

Floristic and Habitat Diversity of the Trigrad Gorge Protected Area (Central Rhodopes Mts.), Bulgaria

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Abstract. A research was conducted regarding the vascular flora and natural habitats of the Trigrad Gorge Protected area, located in the Central Rhodopes Mts. The taxonomic spectrum of the researched flora includes 203 species, 166 genera and 60 families of vascular plants (including the moss species). Four types of natural habitats and their conservation status were determined: 08H38210. Calcareous rocky slopes with chasmophytic vegetation; 21G1 Supra Mediterranean hop-hornbeams woods; 9150. Medio-European limestone beech forests of the *Cephalanthero-Fagion* and 91EO. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incane*, *Salicion albae*).

Key words: floral analysis, floristic complex, natural habitats, conservation status.

Introduction

Until now, no floristic or phytocenological studies of this natural protected area have been conducted. Still, two local for the Rhodopes endemic species have been found already: *Secale rhodopaeum* Delip. and *Arenaria rhodopaea* Delip. (DELIPAVLOV, 1962; 1964). Additional information about specific plant species of the local flora can also be found in DIMITROV (2006). The Trigrad Gorge Protected area is also a part of the Protected Zone BG 0001030 from NATURA 2000, which is a legislative act for the preservation and protection of plant habitats. The Trigrad Gorge, along with Perelik and Persenk, is included in "Important plant areas in Bulgaria" (SPIRIDONOV *et al.*, 2012). This gorge is an actual refuge, where one can find quite interesting and very rare, endemic and relict

species. Other similar to the Trigrad Gorge areas in the Central Rhodopes mountain are the natural phenomena "The Wonder Bridges" and the protected area "Gyumurdzhinski snezhnik". The aim of this research is to perform a complete inventory of the flora of the natural protected area and to describe the its natural habitats.

Material and methods

Study area

The natural protected area Trigrad Gorge is located in the Veliysko-Videshki part of the Central Rhodopes. This gorge is the third longest one in Bulgaria, right after the Buynovsko Gorge and the gorge of river Erma. The Trigrad Gorge was formed due to the constant erosive effects of the Trigrad river flow. The riverbed has carved the gorge through the local Proterozoic marble

rocks and formed this natural landmark. It was officially given a "Protected Area" status by order № 4021, issued on 06.12.1963 by the Committee of Forestry and Forest industry. This natural protected area was increased to 685.62 ha by order RD-429 from 18.06.2007, issued by the Bulgarian Ministry of Environment and Water (MOEW). The Rhodopes are the oldest piece of land on the Balkan peninsula. Its relatively mild climate allowed over the years for many plant species to survive in refugia during the extreme weather conditions of the Tertiary period and later during the Ice Age of the Quaternary period. The Trigrad Gorge in its

form happens to be such a refugium. The gorge starts from the Osmanov pond and goes on until The Devil's Throat Cave (Fig. 1). Its length is about 2.5 km. The width of the gorge at certain places goes up to 60 m, and depth at some places can reach 350 m. The altitude at Osmanov pond is 950 m, while at the Devil's Throat Cave it goes up to 1180 m. The climate here is continental. The average annual temperature is 5-9°C. The average January temperature is 2,5 °C, while the average temperature during the July is 13-16°C. The biggest rainfalls are during the summer - 125 mm. The snow cover lasts from November until April.

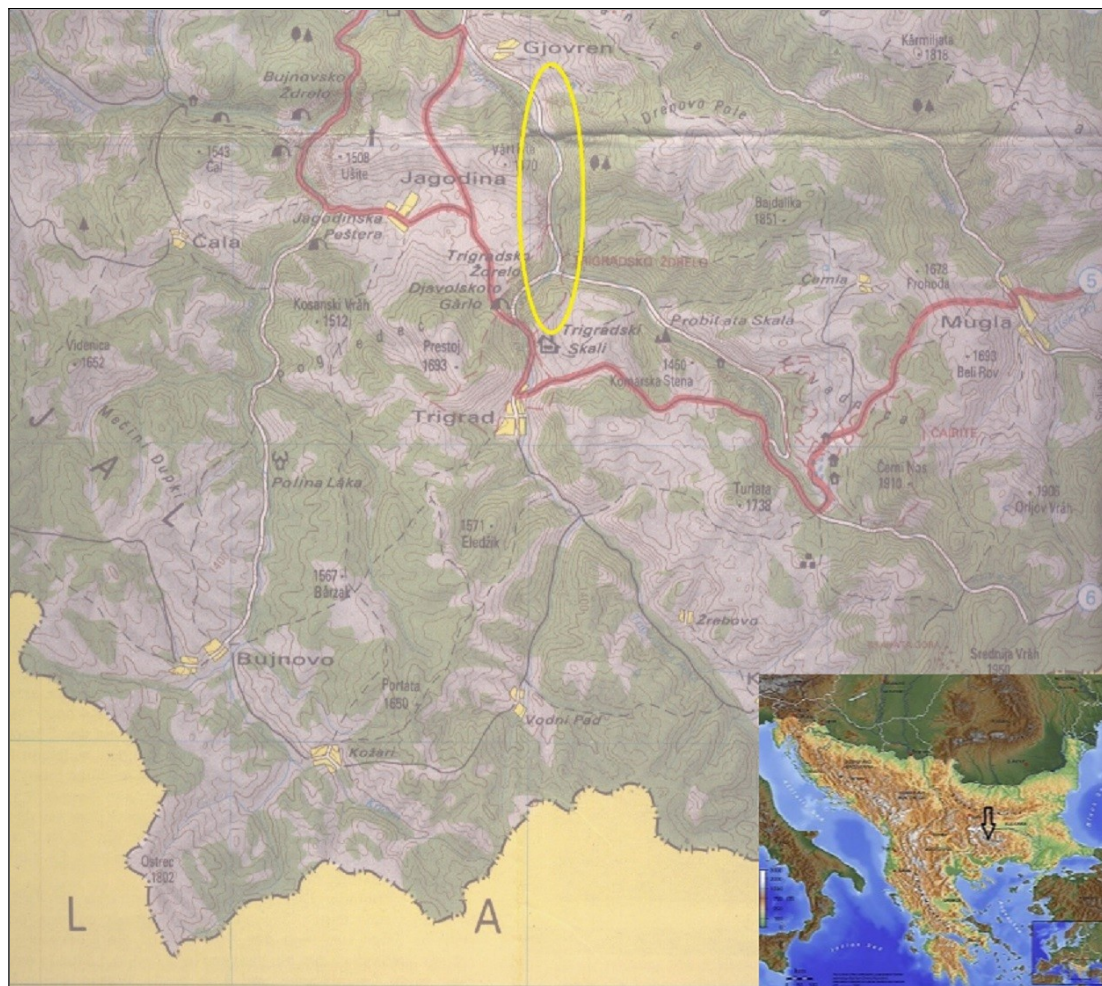


Fig. 1. A map excerpt which outlines the researched area (the research area is marked and circled in yellow). The red line represent the tourist route E 8. The excerpt piece was taken from an official map of the Dospat region in the Western Rhodopes mountain (Scale 1:100,000, issued by Cartography EOOD 1993).

Data sampling and analysis

The research of the flora and natural habitats of the Trigrad Gorge Protected area was performed during several vegetative seasons in the period from 2012 until 2018. The species determination was done according to JORDANOV (1963-1979), KOZUHAROV (1992), DELIPAVLOV & CHESHMEDIJEV (2004), PEEV (2012), TUTIN *et al.* (1964-1980). The transect and trial sites methods were used for the determination of the vegetation in this case. The habitats were determined according to BISSERKOV *et al.* (2015). The geo-elemental composition was analyzed according to ASSYOV & PETROVA (2012). The species category with conservation status was determined according to PETROVA & VLADIMIROV (2009). The protected species status is based on the Law for biological diversity of the republic of Bulgaria. The herbarium specimens have been deposited in the herbarium of the Institute of Biodiversity and Eco Systematic research (SOM).

Results and Discussion

The systematic spectrum of the vascular flora of the Trigrad Protected area includes 60 families, 166 genera and 203 vascular plant species (Appendix 1). The Phylum with the most numerous representatives is Magnoliophyta: 51 families (80.5 %), 153 genera (92.19 %) and 189 species (93.1%). From the Dicotyledonae class - 46 families (76.6 %), 134 genera (80.7 %) and 169 species (83.2 %). From Monocotyledonae - 5 families (8.3 %), 19 genera (11.4 %) and 20 species (9.8 %). Phylum Gymnospermae is represented with 1 family (1.6 %), 3 genera (1.8 %) and 4 species (1.97 %). From Phylum Bryophyta- 2 families (3.2 %), 2 genera 1.2 %) and 2 species (0.98 %). From the Phylum Pteridophyta - 6 families (10 %), 7 genera (4.2 %) and 8 species (3.9 %). Out of the examined families, the ones with the biggest number of species are: Asteraceae (21 species; 10.34 % of the total number of species), Brassicaceae (13; 6.40 %), Lamiaceae (13; 6.40 %), Fabaceae (11; 5.41 %), Poaceae

(11; 5.41 %) and Apiaceae (10; 4.92 %). Other families contain less than 10 species: Caryophyllaceae (9; 4.43 %), Rosaceae (9; 4.43 %), Boraginaceae (6; 2.95 %), Ranunculaceae (6; 2.95 %), Scrophulariaceae (6; 2.95 %), Campanulaceae (5; 2.46 %), Betulaceae (4; 1.97 %), Caprifoliaceae (4; 1.97 %), Crassulaceae (4; 1.97 %), Orchidaceae (4; 1.97 %), Pinaceae (4; 1.97 %), Aspleniaceae (3; 1.47 %), Celastraceae (3; 1.47 %), Geraniaceae (3; 1.47 %), Liliaceae (3; 1.47 %), Salicaceae (3; 1.47 %), Saxifragaceae (3; 1.47 %), Convolvulaceae (2; 0.98 %), Chenopodiaceae (2; 0.98 %), Linaceae (2; 0.98 %), Polygonaceae (2; 0.98 %), Valerianaceae (2; 0.98 %), Violaceae (2; 0.98 %) etc. (Appendix 1).

In comparison, we can take into consideration the flora of Dospat Dere (DIMITROV, 2017), which is comprised of 197 species, 143 genera, 57 families within a territory that has almost the same size as the Trigrad Gorge Protected area.

As per biological type, there are predominantly perennial herbaceous species (132 species; 65 % of the total number of species), followed by annual species (19; 9.3 %), arboreal species (15; 7.38 %), bushes (10; 4.9 %), annual to biennial species (8; 3.9 %), semi bushes (7; 3.4 %), biennial (5; 2.16 %), biennial to perennial species (4; 1.9 %) and annual to perennial species (2; 0.98 %).

Based on the conducted research, the following floristic elements were determined: there are predominantly Submediterranean elements (31 species; 15.27 % of the total number of species), followed by Euro-Asiatic (25; 12.31 %), Euro-Mediterranean (22; 10.83 %), Subboreal (18; 8.86 %), Boreal (16; 7.88 %), Balkan endemites (14; 6.89 %), Euro-Siberian (13; 6.40 %), European (10; 4.92 %), Ponto-Mediterranean (7; 3.44 %), Mediterranean (5; 2.46 %), Bulgarian endemics (5; 2.46 %), Alpo-Carpato-Balcanic (5; 2.46 %), Carpatobalcanic (4; 1.97 %), Euro-Submediterranean (3; 1.47 %), South-Pontic (3; 1.47 %), Balcano-Anatolian (3; 1.47 %), Cosmopolitan (3; 1.47 %), Euro-Orientaloturanian (2; 0.98 %), Balcano-Anatolian (2; 0.98 %), Balcano-Dacian

(2; 0.98 %), Mediterraneo-Orientaloturanian (2; 0.98 %), Appenino-Balcanic (2; 0.98 %), Euro-Southmediterranean (2; 0.98 %). Ponto-Siberian, Ponto-Centralasian, Alpo-Carpato-Balcanic, Ponto-Siberian, Arcto-Alpinic (1; 0.49 %).

The most represented floral elements in the flora of Dospat Dere are Mediterranean species - 34 (17.7 %), Euro-Asian species - 23 (11.6 %), Euro-Mediterranean species - 19 (9.6 %), Pontic-Mediterranean species - 19 (8.1 %) and 10 Balkan species (5.07 %).

The genera represented by the biggest number of species are: *Sedum* (4 species), *Arabis*, *Astragalus*, *Campanula*, *Saxifraga*, *Silene* and *Sorbus* (per 3 species of each).

Tertiary relicts are 16 species: *Abies alba* Mill., *Picea abies* (L.) Carst., *Pinus nigra* Arnold, *P. sylvestris* L., *Acer campestre* L., *Asarum europaeum* L., *Alnus incana* (L.) Moench, *Carpinus betulus* L., *C. orientalis* Mill., *Ostrya carpinifolia* Scop., *Trachelium rumelianum* Hampe, *Tamus communis* L., *Haberlea rhodopensis* Friv., *Populus tremula* L., *Salix alba* L. and *S. caprea* L. Quaternary glacial relicts are two species: *Aster alpinus* L. and *Saxifraga aizoides* L. (ZAHARIEV *et al.*, 2018). Quaternary interglacial relict is *Morina persica* L.

Out of all the determined species, there are 77 (37.9 %) medicinal plants.

Investigated flora of Trigrad Gorge include presence of 5 Bulgarian endemic species: *Arenaria rhodopaea*, *Hieracium kittanae*, *Marrubium friwaldskyjanum*, *Scrophularia bulgarica* and *Secale rhodopaeum* and 13 Balcan endemites: *Campanula jordanovii*, *Campanula orphanidea*, *Carum graecum*, *Chondrilla urumoffii*, *Cirsium appendiculatum*, *Dianthus quadrangulus*, *Haberlea rhodopensis*, *Micromeria dalmatica*, *Scabiosa triniifolia*, *Sesleria achtarovii*, *Sideritis scardica*, *Silene fabarioides* and *Trachelium rumelianum*.

The floristic complex of the flora of Dospat Dere also includes one Bulgarian endemite *Cerastium velenovskyi* and 13 Balkan endemites: *Anthemis macedonica*, *Chondrilla urumoffii*, *Onosma thracica*,

Trachelium rumelianum, *Dianthus cruentus*, *Dianthus drenowskyanus*, *Scabiosa triniifolia*, *Hypericum umbellatum*, *Micromeria dalmatica*, *Linum thracicum*, *Orobanche esulae*, *Festuca penzesii*, *Silene friwaldskyana*. There are 4 common species which can be found both in Dospat Dere and within the Trigrad Gorge Protected area: *Chondrilla urumoffii*, *Trachelium rumelianum*, *Scabiosa triniifolia*, and *Micromeria dalmatica*.

The research has found presence of 17 species with threatened, i.e. conservation status:

Arenaria rhodopaea Delip. EN A1c; B1ab(iv)+ 2ab (iv); C1, (DIMITROV, 2009) BDA, Annex 3

Campanula orphanidea Boiss. EN B1ab(ii,iii)+2ab(ii,iii), (ANCHEV & GORANOVA, 2009), BDA, Annex 3

Sideritis scardica Griseb. EN B1ab(ii,iii,V) +2ab(ii,iii,iv);C2a(i) (EVSTATIEVA, 2009)

Malcolmia orsiniana (Ten.) Ten. subsp.*angulifolia* (Boiss. & Oroph.) Stork EN B2ab(ii,iii);C2a(i), (ANCHEV & GORANOVA, 2009), BDA, Annex 3

Saxifraga aizoides L. EN B1ab(ii,iii) +2ab(ii,iii);C2a(i), (PEEV & TSONEVA, 2009), BDA, Annex 2, 3

Secale rhodopaeum Delip. EN B1ab(iii) +2ab(iii) (VLADIMIROV, 2009), BDA, Annex 3

Orchis militaris L. EN B2ab(ii), (PETROVA, 2009), BDA, Annex 3

Aquilegia nigricans Baumg. VU B1ab (ii,iii,iv,v); C2A (i) (EVSTATIEVA, 2009), BDA, Annex 3

Marrubium friwaldskyjanum Boiss. VU B1ab(iii)+2ab(ii);C2a(i) (MESHINEV, 2009)

Campanula jordanovii Anchev & Kovanda VU B1ab(ii,iii,iv), (ANCHEV & GORANOVA, 2009), BDA, Annex 3

Scrophularia bulgarica (Stoj.) Peev VU B1ab(ii,v)+2ab(ii,v) (PEEV & TSONEVA, 2009)

Kernera saxatilis (L.) Rchb. VU B1ab(ii,iii) +2ab(ii,iii) (GORANOVA & ANCHEV, 2009)

Trachelium rumelianum Hampe VU B1ab(ii,iii,iv), (GORANOVA & ANCHEV, 2009), BDA, Annex 3

Chondrilla urumoffii Degen VU B2ab(ii,iii), (DIMITROVA, 2009; 2015), BDA

Morina persica L. NT (PEEV & TSONEVA 2015), BDA

Haberlea rhodopensis Friv. LC, Bern Convention, (PEEV & TSONEVA, 2009), BDA, Annex 3

Lilium martagon L. BDA, Annex 4

Out of these species, 11 are protected by the Law for Biological Diversity of the republic of Bulgaria (Annexes 2 and 3). Next to *Saxifraga aizoides* L. (from the Annex 2), nine species are reported in Annex 3 - *Arenaria rhodopaea* Delip., *Aquilegia nigricans* Baumg., *Campanula orphanidea* Boiss., *Malcolmia orsiniana* (Ten.) Ten. subsp. *angulifolia* (Boiss. & Orph.) Stork, *Secale rhodopaeum* Delip., *Orchis militaris* L., *Campanula jordanovii* Anchev & Kovanda, *Trachelium rumelianum* Hampe and *Haberlea rhodopensis* Friv. One species - *Lilium martagon* L. is reported in Annex 4.

Thirteen species from the researched flora are reported in the Red Data Book of the republic of Bulgaria, v. 1 Plants and fungi (PEEV *et al.*, 2015): *Arenaria rhodopaea* Delip. EN A1c; B1ab(iv)+2ab(iv); C1 (DIMITROV, 2015a), *Hieracium kittaniae* Vladimir. EN B1ab(iii) (VLADIMIROV, 2015a), *Malcolmia orsiniana* (Ten.) Ten. subsp. *Angulifolia* (Boiss. & Orph.) A. Stork EN B2ab(ii,iii); C2a(i), (ANCHEV & GORANOVA, 2015), *Orchis militaris* L. EN B2ab(iv), (PETROVA, 2015), *Petkovia orphanidea* (Boiss.) Stef. EN B1ab(ii,iii)+ 2ab(ii,iii), (ANCHEV & GORANOVA, 2015), *Saxifraga aizoides* L., EN B1ab(ii,iii)+2ab(ii,iii); C2a(ii), (PEEV & TSONEVA, 2015), *Secale rhodopaeum* Delip. EN B1ab(iii)+2ab(iii), (VLADIMIROV, 2015b), *Sideritis scardica* Griseb. EN B1ab(ii,iii,v)+2ab(ii,iii,iv); C2a(i), (EVSTATIEVA, 2015), *Valeriana montana* L. EN B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v); C2a(i), (EVSTATIEVA, 2015), *Campanula jordanovii* Anchev & Kovanda VU B1ab(ii,iii,iv), (ANCHEV & GORANOVA, 2015), *Chondrilla urumoffii* Degen VU B2ab(ii,iii), (DIMITROVA, 2009; 2015), *Marrubium friwaldskyanum* Boiss. VU B1ab(iii)+2ab(ii); C2a(i), (MESHINEV, 2015), *Trachelium rumelianum* Hampe VU B1ab(ii,iii,iv), (GORANOVA & ANCHEV, 2015).

Four species are also under the protection of the CITES convention: *Cephalanthera rubra* (L.) Rich, *Epipactis helleborine* (L.) Crantz, *Neottia nidus-avis* (L.) Rich and *Orchis militaris* L.

With regards to the flora in Dospat Dere, we managed to establish 15 species with conservation status, 1 endangered species - *Galanthus elwesii* Hook f., 5 species with vulnerable (VU) status: *Chondrilla urumoffii*, *Trachelium rumelianum*, *Romulea bulbocodium*, *Limodorum abortivum* and *Ophrys cornuta*. We also found one species with a least concern (LC) status: e *Lotus aegaeus*.

Further regarding the Dospat Dere flora, we managed to establish 7 species, which are protected by the Bulgarian Biological Diversity Act (BDA, 2002 - Annex 2, 3): *Galanthus elwesii*, *Trachelium rumelianum*, *Romulea bulbocodium*, *Limodorum abortivum*, *Ophrys cornuta*, *Arabis collina* and *Veronica multifida*.

Additionally, there were 3 species found, which have been listed in the Red Data Book of the republic of Bulgaria, v. 1 Plants and fungi (PEEV *et al.*, 2015): *Dianthus drenowskyanus*, *Chondrilla urumoffii* and *Trachelium rumelianum*.

Another 6 species were found, which have been included in the CITES Convention: *Cephalanthera rubra*, *Epipactis atrorubens*, *Limodorum abortivum*, *Ophrys cornuta*, *Orchis coriophora* and *Platanthera chlorantha*.

Regarding the natural habitats here, there are: 08H3 Calcareous rocky slopes with chasmophytic vegetation, 21G1 Supra Mediterranean hop-hornbeam woods, 9150 Medio-European limestone beech forests of the *Cephalanthero-Fagion* and 91EO Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*).

In general, the habitat 08H3 Calcareous rocky slopes with chasmophytic vegetation has a conservation status: vulnerable [VU-A1,2B2 D2 H2 I J] (GUSSEV & RUSSAKOVA,

2015). This habitat is the biggest one in the researched area.

The habitat 21G1 Supra Mediterranean hop-hornbeam woods has a conservation status: vulnerable [VU-A1, B2 C1 D2 E2 F1 G1 H2 I L2]. This habitat has not been reported in the literature (BISSERKOV *et al.*, 2015).

The habitat 9150 Medio-European limestone beech forest of the *Cephalanthero-Fagion* has a conservation status: near threatened [NT-A1, 2B1 C1 D1 E1 F1 G1 H1 I L3], (DIMITROV, 2015b).

The habitat 91EO Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) has a conservation status: vulnerable [VU-A1, 2B1 C1 D2 E2 F1 G1 H1 J L2], (DIMITROV & TASHEV, 2015).

There are 3 natural habitats, which are common for both Dospat Dere and Trigrad Gorge areas: 08H3 Calcareous rocky slopes with chasmophytic vegetation, 21G1 Supra Mediterranean hop-hornbeam woods and 02G1 Southern Helleno-Balcanic swamp alder woods.

Conclusion

The natural protected Trigrad Gorge impresses its visitors not just with its landscape (which includes vertical lime slopes, caves and waterfalls), but also with its flora. One can find here the beautiful rocky species *Haberlea rhodopensis*, *Campanula orphanidea*, *Morina persica*, *Lilium martagon*, *Epilobium dodonaei*, *Aster alpinus*, and *Secale rhodopaeum*. A huge percentage of the flora here is represented by relic and endemic species, which can be found only in this area. The results of this research can also be used for the development of the future management plan of this protected area. Also, these results can be useful for professional and connoisseur botanists who would like to visit this interesting place of the Rhodopes. The main concerning threat for the biodiversity of this natural protected area are the uncontrolled and non-regulated building of small-scale, hydroelectric water

dams, along the river beds of Trigrad and Tchairska rivers. Other threats are the introduction and afforestation of foreign trees and bushes, the building of new, additional roads, the extraction of natural resource from this area and last, but not least - the unauthorized forest cutting. The excessive use of fertilizers from the agricultural activities in the villages above the natural protected area (namely Kesten, Vodni pad, Zhrebevo and Trigrad) also pose a significantly potential threat to the local flora and fauna.

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Appendix 1. List of determined plants from the research area

Pteridophyta

Aspidiaceae

1. *Polystichum aculeatum* (L.) Roth

Aspleniaceae

2. *Asplenium adianthum-nigrum* L.

3. *A. ruta-muraria* L.

4. *Ceterach officinarum* DC.

Athyriaceae

5. *Cystopteris fragilis* (L.) Bernh.

Hypolepidaceae

6. *Pteridium aquilinum* (L.) Kuhn

Polypodiaceae

7. *Polypodium vulgare* L.

Selaginellaceae

8. *Selaginella helvetica* (L.) Spring

Bryophyta

Conocephalaceae

9. *Conocephalus conicum* (L.) Dum.

Marchantiaceae

10. *Marchantia polymorpha* L.

Pinophyta

Pinaceae

11. *Abies alba* Mill.

12. *Picea abies* (L.) Carst.

13. *Pinus nigra* Arnold ssp. *pallasiana* (Lamb.)

Holmboe

14. *P. sylvestris* L.

Magnoliophyta

Aceraceae

15. *Acer campestre* L.

Adoxaceae

16. *Adoxa moschatellina* L.

Apiaceae

17. *Aegopodium podagraria* L.

18. *Angelica sylvestris* L.

19. *Bupleurum praealtum* L.

20. *Carum graecum* Boiss. & Heldr.

21. *Heracleum sibiricum* L.

22. *Laserpitium siler* L. subsp.

garganicum (Ten.) Arcang.

23. *Myrrhoides nodosa* (L.) Cannon

24. *Peucedanum austriacum* (Jacq.) Koch

25. *Pimpinella saxifraga* L.

26. *Seseli rigidum* Waldst. & Kit.

Aristolochiaceae

27. *Asarum europaeum* L.

Asteraceae

28. *Achillea grandifolia* Friv.

29. *Artemisia vulgaris* L.

30. *Aster alpinus* L.

31. *Carduus nutans* L.

32. *Centaurea stoebe* L.

33. *Chondrilla juncea* L.

34. *Ch. urumoffii* Degen

35. *Cirsium appendiculatum* Griseb.

36. *Crepis biennis* L.

37. *Doronicum orientale* Hoffm.

38. *Echinops sphaerocephalus* L.

39. *Eupatorium cannabinum* L.

40. *Hieracium kittaniae* Vladimirov.

41. *Lactuca viminea* (L.) J. & C. Presl

42. *Mycelis muralis* (L.) Dumort.

43. *Petasites hybridus* (L.) Gaertner

44. *Ptilostemon afer* (Jacq.) Greuter

45. *Senecio vernalis* Waldst. & Kit.

46. *Tanacetum corymbosum* (L.) Sch. Bip.

47. *Telekia speciosa* (Schreb.) Baumg.

48. *Tussilago farfara* L.

Araliaceae

49. *Hedera helix* L.

Betulaceae

50. *Alnus incana* (L.) Moench

51. *Carpinus betulus* L.

52. *C. orientalis* Mill.

53. *Ostrya carpinifolia* Scop.

Boraginaceae

54. *Buglossoides arvensis* (L.) I.M. Johnst.

55. *Cerintho minor* L.

56. *Lappula squarrosa* (Retz.) Dumort.
 57. *Onosma heterophylla* Griseb.
 58. *Pulmonaria officinalis* L.
 59. *P. rubra* Schott
 Brassicaceae
 60. *Aethionema saxatile* (L.) R.Br.
 61. *Alliaria petiolata* (M. Bieb.) Cavara & Grande
 62. *Alyssum reiseri* Velen.
 63. *Arabis glabra* (L.) Bernh.
 64. *Arabis procurrens* Waldst. & Kit.
 65. *Arabis turrata* L.
 66. *Berteroa incana* (L.) DC.
 67. *Cardamine pectinata* Pall. ex DC.
 68. *Descurainia sophia* (L.) Webb. ex Prantl.
 69. *Kernera saxatilis* (L.) Rchb.
 70. *Lepidium campestre* (L.) R. Br.
 71. *Malcolmia orsiniana* (Ten.) Ten. subsp. *angulifolia* (Boiss. & Orph.) Stork
 72. *Rorippa sylvestris* (L.) Besser
 Campanulaceae
 73. *Asyneuma limonifolium* (L.) Yanch.
 74. *Campanula glomerata* L.
 75. *C. jordanovii* Anchev & Kovanda
 76. *C. orphanidea* Boiss.
 77. *Trachelium rumelianum* Hampe
 Caprifoliaceae
 78. *Lonicera xylosteum* L.
 79. *Sambucus ebulus* L.
 80. *S. nigra* L.
 81. *Viburnum opulus* L.
 Caryophyllaceae
 82. *Arenaria rhodopaea* Delip.
 83. *A. serpyllifolia* L.
 84. *Dianthus petraeus* Waldst. & Kit.
 85. *D. quadrangulus* Velen.
 86. *Lychnis coronaria* (L.) Desv.
 87. *Myosoton aquaticum* (L.) Moench
 88. *Silene fabarioides* Hausskn.
 89. *S. flavescens* Waldst. & Kit.
 90. *S. italica* (L.) Pers.
 Celastraceae
 91. *Evonymus europaeus* L.
 92. *E. latifolius* (L.) Mill.
 93. *E. verrucosus* Scop.
 Chenopodiaceae
 94. *Chenopodium foliosum* (Moench) Ascherson
 95. *Polycnemon arvense* L.
 Convolvulaceae
 96. *Calystegia sepium* (L.) R. Br.
 97. *Convolvulus cantabrica* L.
 Crassulaceae
 98. *Sedum acre* L.
 99. *S. anopetalum* DC.
 100. *S. caespitosum* (Cav.) DC.
 101. *S. hispanicum* L.
 Dioscoreaceae
 102. *Tamus communis* L.
 Euphorbiaceae
 103. *Euphorbia myrsinites* L.
 104. *E. taurinensis* All.
 105. *Mercurialis perennis* L.
 Fabaceae
 106. *Anthyllis vulneraria* L.
 107. *Astragalus angustifolius* Lam.
 108. *A. glycyphyllos* L.
 109. *A. monspessulanus* L.
 110. *Chamaecytisus hirsutus* (L.) Link
 111. *Coronilla emerus* L. subsp. *emeroides* (Boiss. & Sprun.) Hayek
 112. *C. varia* L.
 113. *Dorycnium herbaceum* Vill.
 114. *Lathyrus laxiflorus* (Desf.) Kuntze
 115. *Lotus corniculatus* L.
 116. *Trifolium heldreichianum* Hausskn.
 Fagaceae
 117. *Fagus sylvatica* L.
 Geraniaceae
 118. *Geranium lucidum* L.
 119. *G. macrorrhizum* L.
 120. *G. robertianum* L.
 Gesneriaceae
 121. *Haberlea rhodopensis* Friv.
 Globulariaceae
 122. *Globularia cordifolia* L.
 Hypericaceae
 123. *Hypericum umbellatum* A. Kern.
 Juncaceae
 124. *Luzula forsteri* (Sm.) DC.
 Lamiaceae
 125. *Acinos suaveolens* (Sm.) Don
 126. *Ajuga genevensis* L.
 127. *Ballota nigra* L.
 128. *Clinopodium vulgare* L.
 129. *Lamium garganicum* L.
 130. *L. galeobdolon* (L.) L.
 131. *Marrubium friwaldskyanum* Boiss.
 132. *Micromeria dalmatica* Benth.

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133. *Nepeta catharia* L.
134. *Origanum vulgare* L.
135. *Scutellaria altissima* L.
136. *Sideritis scardica* Griseb.
137. *Teucrium chamaedrys* L.
Liliaceae
138. *Lilium martagon* L.
139. *Paris quadrifolia* L.
140. *Polygonatum latifolium* (Jacq.) Desf.
Linaceae
141. *Linum tenuifolium* L.
142. *L. catharticum* L.
Morinaceae
143. *Morina persica* L.
Onagraceae
144. *Epilobium dodonaei* Vill.
Orchidaceae
145. *Cephalanthera rubra* (L.) Rich.
146. *Epipactis helleborine* (L.) Crantz
147. *Neottia nidus-avis* (L.) Rich.
148. *Orchis militaris* L.
Orobanchaceae
149. *Orobanche esulae* Pancic
Oxalidaceae
150. *Oxalis acetosella* L.
Papaveraceae
151. *Papaver rhoeas* L.
Poaceae
152. *Arrhenatherum elatius* (L.) P. Beauv.
153. *Bromus ramosus* Huds.
154. *Dactylis glomerata* L.
155. *Koeleria nitidula* Velen.
156. *Melica uniflora* Retz.
157. *Phleum pratense* L.
158. *Poa nemoralis* L.
159. *Secale rhodopaeum* Delip.
160. *Sesleria ahtarovii* Deyl
161. *S. rigida* Heuffel ex Rchb.
162. *Vulpia myurus* (L.) C.C. Gmel.
Polygalaceae
163. *Polygala major* Jacq.
Polygonaceae
164. *Rumex acetosa* L.
165. *R. acetosella* L.
Primulaceae
166. *Lysimachia vulgaris* L.
Pyrolaceae
167. *Orthilia secunda* (L.) House
Ranunculaceae
168. *Actaea spicata* L.
169. *Anemone nemorosa* L.
170. *Aquilegia nigricans* Baumg.
171. *Clematis vitalba* L.
172. *Helleborus odoratus* Waldst. & Kit.
173. *Hepatica nobilis* Mill.
Rhamnaceae
174. *Rhamnus saxatilis* Jacq.
Rosaceae
175. *Aremonia agrimonoides* (L.) DC.
176. *Crataegus monogyna* Jacq.
177. *Geum urbanum* L.
178. *Fragaria vesca* L.
179. *Potentilla sulphurea* Lam.
180. *Sorbus aucuparia* L.
181. *S. austriaca* (Beck.) Hedl.
182. *Sorbus torminalis* (L.) Crantz
183. *Rubus thyrsanthus* Focke
Rubiaceae
184. *Galium anisophyllum* Vill.
Salicaceae
185. *Populus tremula* L.
186. *Salix alba* L.
187. *S. caprea* L.
Saxifragaceae
188. *Saxifraga aizoides* L.
189. *S. rotundifolia* L.
190. *S. sempervivum* C. Koch
Scrophulariaceae
191. *Linaria genistifolia* (L.) Mill.
192. *Melampyrum sylvaticum* L.
193. *Odontites glutinosa* (M. Bieb.) Benth
194. *Scrophularia bulgarica* (Stoj.) Peev
195. *S. scopoli* Hoppe ex Pers.
196. *Verbascum nigrum* L.
Solanaceae
197. *Solanum dulcamara* L.
Ulmaceae
198. *Ulmus glabra* Hudson
Urticaceae
199. *Urtica dioica* L.
Valerianaceae
200. *Valeriana montana* L.
201. *V. tripteris* L.
Violaceae
202. *Viola kitaibeliana* Schult.
203. *V. riviniana* Rchb.

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