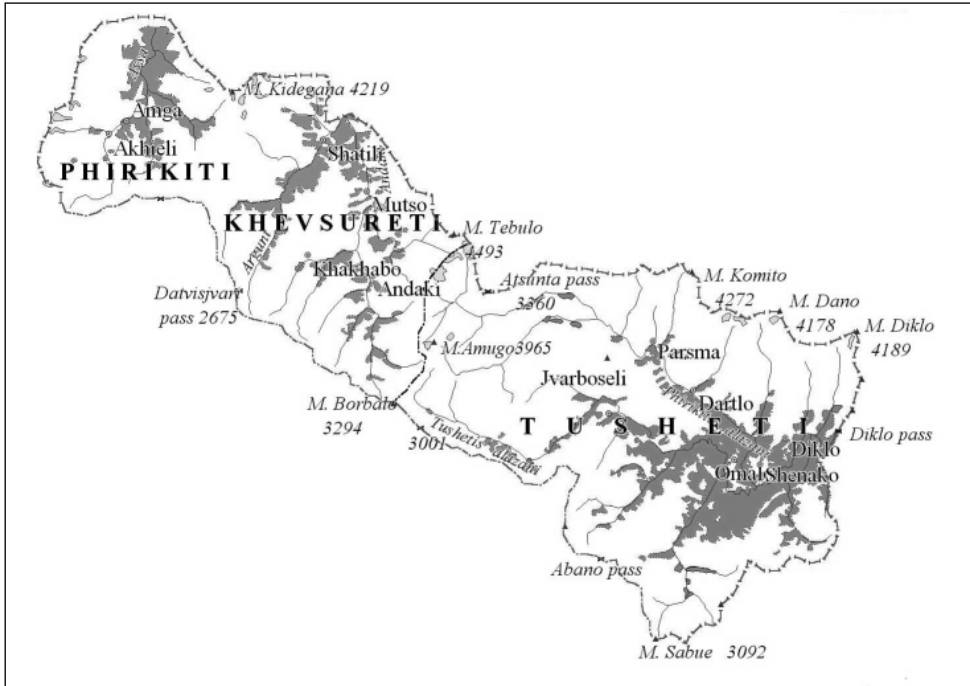


Fig. 1. Physical-Geographical area of Piriciti Khevsureti and Tusheti.

talline complexes and limestone in these gorges; they are constituted by slates (Geomorphology of Georgia 1971).

Glacial ranges are well formed in the Arghuni gorge (Tebulo, Amugo, Pirchita). Crushed upper parts of the peaks (the nival belt) have formed complexes of scree-skeleton substrate. Clear traces of ravine glaciers of the Quaternary can be found in gorges of north-facing slopes.

The climate in this high mountainous region (1800-2500 m) is moderately humid. Winter is cold and severe and summer is short. The average monthly temperature is 10°C. The precipitation amounts to 1200-1500 mm, the maximum precipitation falls on the beginning of spring and autumn (Kordzakhia 1961).

Soils are mainly made up of the Jurassic loamy slates and sand. Wide vertical amplitude of the mountain meadow soils results in the diversity of soils on the studied area. Two soil subzones are distinguished: the lower or subalpine subzone characterized by turfy mountain meadow and mountain meadow turfy peat soils (2400-2500 m a. s. l.) and the upper or alpine sub-zone characterized by thin stony and peat mountain meadow soils (3500 m a. s. l.) (Tarasashvili 1956).

The physico-geographic region of Tusheti (gorges of the rivers Gometsris Alazani and Pirikiti Alazani) resembles Khevsureti. It is situated on north-facing slopes of the Greater Caucasus and borders Dagestan. Tusheti is characterized by homogenous geological structure too: slaty layers predominate in this region.

The hydrological net of Tusheti is a part of the hydrological system of Dagestan and is represented by the upper part of the river Andiis Koisu. There are numerous depressions along the main and lateral ranges. Mt. Tebulo (4493 m), Mt. Komito (4261 m), Mt. Danu (4174 m), Mt. Diklo (4285 m) and other peaks rise above the lateral range.

Relict erosive plains still remain in gorges of the rivers Pirikiti Alazani and Gometstris Alazani (villages Omalo, Shenako, Diklo). The morphological features of the gorges are formed by river-borne erosion and only their upper parts experienced the action of glaciers of the Quaternary.

Climate is relatively draughty and continental in Tusheti, which is proved by passage of the snowline at 3600-3800 m a. s. l. As in Khevsureti, the soils are formed by clay and slate and are divided into two sub-zones (subalpine and alpine).

Vertical high mountain vegetation belts are pronounced in Pirikiti Khevsureti and Tusheti. The following vegetation belts are distinguished there: subalpine – 1800 (1900)-2400 (2500) m, alpine – 2500 (2600)-2800 (2900) m, subnival – 2900 (3000)-3800 (4000) m, nival – above 3800 (4000) m. This kind of zonation belongs to the Dagestanian or Northern Transcaucasian type (Shiffers 1960; Gagnidze 1974). Variants of Tusheti and Khevsureti are set apart from this type (Gagnidze 1974; Shetekauri 1999). This is based on the fact that beech (*Fagus orientalis*) does not participate in the phytolandscapes of this region and pine forests (*Pinus sosnowskyi*) with *Linnaea borealis* are spread over large areas, whereas in adjacent Chechnya-Ingushetia and Dagestan beech forests occur along with pine ones. Besides, shibliak and desertified steppe are widespread in Chechnya-Ingushetia and Dagestan (Shiffers 1960; Chilikina & Shiffers 1962).

The diverse flora and phytolandscapes of Tusheti and Pirikiti Khevsureti are created by high mountain forests, thickets of *Rhododendron caucasicum*, subalpine tall herbaceous vegetation, subalpine and alpine meadows, alpine carpets and petrophyton. On the north-facing slopes pine and birch forests (*Pinus sosnowskyi*, *Betula raddeana*, *B. litwinowii*) are particularly important. The appearance of pine on the Eastern Greater Caucasus is related to the Quaternary (Tumadjanov 1938) and the appearance of birch species to the Tertiary (Takhtadjan 1946). The Eastern Caucasus is the main old centre on the Greater Caucasus, where intense formation of xerophilous and hemixerophilous species took place (Kuznetsov 1909; Grossheim 1956; Sosnovsky 1943; Kharadze 1960; Galushko 1969; Ochiauri 1985).

Along with the autochthonous species, xerophilous and steppe plants of adjacent Chechnya-Ingushetia and Dagestan (*Stipa pulcherrima*, *S. capillata*, *Artemisia chamaemelifolia*, *A. scoparia*, *Astracantha microcephala*, *A. denudata*, *Festuca valesiaca*, *Dianthus dagestanicus*, *Betonica ossetica*) are important in the creation of the floristic diversity of the studied historical-geographic region. Dagestan is the main Caucasian refugium, where old xerophytes and hemixerophytes settled owing to inter-mountain depression of the Central Caucasus (Kharadze 1960).

The process of formation of the Caucasian high mountain flora was strongly influenced by epeirogenesis of the Tertiary, fall of temperature in the Pliocene and, especially, Pleistocene (glaciation period) and arid epochs of the Upper Pleistocene and Holocene (Kuznetsov 1909; Fedorov 1952; Kharadze 1966). Arcto-alpine plants of the Pleistocene (*Myosotis alpestris*, *Lloydia serotina*, *Oxyria elatior*, *Trisetum spicatum*, *Linnaea borealis*, *Sagina saginoides*) are poorly represented in the Caucasus.

Materials and methods

The present work is based on the results of the botanical investigations undertaken in 1985-1987 and 2000-2005. Field works were carried out using detailed itinerary and semi-stationary techniques.

Aspects and inclination degrees of slopes were taken into account; botanical-geographical profiles and floristic lists compiled at every 100 (200) m upwards a. s. l.

The species not typical of the high mountainous regions, i.e. random species were excluded. Therefore, only high mountain plant species were entered in the presented checklist. Species characteristic to different habitats (meadow, rock-skeleton substrate, alpine carpets, tall herbaceous vegetation) were discriminated.

In the appendix name of the taxon, habitat, chorology and altitudinal belts are given. Types of the distribution ranges of the high mountain plant species are given according to the typological system of the distribution ranges elaborated for the Caucasus by Gagnidze and Ivanishvili (1975a, b). The system by Grossheim (1936) was also used with certain amendments.

Plant taxonomy and nomenclature follows Ketskhoveli & al. (1971-2003), zerepanov (1995) and Gagnidze (2005).

Results and discussion

The checklist based on the collections and field investigations comprises 595 species belonging to 246 genera and 67 families (Table 1, Appendix). The most representative are the following families: *Asteraceae* (87), *Cyperaceae* (40), *Caryophyllaceae* (40), *Fabaceae* (38), *Brassicaceae* (26), *Rosaceae* (25) and the following genera: *Campanula* (20), *Carex* (19), *Primula* (10), *Saxifraga* (9).

The chorological spectrum (Fig. 2) shows clear dominance of the taxa with Caucasian (44,9 % of the whole number of the taxa recorded on the studied area) and Eucaucasian (the Greater Caucasus) (18,5 %) distribution. They are followed by Palearctic (11,4%), (Holarctic (10,4%), European (6,4%), Mediterranean (4,0%), Pancontinental (2,4%), Minor Asian (1,2%), West Asian (0,3%), Colchic (0,2%) and Euxinian (0,2%).

Table 1. Systematic units of the high mountain flora of Khevsureti and Tusheti.

Systematic units	Families	Genera	Species	%
<i>Pteridophyta</i>	11	16	25	4,2
<i>Gymnospermae</i>	2	2	4	0,7
<i>Dicotyledones</i>	44	185	475	79,8
<i>Monocotyledones</i>	10	43	91	15,0
TOTAL	67	246	595	100,0

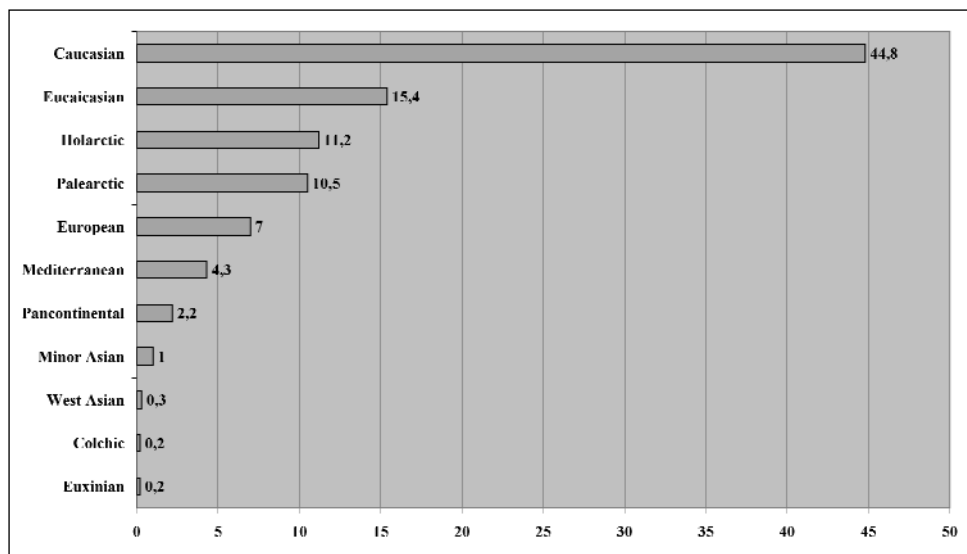


Fig. 2. Chorological spectrum of high mountain flora of Pirikiti Khevsureti and Tusheti.

Tusheti and Khevsureti are neighbouring territories and combine to form one geobotanical region. They are characteristically similar in physical, geographical surroundings, lithology, soil and climate. As a result the flora studied in the area are almost identical. There are a few plants *Erysimum subnivale*, *Delphinium caucasicum*, *Ranunculus tebulossicus*, *Pseudobetekea caucasica*, *Kemulariella rosea* however found only in Tusheti, which were collected for the first time by us from the Tusheti mountains of Kachu, Tebulo and Kvakhidi. Earlier they had only been found in Chechnya. They were not found by us in the river gorges of Assa or Argun. The remaining species are common for both Tusheti and Khevsureti.

Coenotic positions of the Tusheti and Khevsureti high mountains are different in separate habitats and hiphometric areas. The optimal zones for the species distribution are the subalpine and alpine belts. The number of species is the greatest in the habitats of the high mountain meadows (Fig. 3) and rock-scrree-skeleton substrate.

High mountain forests are constituted by: *Betula litwinowii*, *B. raddeana*, *Pinus sosnowskyi*, *Sorbus caucasigena*, *Salix caprea*, *Populus tremula*, *Acer trautvetteri* and shrubbery by: *Juniperus oblonga*, *J. depressa*, *J. sabina*, *Ribes biebersteinii*, *Rosa oplisthes*, *R. oxyodon*, *R. spinosissima*, *Rhododendron caucasicum* (Fig. 4), *Vaccinium myrtillus*, *V. vitis-idaea*, *Empetrum caucasicum*.

The main edificators of the tall herbaceous vegetation are: *Heracleum sosnowskyi*, *H. asperum*, *Cephalaria gigantea*, *Ligusticum alatum*, *Lilium georgicum*, *Agasyllis latifolia*, *Chaerophyllum maculatum*, *Anthriscus sylvestris*, *Symphytum asperum*, *Galega orientalis*, *Aconitum orientalis*.

The high mountain meadows and petrophyton are rather widespread. Forb, grass-forb and sedge meadows (*Agrostis planifolia*, *Calamagrostis arundinacea*, *C.pseudophragmites*,



Fig. 3. Gorge of Arkhoti (Gorge of riv. Assa), high mountain landscapes.

Festuca woronowii, *Phleum alpinum*, *Poa alpina*, *Nardus stricta*, *Betonica macrantha*, *Anemonastrum fasciculatum*, *A. speciosum*, *Bistorta carnea*, *Trifolium pratense*, *T. alpestre*, *T. canescens*, *Scabiosa caucasica*, *Centaurea salicifolia*, *C. fischeri*, *Leontodon danubialis*, *Daphne glomerata*, *Polygala alpicola*, *Luzula pseudosudetica*, *Carex medwedewii*, *C. lachenelii*, *C. pallescens*, *C. tristis*) occur in the high mountains especially frequently.

The proportion of the endemic species (212) is (35,4%). Petrophilous flora is distinguished by particularly high degree of endemism. 8 of the 17 endemic genera of the



Fig. 4. *Rhododendron caucasicum* Pall.

Caucasus occur in Tusheti and Khevsureti; these are: *Trigonocaryum* Trautv., *Mandenovia* Alava., *Symphyoloma* C. A. Mey., *Agasyllis* Spreng., *Gadellia* Shulkina, *Kemulariella* Tamamsch., *Pseudobetckea* (Hock) Lincz., *Pseudovesicaria* Rupr. The principal refugia for these taxa are the habitats of rock-scrub and skeleton substrate. 40-45% of the petrophilous flora belongs to the group of the Caucasian endemics. Rare endemic species (*Silene humilis*, *Pseudovesicaria digitata*, *Pseudobetckea caucasica*, *Ranunculus tebulosicus*, *Delphinium caasicum*, *Erysimum subnivale*, *Campanula petrophila*, *C. doluchanovii*, *Vavilovia formosa*, *Primula bayernii*, etc.) are in the main distributed in the high-mountainous system composed by Tebulo, Kvakhidi, Kachu, Diklo, Kidegana. The high degree of endemism is explained by distinct geographic isolation and heterogeneity of the lithological substrate (Galushko 1969; Prima 1974; Shetekauri & Gagnidze 2000; Gagnidze & al. 2002; Shetekauri & Tsiskarauli 2004).

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Appendix:**Floristic List**

Abreviations and symbols used:

Cauc – Caucasian	Pr – meadow
Eucauc – Eucaucasian or Greater Caucasian	R-L – stone, rock
Colch – Colchic	Rhod – rose bay shrubbery
Eux – Euxinian	Alt – tall herbaceous vegetation
Holarct – Holarctic	Pr-alp – alpine carpet
Palaearct – Palaearctic	Pal – swamp
Europ – European	
Medit – Mediterranean	Subalp Tr – Subalpine tree
Pancont – Pancontinental	Subalp Shr – Subalpine shrubbery
As Min – Asia Minor	
West Asian – Asia Anterior	Subalp – subalpine belt
centr et o.gr. cauc – Central and Eastern Greater Caucasian	Alp – alpine belt
w.gr. cauc. – western Caucasian group	Subn – subnival belt

PTERYDOPHYTA*HUPERZIACEAE*

Huperzia selago (L.) Bornh.-ex Schrak & C.Mart.; Pr, Rhod; Pancont; Subalp, Alp

SELAGINELLACEAE

Selaginella helvetica (L.) Spring; Pr; Pancont; Subalp, Alp

ASPLENIACEAE

Asplenium ruta-muraria L.; R-L; Palaearct; Subalp, Alp

A. septentrionale (L.) Hoffm.; R-L; Holarct; Subalp, Alp

A. trichomanes L.; R-L; Pancont; Subalp, Alp

A. viride Huds.; R-L; Holarct; Subalp, Alp

Ceterach officinarum Willd.; R-L; Palaearct; Subalp

ATHYRIACEAE

Athyrium distentifolium Tausch & Opiz; R-L, Rhod; Holarct; Subalp, Alp

A. filix-femina (L.) Roth; Pr, R-L; Holarct; Subalp, Alp

Cystopteris fragilis (L.) Bernh.; R-L, Rhod; Pancont; Subalp, Alp

C. montana (Lam.) Desv.; R-L; Holarct; Subalp, Alp

Gymnocarpium dryopteris (L.) Newm.; Rhod; Holarct; Subalp

BOTRYCHIACEAE

Botrychium lunaria (L.) Sw.; Pr; Pancont; Subalp, Alp

CRYPTOGRAMMACEAE

Cryptogramma crispa (L.) R.Br.; R-L; Palaearct; Subalp, Alp

DRYOPTERIDACEAE

Dryopteris assimilis S.Walker; R-L; Holarct; Subalp

D. filix-mas (L.) Schott; R-L; Holarct; Subalp
D. oreades Fomin; R-L, Rhod; Eucauc; Subalp, Alp
Polystichum braunii (Spenn.) Fee; R-L, R-L; Holarct; Subalp
P. lonchitis (L.) Roth; R-L; Holarct; Subalp, Alp

LYCOPODIACEAE

Diphasiastrum alpinum (L.) Holub; Rhod, R-L; Holarct; Subalp, Alp

POLYPODIACEAE

Polypodium vulgare L.; R-L; Holarct; Subalp, Alp

THELYPTERIDACEAE

Oreopteris limbosperma (All.) Holub; Alt; Holarct; Subalp
Phegopteris connectilis (Michx.) Watt ; R-L; Holarct; Subalp

WOODSIACEAE

Woodsia alpina (Bolt.) S.F. Gray; R-L, Pr; Holarct; Subalp, Alp
W. fragilis (Trev.) Moore; R-L; Europ; Subalp

SPERMATORHYTA

GYMNOSPERMAE

CUPRESSACEAE

Juniperus hemysphaerica C. Presl; Subalp. Shr; Cauc-As.Min; Subalp
J. oblonga Bieb. ; Subalp. Shr; Cauc-As Min; Subalp, Alp
J. sabina L.; Subalp. Shr; Palearct; Subalp, Alp

PINACEAE

Pinus sosnowskyi Nakai; Subalp. Tr; Cauc-As Min; Subalp

ANGYOSPERMAE

DICOTYLEDONEAE

ACERACEAE

Acer campestre L.; Subalp.Tr; Palearct; Subalp
A. trautvetteri Medw.; Subalp.Tr; Cauc-West Asian; Subalp

APIACEAE

Agasyllis latifolia (Bieb.) Boiss.; Pr; Cauc; Subalp
Angelica sylvestris L.; Alt; Europ; Subalp
A. tatianae Bordz.; Alt; Cauc; Subalp
Anthriscus ruprechtii Boiss.; R-L; Cauc; Subalp
Astrantia maxima Pall.; Pr; Cauc-As Min; Subalp
Bupleurum nordmannianum Ledeb.; R-L; Cauc-As Min; Subalp, Alp
B. polyphyllum Ledeb.; Pr; Cauc-West asian; Subalp, Alp
Carum carvi L.; Pr; Palearct; Subalp, Alp
C. meifolium (Bieb.) Boiss.; Pr; Cauc-As Min; Subalp, Alp

Chaerophyllum aureum L.; Pr, Alt; Europ- Medit; Subalp
C. bulbosum L.; Pr-alp, Pr; Cauc-As Min; Subalp, Alp
C. humile Stev.; R-L; Cauc; Subalp
C. roseum Bieb.; Pr; Cauc; Subalp, Alp
Chamaesciadum acaule (Bieb.) Boiss.; Pr-alp, R-L; Cauc-West Asian; Alp
Eleutherospermum cicutarium (Bieb.)Boiss.; Pr; Cauc-As Min; Subalp
Heraclium asperum (Hoffm.) Bieb.; Alt; Eucauc: centr. et o.gr. cauc; Subalp
H. leskovii Grossh.; R-L; Eucauc; Subalp
H. roseum Stev.; Pr; Eucauc; Subalp
H. sosnowskyi Manden.; Alt; Cauc; Subalp
Ligusticum alatum (Bieb.) Spreng.; Alt; Cauc-West Asian; Subalp, Alp
Pastinaca armena Fisch.& C.A.Mey.; Pr; Cauc-As Min; Subalp
Pimpinella rhodantha Boiss.; Pr; Cauc-As..Min; Subalp
Symphyloma graveolens C. A. Mey.; R-L; Eucauc; Alp, Subn

ASTERACEAE

Achillea millefolium L.; Pr; Pancont; Subalp
A. setacea Waldst.& Kit.; Pr; Europ- Medit; Subalp
Aetheopappus caucasicus Sosn.; R-L; Eucauc; Alp
Antennaria caucasica Boriss.; R-L; Cauc-As Min; Alp
Anthemis iberica Bieb.; R-L; Cauc-As Min; Subalp
A. rigescens Willd.; Pr; Cauc-West Asian; Subalp
A. sosnovskyana Fed.; R-L; Eucauc; Subalp, Alp
Artemisia chamaemelifolia Vill.; R-L; Cauc- West Asian; Subalp
A. splendens Willd.; R-L, Pr; Cauc; Subalp
Aster alpinus L.; Pr, R-L; Europ- Medit; Subalp
Carduus adpressus C.A. Mey.; Pr, R-L; Cauc; Subalp, Alp
C. laciniatus Ledeb.; R-L,Pr; Cauc-As Min; Subalp, Alp
Centaurea cheiranthifolia Willd.; Pr, R-L; Cauc-As Min; Subalp, Alp
C. fischeri Schlecht.; Pr, R-L, Alt; Cauc-West.Asian; Subalp, Alp
C. salicifolia Bieb.; Pr; Palearct; Subalp
Cicerbita macrophylla (Willd.)Wallr.; Alt; Cauc; Subalp
C. petiolata (C.Koch) Gagnidze; Alt; Cauc; Subalp
C. prenanthoides (Bieb.) Beauverd; Alt; Colch; Subalp
C. racemosa (Willd.) Beauverd; R-L; Cauc-As Min; Subalp, Alp
Cirsium echinus (Bieb.) Hand.-Mazz.; Pr; Cauc-As Min; Subalp
C. hydrophyloides Charadze; Alt, Pal; Cauc; Subalp
C. ketzkhovelii Charadze; Pr; Eucauc; Subalp
C. macrocephalum C.A.Mey.; R-L; Cauc; Subalp, Alp
C. obvallatum (Bieb.) Fisch.; Pr, Alt; Cauc-As Min; Subalp, Alp
C. osseticum (Adams) Petrak; Alt; Eucauc; Subalp
C. pugnax Somm.& Levier; Pr; Eucauc; Subalp
C. rhizocephalum C.A.Mey.; Pr, Pal; Cauc-As Min; Subalp, Alp
C. simplex C.A. Mey.; Pal, Pr; Cauc-As Min; Subalp, Alp
C. tomentosum C.A.Mey.; R-L, Pr; Eucauc; Subalp
Dolichorrhiza caucasica (Bieb.) Galushko; R-L,Pr; Eucauc; Subalp, Alp
D. renifolia (C.A.Mey.) Galushko; R-L; Eucauc; Subalp
Doronicum macrophyllum Fisch. ex Hornem.; Alt, Pr, Rhod; Medit; Subalp, Alp
D. oblongifilium DC.; Alt, Pr; Cauc-As Min; Subalp

- Erigeron alpinus* L.; Pr, R-L; Medit; Alp, Subn
E. caucasicus Stev.; Pr; Cauc; Subalp, Alp
E. orientalis Boiss.; Pr, R-L; Cauc-West Asian; Subalp, Alp, Subn
E. uniflorus L.; R-L, Pr; Europ-Medit; Alp, Subn
E. venustus Botsch.; Pr, R-L; Cauc; Alp, Subn
Hieracium chlorochromum Sosn. & Zahn; Pr; Eucauc: centr. et o.gr. cauc ; Subalp
H. erithrocarpoides (Litv. & Zahn) Kem.-Nath.; Pr; Cauc; Subalp
H. laevigatum Willd.; Pr; Palearct; Subalp
H. pilosella L.; Pr; Palearct; Subalp
H. prenanthoides Vill.; Pr; Europ; Subalp
H. ruprechtii Boiss.; Pr; Cauc; Subalp
H. sabiniforme (Zahn) Kem.-Nath.; Pr; Europ; Subalp
Inula grandiflora Willd.; Pr; Cauc-As Min; Subalp
I. orientalis Lam.; Pr; Cauc-As Min; Subalp
Jurinea exuberans (Trautv.) Sosn.; R-L; Eucauc; Subalp
J. filicifolia Boiss.; R-L; Eucauc: centr. et o.gr. cauc ; Alp, Subn
Jurinella moschus (Habl.)Bobr.; R-L; Cauc-West Asian; Alp, Subn
J. subacaulis (Fisch. & C.A.Mey.) Jljn; R-L; Cauc-As Min; Alp, Subn
Kemulariella rosea (Stev. ex Bieb.) Tamamsch.; R-L; Cauc; Subalp
Lamyropsis sinuata (Trautv.) M.Dittrich; R-L; Eucauc; Subalp
Lapsana grandiflora Bieb.; Pr; Europ-Medit; Subalp
Leontodon hispidus L.; Pr; Europ-Medit; Subalp, Alp
Ligularia sibirica (L.) Cass.; Pal; Palearct; Subalp
Omalotheca caucasica (Somm. & Levier) Czer.; R-L, Pr; Cauc; Subalp, Alp
O. supina (L.) DC.; R-L, Pr; Holarct; Subalp, Alp, Subn
Petasites albus (L.) Gaertn.; Pal, Alt; Europ-Medit; Subalp
Podospermum alpigenum C. Koch; Pr, Pr-alp; Cauc-West Asian; Subalp, Alp
P. grigorashvili Sosn.; Pr, R-L; Eucauc : o.gr. cauc; Subalp, Alp
P. meyeri C. Koch; Pr, R-L; Cauc; Alp, Subn
Psephellus sosnowskyi Chuchrukidze; Pr; Cauc; Subalp
P. salviifolius Boiss.; Pr; Cauc; Subalp, Alp
Ptarmica biserrata (Bieb.) DC.; Pr, Alt; Cauc-As Min; Subalp, Alp
P. ptarmicifolia (Willd.) Galushko; R-L, Pr; Cauc-As Min; Subalp
Pyrethrum aromaticum Tzvel.; R-L, Pr; Eucauc:o.gr.cauc; Alp, Subn
P. coccineum (Willd.) Worosch.; Pr; Cauc-As Min; Subalp
P. demetrii Manden.; R-L; Eucauc : o.gr. cauc; Subalp
Scorzonera filifolia Boiss.; R-L; Cauc; Subalp, Alp
Senecio kolenatianus C.A. Mey.; Pr; Cauc; Subalp
S. lapsanoides DC.; Pr, R-L; Cauc; Subalp
S. sosnovskyi Sof.; R-L; Eucauc; Alp, Subn
S. taraxacifolius (Bieb.) DC.; R-L, Pr; Cauc-West Asian; Subalp, Alp, Subn
Solidago caucasica Kem-Nath.; Pr; Cauc-As Min; Subalp, Alp
S. virgaurea L. ; Pr; Palearct; Subalp
Taraxacum confusum Schischk. ; Pr; Cauc; Subalp, Alp
T. porphyranthum Boiss.; R-L, Pr; Palearct; Subalp, Alp
T. stevenii DC. ; Pr-alp, R-L; Europ-Medit; Subalp, Alp
Tephroses aurantiaca (Hoppe ex Willd.) Griseb. & Schenk; Pr; Palearct; Subalp
T. cladobotrys (Ledeb.) Griseb. & Shenk; Alt, Pr; Cauc; Subalp
T. karjagini (Sof.) Holub; R-L; Eucauc; Subalp

T. subfloccosa (Schischk.) Gagnidze & Gagua; Alt; Cauc; Subalp
Tragopogon filifolius Rehm. ex Boiss.; Pr; Cauc; Subalp, Alp
T. otschiaurii Kuth.; Pr; Eucauc: o.gr. cauc; Subalp, Alp
T. reticulatus Boiss. & Huet. ; Pr; Cauc-As Min; Subalp, Alp
Tripleurespermum caucasicum (Willd.) Hayek.; Pr-alp, Pr, R-L; Cauc-As Min; Alp, Subn

BETULACEAE

Betula litwinowii Doluch. ; Subalp.Tr; Cauc-As Min; Subalp
B. pendula Roth ; Subalp.Tr; Palearct; Subalp, Alp
B. raddeana Trautv. ; Subalp.Tr; Cauc; Subalp

BORAGINACEAE

Cerinth glabra Mill.; R-L, Pr; As Min-Europ; Subalp, Alp
C. minor L.; R-L, Pr; Medit-West.Asian; Subalp
Myosotis alpestris F.W.Schmidt ; Pr-alp, Pr; Holarct; Subalp, Alp, Subn
M. caespitosa K.F. Schultz ; Pr, Pal; Pancont; Subalp
M. sparsiflora Pohl ; Pr; Palearct; Subalp
Nonea versicolor (Stev.) Swett ; Pr; Cauc-West Asian; Subalp
Symphytum asperum Lepech.; Alt, Pal; Cauc-As Min; Subalp
Trigonocaryam involucreatum (Stev.)Kusn.; R-L; Eucauc; Subalp, Alp

BRASSICACEAE

Alliaria brachycarpa Bieb.; R-L; Eucauc; Subalp, Alp, Subn
Alyssum murale Waldst.& Kit ; Pr; Medit-West Asian; Subalp
A. trichostachyum Rupr.; R-L, Pr; Eux; Subalp
Arabis caucasica Schlecht.; R-L; Medit; Subalp
Barbarea ketzkhoveli Mardalesjshvili; R-L; Eucauc: centr. et o.gr. cauc; Subalp, Alp, Subn
Cardamine impatiens L.; Pal, Pr; Palearct; Subalp
C. pectinata Pall.ex DC. ; Pr, Pal; Cauc-West Asian; Subalp
C. uliginosa Bieb.; Pal, Pr; Cauc-West Asian; Subalp, Alp
Dentaria bipinnata C.A. Mey.; R-L; Cauc; Alp, Subn
D. microphylla Willd.; R-L; Eucauc; Alp, Subn
Draba bryoides DC.; R-L; Eucauc; Subalp, Alp
D. hispida Willd.; R-L; Cauc-As Min; Subalp
D. nemorosa L.; R-L; Holarct; Subalp
D. sibirica (Pall.) Thell.; R-L; Palearct; Subalp, Alp, Subn
D. siliquosa Bieb.; R-L; Cauc-West Asian; Alp, Subn
D. supranivalis Rupr.; R-L; Eucauc; Alp, Subn
Erysimum ibericum (Adams) DC.; R-L; Cauc; Subalp, Alp, Subn
E. subnivale Prima; R-L; Eucauc: o. gr. cauc; Alp, Subn
Eunomia rotundifolia C.A. Mey.; R-L; Cauc; Subalp, Alp, Subn
Hesperis matronalis L.; Alt, Pr; Palearct; Subalp
H. voronovii N.Busch; Pr, R-L; Cauc-As Min; Subalp
Murbeckiella huetii (Boiss.) Rothm.; R-L; Palearct; Alp, Subn
Pseudovesicaria digitata (C.A.Mey.)Rupr.; R-L; Eucauc-Cauc Min; Alp, Subn
Sisymbrium erucastrifolium (Rupr.)Trautv.; R-L; Eucauc; Subalp
S. irio L.; Pr; Palearct; Subalp
Sobolewskia caucasica (Rupr.) N.Busch; R-L; Cauc; Subalp

CAMPANULACEAE

- Asyneuma campanuloides* (Bieb.ex Sims) Bornm.; Pr; Cauc; Subalp, Alp
Campanula alliarifolia Willd.; Pr; Cauc-West.Asian; Subalp
C. argunensis Rupr.; R-L; Eucauc: o. gr. cauc; Subalp, Alp
C. aucheri A. DC.; Pr, R-L; Eucauc: o. gr. cauc; Subalp, Alp
C. bellidifolia Adams; R-L; Eucauc; Subalp, Alp
C. biebersteini Schult.; Pr-alp, R-L; Cauc-As Min; Subalp, Alp, Subn
C. charadzeae Grossh.; R-L; Eucauc; Subalp
C. ciliata Stev.; R-L; Cauc; Subalp, Alp
C. collina Sims; Pr; Cauc-West Asian; Subalp, Alp
C. cordifolia C.Koch; Pr; Cauc; Subalp
C. doluchanovii Charadze; R-L; Eucauc: centr. et o. gr.cauc; Subalp, Alp
C. elatior (Fomin) .Grossh.; R-L, Pr; Eucauc; Subalp
C. hohenackeri Fisch. & C.A. Mey.; R-L; Cauc-West Asian; Subalp
C. latifolia L.; Alt, Pr; Palearct; Subalp
C. ochroleuca Kem-Nath.; R-L, Pr; Cauc; Subalp, Alp
C. petrophila Rupr.; R-L; Eucauc; Subalp, Alp
C. rapunculoides L.; R-L, Pr; Palearct; Subalp
C. sarmatica Ker-Gawl.; R-L; Eucauc; Subalp
C. saxifraga Bieb.; R-L; Eucauc; Subalp, Alp
C. stevenii Bieb.; Pr; Cauc-West Asian; Subalp, Alp
C. trautvetteri Grossh.ex Fed.; Pr; Cauc-As Min; Subalp, Alp
Gadellia lactiflora (Bieb.) Schulkin; Alt, Pr; Cauc-As Min; Subalp

CARYOPHYLLACEAE

- Arenaria rotundifolia* Bieb.; R-L, Pr; Medit; Subalp
A. serpyllifolia L.; Pr, R-L; Holarct; Subalp
Cerastium arvense L.; Pr; Holarct; Subalp, Alp
C. hemschincicum Schischk.; Pr, Alt; Cauc-West Asian; Subalp
C. kasbek Parott; R-L; Eucauc; Subalp
C. multiflorum C.A. Mey.; R-L; Eucauc; Subalp, Alp
C. polymorphum Rupr.; R-L; Eucauc; Subalp, Alp, Subn
C. purpurascens Adams; Pr-alp, Pr; Cauc; Subalp, Alp, Subn
C. salavaticum Rupr.; R-L; Eucauc; Subalp, Alp, Subn
Dianthus caucaseus Smith; Pr; Eucauc; Subalp, Alp
D. cretaceus Adams; Pr, R-L; Cauc; Subalp
D. dagestanicus Charadze; R-L, Pr; Eucauc; Subalp
D. ruprechtii Schischk.; Pr; Eucauc; Subalp
Dichodon cerastoides (L.) Reichenb.; Pr-alp, R-L; Holarct; Subalp, Alp, Subn
Eremogone lychnidea (Bieb.) Rupr.; R-L, Pr-alp; Cauc-As Min; Subalp, Alp, Subn
Gypsophila elegans Bieb.; R-L; Cauc-West Asian; Subalp
G. tenuifolia Bieb.; R-L; Cauc-As Min; Subalp, Alp
Herniaria caucasica Rupr.; R-L; Palearct; Subalp, Alp, Subn
Melandrium album (Mill.) Garcke; Pr; Holarct; Subalp
Minuartia aizoides (Boiss.) Bornm.; Pr-alp, R-L; Cauc-As Min; Subalp, Alp
M. biebersteinii (Rupr.) Schischk.; R-L; Eucauc; Subalp
M. buschiana Schischk.; R-L; Eucauc; Subalp, Alp
M. circassica (Albov) Woronow; Pr-alp, R-L; Cauc-West Asian; Subalp, Alp, Subn
M. imbricata (Bieb.) Woronow; R-L; Cauc-West Asian; Subalp, Alp

M. inamoena (C.A. Mey.) Woronow; R-L; Cauc; Subalp, Alp
M. oreina (Mattf.) Schischk.; Pr-alp, R-L; Cauc-West Asian; Subalp, Alp, Subn
M. verna (L.) Hiern.; R-L; Palearct; Alp
Oberna lacera (Stev.) Ikonn.; R-L; Eucauc; Subalp, Alp
O. multifida (Adams) Ikonn.; Pr, Alt; Cauc-As Min; Subalp
O. wallichiana (Klotzsch) Ikonn.; Pr; Cauc-West Asian; Subalp
Petrorhagia saxifraga (L.) Link; R-L; Cauc-As Min; Subalp
Sagina procumbens L.; Pr, R-L; Pancont; Subalp
S. saginoides (L.) karst.; Pr, Pal; Holarct; Subalp
Silene caucasica (Bunge) Boiss.; Pr, R-L; Eucauc: o. gr. cauc; Subalp, Alp
S. humilis C. A. Mey.; R-L; Eucauc; Subalp, Alp, Subn
S. italica (L.) Pers.; Pr; Medit-West Asian; Alp
S. linearifolia Otth; R-L; Eucauc; Alp, Subn
S. lychnidea C. A. Mey.; R-L; Eucauc: centr. cauc; Alp, Subn
S. pygmaea Adams; R-L; Eucauc; Subalp, Alp
S. ruprechtii Schischk; R-L, Pr; Cauc-As-min; Subalp, Alp
Stellaria anagalloides C. A. Mey.; Pr; Cauc; Subalp

CRASSULACEAE

Pseudorosularia pilosa (Bieb) Gurgenzidze; R-L; As Min-Cauc; Subalp, Alp
Sedum acre L.; R-L; Holarct; Subalp, Alp
S. annuum L.; R-L; Medit-Europ; Subalp
S. caasicum (Grossh.) Boriss.; R-L; Cauc-As Min; Subalp
S. gracile C.A. Mey.; R-L; Cauc-As Min; Subalp
S. hispanicum L.; R-L; Medit-West Asian; Subalp, Alp
S. involucreatum Bieb.; R-L; Cauc; Subalp, Alp
S. oppositifolium Sims.; R-L; Cauc-West Asian; Subalp
S. pallidum Bieb.; R-L; Medit-West Asian; Subalp
S. stevenianum Rouy & Camus; R-L; Cauc-Medit-As.Min; Subalp
S. stoloniferum S.G. Gmel.; R-L; Cauc-As Min; Subalp
S. tenellum Bieb.; R-L; West.As -Cauc; Subalp, Alp, Subn
Sempervivum caasicum Rupr.; R-L; Cauc; Subalp, Alp
S. pumilum Bieb.; R-L; Cauc; Subalp, Alp

DIPSACACEAE

Cephalaria gigantea (Ledeb.) Bobr.; Alt, Pr; Cauc; Subalp, Alp
Knautia montana (Bieb.) DC.; Alt, Pr; Cauc; Subalp
Scabiosa bipinnata C. Koch; Pr; Cauc-As Min; Subalp, Alp
S. caucasica Bieb.; Pr; Cauc-As Min; Subalp, Alp
S. owerinii Boiss.; Pr; Eucauc: o. gr. cauc; Alp

EMPETRACEAE

Empetrum caasicum Juz.; Rhod; Cauc-As Min; Subalp, Alp

ERICACEAE

Rhododendron caasicum Pall.; Rhod; Cauc-As Min; Subalp, Alp
R. luteum Sweet; Subalp.Shr; Europ-Medit-Cauc; Alp

EUPHORBIACEAE

- Euphorbia glaberrima* C. Koch; Pr; Cauc; Subalp
E. macroceras Fisch.& C.A. Mey.; Alt; Cauc; Subalp
E. oblongifolia (C.Koch) C. Koch; Pr, R-L; Cauc-As Min; Subalp, Alp
E. squamosa Willd.; Pr; Cauc-As Min; Subalp

FABACEAE

- Amoria ambigua* (Bieb.) Sojak; Pr, R-L; Cauc-As Min; Subalp, Alp
A. ruprechtii (Tamamsh.& Fed.) Roskov ; Pr, R-L; Holarct; Subalp, Alp
Anthyllis macrocephala Wend.; Pr; Europ; Subalp, Alp
A. variegata Boiss. ex Groossh.; Pr; Cauc-As Min; Subalp, Alp
Astracantha denudata (Stev.) Podlech; R-L; Cauc-As.Min; Subalp
Astragalus alpinus L.; R-L; Europ; Subalp, Alp
A. brachytropis (Stev.) C. A. Mey.; Pr, R-L; Cauc; Alp, Subn
A. captiosus Boriss.; Pr, R-L; Eucauc; Subalp
A. chordorrhizus Fisch. & Bunge; R-L, Pr; Eucauc; Subalp, Alp
A. kazbekii A. Charadze; R-L; Eucauc; Subalp, Alp
A. ketzkhoveli A.Charadze ; Pr,R-L; Cauc; Subalp
A. levieri Freyn ex Somm. & Levier; R-L; Cauc; Alp
A. oreades C. A. Mey.; R-L; Cauc-As Min; Subalp, Alp
A. supinus Bunge; R-L; Eucauc; Subalp, Alp
Gelega orientalis Lam.; Pr; Cauc; Subalp
Hedysarum caucasicum Bieb.; Pr, R-L; Eucauc; Subalp, Alp
Lathyrus aureus (Stev.) Bransza; Pr; Holarct; Subalp
L. cyaneus (Stev.) C. Koch; Pr; Cauc-As Min; Subalp
L. pratensis L.; Pr; Holarct; Subalp
Lotus caucasicus Kuprian. ex Juz.; Pr, R-L; Cauc; Subalp, Alp
Medicago glutinosa Bieb.; Pr; Eucauc; Subalp
M. lupulina L.; Pr; Holarct; Subalp
Melilotus officinalis (L.) Pall.; Pr; Pancont; Subalp
Onobrychis bieberscheini Sirj.; Pr; Cauc; Subalp
Oxytropis cyanea Bieb.; R-L; Cauc-As Min; Subalp, Alp
O. dasypoda Rupr. ex Boiss.; R-L; Eucauc; Subalp, Alp
Trifolium campestre Schreb.; Pr; Medit-As Min; Subalp
T. canescens Willd.; Pr; Cauc-As Min; Subalp, Alp
T. pratense L.; Pr; Holarct; Subalp
T. spadiceum L.; Pr, Pal; Palearct; Subalp, Alp
T. trichocephalum Bieb.; Pr; Cauc-West Asian; Subalp, Alp
Vavilova formosa (Stev.) Fed.; R-L; Cauc-As Min; Alp
Vicia abbreviata Fish. & Spreng; Pr; Europ-West Asian; Subalp
V. alpestris Stev.; Pr; Cauc-As Min; Subalp, Alp
V. balansae Boiss.; Pr; Cauc-As Min; Subalp
V. grossheimii Ekvtim.; Pr; Cauc; Subalp, Alp
V. sepium L.; Pr; Palearct; Subalp
V. sosnowskyi Ekvtim.; Pr; Eucauc; Subalp

FAGACEAE

- Quercus macranthera* Fisch.& C. A. Mey. ex Hohen.; Arb; Cauc-West Asian; Subalp, Alp

FUMARIACEAE

- Corydalis alpestris* C.A. Mey.; R-L, Pr; Medit-West. As; Alp, Subn
C. conorhiza Ledeb.; R-L, Pr; Cauc-As Min; Alp
C. emanuelii C. A. Mey.; R-L, Pr; Eucauc; Subalp, Alp

GENTIANACEAE

- Gentiana angulosa* Bieb.; Pr, Pr-alp; Cauc-West Asian; Subalp, Alp
G. aquatica L.; Pr; Cauc-West Asian; Subalp, Alp
G. cruciata L.; Pr; Palearct; Subalp
G. septemfida Pall.; Pr; Cauc-As Min; Subalp, Alp
Gentianella biebersteinii (Bunge) Holub.; Pr, Pr-alp; Cauc-As Min; Subalp, Alp, Subn
G. caucasea (Lodd. ex Sims) Holub.; Pr, R-L; Cauc-West Asian; Subalp, Alp, Subn
Gentianopsis blepharophora (Bordz.) Galushko; Pr; Cauc-As Min; Subalp, Alp
Lomatogonium carinthiacum (Wulf) Reichenb.; Pr; Palearct; Subalp, Alp
Swertia iberica Fisch. & C. A. Mey.; Pal, Pr; Cauc-As Min; Subalp, Alp

GERANIACEAE

- Geranium gymnocaulon* DC.; Pr, Rhod; Cauc-As Min; Subalp, Alp
G. ibericum Cav.; Pr; Cauc-West Asian; Subalp, Alp
G. kemulariae Charadze; Pr; Cauc; Subalp
G. platypetalum Fisch. & C.A. Mey.; Pr; Cauc-West Asian; Subalp
G. pyrenaicum Burm.; Pr; Medit-Europ; Subalp
G. robertianum L.; Pr; Holarct; Subalp, Alp
G. ruprechtii (Woronow) Grossh.; Pr; Cauc; Subalp, Alp
G. sylvaticum L.; Pr; Palearct; Subalp

GROSSULARIACEAE

- Ribes alpinum* L.; Fr; Palearct; Subalp
R. biebersteinii Berl. ex DC.; Fr; Cauc-West Asian; Subalp

HELLEBORACEAE

- Aconitum confertiflorum* (DC.) Gayer; Alt, Pr; Europ-Medit; Subalp
A. nasutum Fisch.ex Reichenb.; Alt; Cauc; Subalp
A. orientatale Mill.; Alt; Cauc-As Min; Subalp
A. tuscheticum (N. Busch) N. Busch.; Pr, Alt; Eucauc; Subalp
Aquilegia caucasica Bieb.; Pr; Cauc; Subalp, Alp
Caltha palustris L.; Pal, Pr; Holarct; Subalp, Alp
C. polypetala Hochst.; Pal, Pr; Cauc-West Asian; Subalp, Alp
Delphinium caasicum C.A. Mey.; R-L; Eucauc; Alp, Subn
D. speciosum Bieb.; Alt; Eucauc; Subalp, Alp
Trollius ranunculinus (Smith) Stearn; Pal, Pr; West Asian-Cauc; Subalp

HYPERICACEAE

- Hypericum hirsutum* L.; Pr; Palearct; Subalp, Alp
H. linarioides Bosse; Pr; Medit; Subalp, Alp
H. montanum L.; Pr; Europ-Medit; Subalp
H. perforatum L.; Pr; Holarct; Subalp
H. ptarmicifolium Rupr.; Pr, R-L; Medit; Subalp, Alp

LAMIACEAE

- Ajuga genevensis* L.; Pr, R-L; Palearct; Subalp, Alp, Subn
A. orientalis L.; Pr, R-L; Medit; Subalp, Alp
Betonica macranta C. Koch; Pr; Cauc-As Min; Subalp, Alp
B. ossetica (Bornm.) Chinth.; R-L; Eucauc; Subalp, Alp
Dracocephalum austriacum L.; Pr; Palearct; Subalp
Lamium tomentosum Willd.; R-L; Cauc- As Min; Alp, Subn
Nepeta biebersteiniana (Trautv.) Pojark.; R-L; Eucauc; Subalp
N. grandiflora Bieb.; Pr, Alt; Europ; Subalp
N. supina Stev.; R-L; Cauac-As Min; Subalp
Prunella vulgaris L.; Pr; Pancont; Subalp, Alp
Scutellaria leptostegia Juz.; R-L; Eucauc; Subalp, Alp
S. raddeana Juz.; Pr; Eucauc; Subalp
Stachys balansae Boiss.& Kotschy.; Pr; Medit; Subalp
S. spectabilis Choisy & DC.; Pr; Cauc-West Asian; Subalp
Thymus caucasicus Willd.ex Ronn.; R-L; Cauc; Subalp, Alp
T. nummularius Bieb.; R-L; Eucauc; Subalp, Alp
Ziziphora puschkinii Adams; R-L; Cauc; Subalp, Alp

LINACEAE

- Linum hypericifolium* Salisb.; Pr; Cauc-As Min; Subalp, Alp

LYTHRACEAE

- Lythrum salicaria* L.; Pal, Pr; Pancont; Subalp

ONAGRACEAE

- Chamaenerion angustifolium* (L.) Holub; Pr, Alt; Holarct; Subalp, Alp
C. dodonaei (Vill.) Holub; R-L, Pr; Europ-Medit; Subalp
Epilobium algidum Bieb.; Pr, R-L, Pal; As Min-Cauc; Subalp, Alp
E. anagallidifolium Lam.; R-L, Pr, Pal; Palearct; Subalp, Alp
E. gemmascens C.A. Mey.; Pr, R-L, Pal; Cauc-As Min; Subalp, Alp

OXALIDACEAE

- Oxalis acetosella* L.; Rhod, Pr; Holarct; Subalp

PAPAVERACEAE

- Papaver fugax* Poir.; R-L; Cauc-As Min; Subalp, Alp
P. oreophilum Rupr.; R-L; Eucauc; Subalp, Alp

PLANTAGINACEAE

- Plantago lanceolata* L.; Pr; Holarct; Subalp
P. saxatilis Bieb.; R-L, Pr; Medit; Subalp, Alp, Subn

POLYGALACEAE

- Polygala alpicola* Rupr.; Pr; Cauc-As Min; Subalp, Alp
P. ameonissima S. Tamamsch; Pr; Eucauc; Subalp
P. transcaucasica Tamamsch.; Pr; Cauc-As Min; Subalp

POLYGONACEAE

- Bistorta carnea* (C. Koch.) Kom; Pr, Rhod; Medit; Subalp, Alp
B. vivipara (L.) S.F. Gray ; Pr; Holarct; Subalp
Oxyria digina (L.) Hill.; R-L; Palearct; Subalp, Alp, Subn
Polygonum alpinum All.; Pr; Cauc-West Asian; Subalp, Alp
Rumex acetosa L. ; Pr; Holarct; Subalp
R. acetosella L.; Pr; Palearct; Subalp, Alp
R. alpinus L.; Alt, Pr; Europ-Medit; Subalp, Alp

PRIMULACEAE

- Androsace albana* Stev.; R-L, Pr; Cauc-As Min; Subalp, Alp
A. villosa L.; R-L, Pr; Holarct; Subalp, Alp
Lysimachia verticillaris Spreng.; Pr; Cauc-As Min; Subalp
Primula algida Adams; Pr-alp, Pr, R-L; Palearct; Subalp, Alp
P. amoena Bieb.; Pr; Cauc; Subalp, Alp
P. auriculata Lam.; Pal, Pr; Cauc-West Asian; Subalp, Alp
P. bayernii Rupr.; R-L; Eucauc; Alp, Subn
P. cordifolia Rupr.; Pr; Cauc; Subalp
P. farinifolia Rupr.; R-L; Eucauc; Subalp
P. luteola Rupr.; R-L; Eucauc; Subalp
P. macrocalyx Bunge; Pr; Cauc-West Asian; Subalp
P. meyeri Rupr.; R-L, Pr; Eucauc: o. gr. cauc; Subalp, Alp, Subn
P. ruprechtii Kusn.; Pr, R-L; Cauc; Subalp, Alp

PYROLACEAE

- Pyrola minor* L.; Rhod; Palearct; Subalp
P. rotundifolia L.; Rhod; Holarct; Subalp

RANUNCULACEAE

- Anemonastrum fasciculatum* (L.) Holub; Pr; Cauc-West Asian; Subalp, Alp
A. speciosum (Adams ex G. Pritz.) Galushko; Pr, R-L; Cauc; Subalp
Anemonoides caucasica (Rupr.) Holub; Pr; Cauc-West Asian; Subalp, Alp
Pulsatilla albana (Stev.) Bercht.& Presl; Pr, R-L; Eucauc; Subalp, Alp
P. violacea Rupr.; R-L, Pr; Eucauc; Subalp, Alp
Ranunculus baidarae Rupr.; Pr; Cauc; Subalp
R. brachylobus Boiss. & Hohen.; Pr, R-L; Cauc-West Asian; Subalp, Alp
R. caucasicus Bieb.; Pr; Cauc; Subalp, Alp
R. crassifolius (Rupr.) Grossh.; Pr; Cauc; Subalp, Alp
R. grandiflorus L.; Pr; Cauc; Subalp, Alp
R. oreophilus Bieb.; Pr-alp, R-L; Eucauc; Subalp, Alp, Subn
R. osseticus Ovcz.; Pr; Eucauc; Subalp
R. tebulossicus Prima; R-L; Eucauc: o. gr. cauc; Alp, Subn
Thalictrum alpinum L.; R-L, Pr; Palearct; Subalp, Alp
T. buschianum Kem.-Nath.; R-L, Pr; Cauc; Subalp, Alp
T. foetidum L.; R-L, Pr; Europ-Medit; Subalp, Alp

RHAMNACEAE

- Rhamnus depressa* Grub.; Fr; Eucauc: centr. et o. gr. cauc; Subalp, Alp

ROSACEAE

- Alchemilla caucasica* Bus.; R-L, Pr; Cauc-As Min; Subalp, Alp
A. debilis Juz.; R-L; Cauc; Alp, Subn
A. divaricans Bus.; Pr; Cauc; Subalp, Alp
A. erythropoda Juz.; Pr; Medit; Subalp, Alp
A. retinervis Bus.; R-L, Pr; Cauc-As Min; Subalp, Alp
A. sericata Reichenb. ex Bus.; R-L, Pr; Cauc-As Min; Subalp, Alp
A. sericea Willd.; R-L; Cauc-West Asian; Alp, Subn
Comarum palustre L.; Pal, Pr; Palearct; Subalp
Dryas caucasica Juz.; R-L, Rhod; Eucauc; Subalp, Alp
Potentilla adscharica Somm. & Levier; Pr; Cauc-West Asian; Subalp
P. caucasica Juz.; Pr; Cauc; Subalp
P. crantzii (Grantz.) G.Beck ex Fritsch; R-L; Palearct; Subalp, Alp
P. gelida C. A. Mey.; R-L, Pr; Palearct; Alp, Subn
P. ruprechtii Boiss.; Pr; Cauc-As Min; Subalp, Alp
Rosa boissieri Crep.; Subalp. Shr; Europ-Medit; Subalp
R. buschiana Chrshan.; Subalp. Shr; Cauc; Subalp, Alp
R. mollis Smith; Subalp. Shr; Europ-Medit; Subalp
R. oplisthes Boiss.; Subalp. Shr; Eucauc; Subalp
R. pulverulenta Bieb.; Subalp. Shr; Cauc-As Min; Subalp
R. tuschetica Boiss.; Subalp. Shr; Eucauc; Subalp, Alp
Rubus saxatilis L.; Subalp. Shr; Holarct; Subalp, Alp
Sibbaldia parviflora Willd.; Pr-alp, R-L; Cauc-As Min; Subalp, Alp, Subn
S. semiglabra C. A. Mey.; Pr-alp, R-L; Cauc-As Min; Alp, Subn
Sorbus caucasigena Kom. ex Gatsch.; Subalp. Tr; Cauc; Subalp, Alp
Spiraea hypericifolia L.; Subalp.Tr; Palearct; Subalp

RUBIACEAE

- Asperula albobii* Manden.; R-L; Eucauc; Subalp, Alp
A. kemulariae Manden.; R-L; Eucauc; Subalp, Alp
A. prostrata (Adams) C. Koch; R-L; Cauc-West Asian; Subalp
Cruciata coronata (Sibth. & Smith) Ehrend.; R-L; Cauc. As. Min; Alp, Subn
C. laevipes Opiz ; Pr, R-L; Europ-Medit; Subalp
Galium mollugo L.; Pr; Europ-Medit; Subalp
G. valantoides Bieb.; R-L; Cauc; Subalp
G. verum L.; Pr; Holarct; Subalp

SALICACEAE

- Populus tremula* L.; Subalp. Tr; Palearct; Subalp
Salix caprea L.; Subalp.Tr; Palearct; Subalp
S. kazbekensis A. Skvorts.; Subalp. Shr; Cauc; Alp, Subn
S. kuznetzowii Laksch.; Subalp.Tr; Eucauc; Subalp, Alp

SANTALACEAE

- Thesium alpinum* L.; Pr, R-L; Europ; Subalp, Alp

SAXIFRAGACEAE

- Saxifraga cartilaginea* Willd.; R-L; Cauc-West Asian; Subalp, Alp

- S. exarata* Vill.; R-L; Europ-Medit; Subalp, Alp, Subn
S. flagellaris Willd. ex Sternb.; Pr, R-L; Holarct; Alp, Subn
S. juniperifolia Adams; R-L; Cauc; Subalp, Alp, Subn
S. kolenatiana Regel; R-L; Medit -As Min; Subalp, Alp
S. moschata Wulf.; R-L; Palearct; Subalp, Alp, Subn
S. ruprechtiana Manden.; R-L; Eucauc: centr. et o. gr. cauc ; Alp, Subn
S. sibirica L.; R-L; Eucauc; Subalp, Alp, Subn
S. subverticillata Boiss.; R-L; Eucauc; Subalp, Alp, Subn

SCROPHULARIACEAE

- Euphrasia amblyodonta* Juz.; R-L, Pr; Cauc-As Min; Subalp, Alp
E. caucasica Juz.; Pr; Eucauc; Subalp
E. hirtella Jord. ex Reut.; Pr, R-L; Europ-Medit; Subalp, Alp
E. ossica Juz.; Pr, R-L; Eucauc; Subalp, Alp
E. petiolaris Wettst.; R-L, Pr; Cauc-West Asian; Subalp, Alp
E. woronowii Juz.; R-L; Eucauc; Subalp, Alp
Melampyrum caucasicum Bunge; Pr; Cauc; Subalp
Pedicularis caucasica Bieb.; Pr; Cauc; Subalp, Alp
P. condensata Bieb.; Pr, R-L; Cauc-As Min; Subalp, Alp
P. crassirostris Bunge; Pr-alp, Pr, R-L; Cauc; Alp, Subn
P. eriantha (Boiss. & Buhse) T. N. Pop.; Pr; Cauc; Subalp
P. nordamanniana Bunge; Pr-alp, Pr, R-L; Cauc-As Min; Alp, Subn
Rhinanthus alectorolophus (Scop.) Poll.; Pr; Palearct; Subalp
R. minor L.; Pr; Europ; Subalp
R. schischkini Vass.; Pr; Eucauc; Alp, Subn
Rhynchocorys elephas (L.) Griseb.; Pr, Pal; Cauc-As Min; Subalp, Alp
R. orientalis (L.) Benth.; Pr; Cauc-As Min; Subalp
R. stricta (C. Koch) Albov; Pr; Cauc-As Min; Subalp
Scrophularia lateriflora Trautv.; R-L, Pr; Cauc; Subalp
S. minima Bieb.; R-L; Eucauc; Alp, Subn
S. olympica Boiss.; R-L; Cauc-As Min; Alp, Subn
S. ruprechtii Boiss.; R-L, Pr; Cauc; Alp, Subn
S. scopolii Hoppe ex Pers.; Pr; Palearct; Subalp, Alp
Verbascum pyramidatum Bieb.; Pr; Cauc-As Min; Subalp
V. wilhelmsianum C. Koch; Pr; Eucauc; Subalp
Veronica gentianoides Vahl.; Pr, R-L; Cauc-West Asian; Subalp, Alp, Subn
V. peduncularis Bieb.; Pr, R-L; Cauc-As Min; Subalp
V. petraea (Bieb.) Stev.; Pr; Eucauc; Subalp, Alp
V. schistosa E. Busch; R-L; Eucauc; Alp, Subn
V. telephifolia Vahl; R-L; Eucauc; Alp, Subn

THYMELAEACEAE

- Daphne glomerata* Lam.; Fr,Pr; Cauc-West Asian; Subalp, Alp
D. mezereum L.; Fr,Pr; Europ-Medit; Subalp

VACCINIACEAE

- Vaccinium myrtillus* L.; Rhod; Holarct; Subalp, Alp
V. vitis-idaea L.; Rhod; Holarct; Subalp, Alp

VALERIANACEAE

- Pseudobetekea caucasica* (Boiss.) Lincz.; R-L; Eucauc; o. gr. cauc
Valeriana alpestris Stev.; Pr, R-L; Cauc-As Min; Subalp, Alp
V. cardamines Bieb.; R-L; Eucauc; Subalp, Alp
V. officinalis L.; Pr; Palearct; Subalp
V. saxicola C. A. Mey.; R-L; Eucauc; Alp, Subn
V. tiliifolia Troistzk.; Alt; Cauc; Subalp

VIOLACEAE

- Viola caucasica* Kolenati; R-L; Palearct; Subalp, Alp
V. minuta Bieb.; R-L; Cauc; Alp, Subn
V. oreades Bieb.; R-L; Cauc-As Min; Subalp, Alp
V. ruperstris F. W. Schmidt; R-L; Cauc- Medit; Subalp
V. somchetica C. Koch; R-L; Cauc; Subalp, Alp

MONOCOTYLEDONEAE

ALLIACEAE

- Allium kunthianum* Vved.; Pr, R-L; Cauc; Subalp, Alp
A. szovitsii Regel; Pr; As Min-Cauc; Subalp, Alp
A. victorialis L.; Pr, Rhod; Holarct; Subalp, Alp

AMARYLLIDACEAE

- Galanthus latifolius* Woronow; Pr; Eucauc; Subalp, Alp

CYPERACEAE

- Blysmus compressus* (L.) Panz. ex Link; Pal, Pr; Palearct; Subalp, Alp
Carex buschiorum V. Krecz.; Pal, Pr; Cauc-Europ; Subalp, Alp
C. capillaris L.; Pal, Pr; Holarct; Subalp, Alp
C. cinerea Poll.; Pr; Holarct; Subalp
C. dacica Heuff.; Pal, Pr; Europ-Medit; Subalp, Alp
C. digitata L.; Pr; Palearct; Subalp
C. hartmanii Cajand.; Pr; Europ; Subalp, Alp
C. hirta L.; Pal, Pr; Europ-Medit; Subalp
C. huetiana Boiss.; Pr; Cauc-West Asian; Subalp, Alp
C. humilis Leyss.; Pal, Pr; Palearct; Subalp, Alp
C. kotschyana Boiss. & Hohen.; Pr; Cauc-West Asian; Alp, Subn
C. lachenalii Schkuhr.; Pal, Pr; Holarct; Subalp
C. medwedewii Leskov.; Pr-alp, Pr; Cauc; Alp, Subn
C. meinshauseniana V. Krecz.; Pr; Cauc; Subalp
C. microglochin Wahlenb.; Pal, Pr; Holarct; Subalp
C. micropodioides V Krecz.; Pr; Cauc-As Min; Subalp
C. muricata L.; Pal, Pr; Holarct; Subalp, Alp
C. pallescens L.; Pr; Holarct; Subalp
C. szovitsii V. Kzecz.; Pr; Cauc-As Min; Subalp
C. trisits Bieb.; Pr; Cauc-West Asian; Subalp, Alp
Eriophorum vaginatum L.; Pal, Pr; Palearct; Subalp, Alp
Kobresia macrolepis Meinsh.; Pr; Cauc-As Min; Subalp, Alp
K. schoenoides (C. A. Mey.) Steud.; Pr; Cauc-As Min-West Asian; Subalp, Alp

HYACINTHACEAE

Muscari pallens (Bieb.) Garbari; Pal, Pr; Cauc; Subalp, Alp
Pushkinia sciloides Adams; Pr; Cauc-West Asian; Subalp

IRIDACEAE

Crocus speciosus Bieb.; Pr; Medit; Subalp

JUNCACEAE

Juncus alpigenus C. Koch; Pr, R-L; Medit-As Min; Subalp, Alp
J. articulatus L.; Pal, Pr; Pancont; Subalp
J. bufonius L.; Pr, Pal; Pancont; Subalp
J. effusus L.; Pr, Pal; Palearct; Subalp
Luzula spicata (L.) DC.; Pr, R-L; Holarct; Subalp, Alp, Subn
L. pseudosudetica (Willd.) Schult.; Pr-alp, Pr; Cauc-West Asian; Subalp, Alp, Subn

LILLACEAE

Fritillaria latifolia Willd.; Pr; Cauc; Subalp, Alp
F. lutea Mill.; Pr; Eucauc; Alp, Subn
Gagea anisanthos C. Koch; Pr; Cauc-As Min; Subalp, Alp
G. glacialis C. Koch; Pr, R-L; As Min-Cauc; Subalp, Alp, Subn
Lilium georgicum Manden.; Alt, Pr; Eucauc; Subalp
Lloydia serotina (L.) Reichenb.; Pr; Holarct; Alp, Subn

MELANTHYACEAE

Merendera ghalghana Otschiaurii; Pr; Eucauc; Subalp, Alp
M. raddeana Regel; Pr; Eucauc; Subalp, Alp
Veratrum lobelianum Bernh. ; Alt, Pr; Palearct; Subalp, Alp

ORCHIDACEAE

Coeloglossum viride (L.) C. Hartm.; Pr; Holarct; Subalp, Alp
Dactylohriza amblioloba (Nevski) Aver.; Pr, Pal; Cauc-West Asian; Subalp, Alp
D. euxina (Newski) Czer.; Pr, Pal; Cauc-West Asian; ; ;
Gymnadenia conopsea (L.) R. Br.; Pr; Palearct; Subalp, Alp
Orchis mascula (L.) L.; Pr; Europ-Medit; Subalp
Traunsteinera spaerica (Bieb.) Schlechter; Pr; As Min-Cauc; Subalp

POACEAE

Agrostis planifolia C. Koch; Pr; Cauc-As Min; Subalp, Alp
Alopecurus dasyanthus Trautv.; R-L, Pr; Cauc; Alp, Subn
A. glacialis C. Koch; Pr, R-L; Cauc-As Min; Subalp, Alp
A. tuscheticus Trautv.; R-L; Eucauc; Subalp, Alp
Anthoxanthum odoratum L.; Pr; Holarct; Alp, Subn
Avenella flesuosa (L.) Drej.; Pr; Holarct; Subalp, Alp
Briza elotior Sibth. & Smith.; Pr; Palearct; Subalp
B. marcowiczii Woronow; Pr-alp, Pr; Cauc-As Min; Subalp, Alp, Subn
B. media L.; Pr; Europ-Cauc; Subalp
Bromopsis varirgatus (Bieb.) Holub.; Pr; Cauc; Subalp, Alp, Subn
Calamagrostis arundinacea (L.) Roth.; Pr; Palearct; Subalp

- C. caucasica* Trin.; Pr, R-L; Eucauc; Subalp, Alp
C. pseudophragmites (Hall. fil.) Koel.; Pr, Pal; Palearct; Subalp
Catabrosa aquatica (L.) Beauv.; Pal, Pr; Holarct; Subalp
Catabrosella variegata (Boiss.) Tzvel.; Pr; Cauc-As Min; Subalp, Alp
Colpodium versicolor (Stev.) Schmalh.; Pr-alp, R-L; Cauc; Alp, Subn
Dactylis glomerata L.; Pr; Pancont; Subalp, Alp
Elymus buschianus (Roschev.) Tzvel.; R-L, Pr; Eucauc; Subalp
Festuca arundinacea Schreb.; Pr, Pal; Palearct; Subalp
F. ovina L.; Pr; Palearct; Subalp, Alp
F. pratensis Huds; Pr; Palearct; Subalp
F. supina Schur.; Pr; Palearct; Subalp, Alp, Subn
F. valesiaca Gaudin; Pr; Medit-As Min; Subalp, Alp, Subn
F. woronowii Hack.; Pr; Europ-Medit; Subalp, Alp, Subn
Helictotrichon adzharicum (Albov) Grossh.; Pr; Cauc; Alp, Subn
H. pubescens (Huds.) Pilg.; Pr; Palearct; Subalp, Alp
Hordeum violaceum Boiss. & Huet; Pr; Cauc-West. As.; Subalp, Alp
Melica ciliata L.; R-L; Palearct; Subalp, Alp
Milium effusum L.; Pr; Holarct; Subalp
Nardus stricta L.; Pr; Holarct; Subalp, Alp
Phleum alpinum L.; Pr; Holarct; Subalp, Alp, Subn
P. montanum C. Koch; Pr; As Min-Cauc; Subalp
P. phleoides (L.) Karst.; Pr; Palearct; Subalp
P. pratense L.; Pr, Pal; Palearct; Subalp
Poa alpina L.; Pr. alp, R-L; Holarct; Alp, Subn
P. caucasica Trin.; Pr; Cauc; Subalp, Alp
P. iberica Fisch & Mey; Pr; Cauc; Subalp
Trisetum flavescens (L.) Beauv.; Pr; Palearct; Subalp
T. rigidum (Bieb.) Roem. & Schult.; R-L, Pr; Cauc –West. As; Subalp, Alp