

# Vascular flora of the Uludag Mt (Bursa, Turkey) – I

Ruziye Daşkın & Gönül Kaynak

Department of Biology, Faculty of Arts and Sciences, Uludag University, 16059 Görükle, Bursa-Turkey, e-mail: ruziyeg@uludag.edu.tr (corresponding author)

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**Abstract.** The vascular flora of the Uludag Mt, which is one of the 122 Important Plant Areas in Turkey and has “Emergency” status for conservation priorities, was determined. During the floristic surveys, 1309 taxa of 488 genera belonging to 102 families were recorded. As the total number of taxa was very high, the flora of the study area is presented in two parts. This paper comprises 247 taxa, including ferns, gymnosperms and monocotyledones. The remainder of the plant list consisting of dicotyledones is presented in a second part. Considering all taxa in the study area, the largest families are *Asteraceae* (173), *Fabaceae* (94), *Poaceae* (79), *Lamiaceae* (78), and *Brassicaceae* (70) in terms of the number of taxa. The largest genera are *Trifolium* (25), *Veronica* (19), *Verbascum* (18), *Hypericum* (18), and *Ranunculus* (17). The distribution of taxa according to phytogeographical elements is as follows: Euro-Siberian 252 (19.24%), Mediterranean 151 (11.54%), Irano-Turanian 50 (3.82%), and multiregional or unknown 856 (65.40%). The range of Raunkier’s life forms is as follows: hemicryptophytes 55%, therophytes 20.4%, cryptophytes 15.1%, phanerophytes 7.4%, and chamaephytes 2.1%. The number of taxa endemic to Turkey is 169 (the endemism rate is 12.9%) and 31 of these taxa are endemic to the study area.

**Key words:** Bursa, Turkey, Uludag Mt, vascular flora

## Introduction

According to the latest knowledge, the flora of Turkey consists of nearly 11 000 taxa and a great number of new taxa are still being described. Anatolia is one of the most important regions in the Northern Hemisphere in terms of endemism. More than 3000 of these taxa are endemic to Turkey. Therefore, the endemism ratio in Turkey exceeds 30%. On the other hand, this ratio is 14.9% in Greece, 2.9% in France, 18.6% in Spain and 0.1% in Poland (Avcı 2005).

The Uludag Mt, known as “Bithynian Olympus” in mythology or “Keşiş Dağı” in the Ottoman period, is the highest mountain of West Anatolia. It is situated between 39°04' – 40°04' N and 28°13' – 29°13' E in the Bursa province. Its range is 40 km long and 15–20 km wide. According to the grid system used in the *Flora of Turkey* (Davis 1965), the mountain is mostly located in A2 (A), with a remaining small

part in B 2. This is the Mediterranean phytogeographical region.

The altitude of the mountain is 250–300 m southwards of the city of Bursa, and 2543 m at the summit. Peak Uludag (2542 m), Çiftesenaber (2525 m), Karataş (2512 m), Kuşaklıkaya (2232 m), Şahinkaya (2200 m), Çobankaya (1750 m), and Bakacak (1743 m) are the other major altitudes in the area. On the other hand, there are high plateaus in the mountain, such as Bozova (1920 m), Kıran (1900 m), Sarialan (1621 m), Kirazlıyayla (1505 m), Keten (1300 m), Kocayayla (1270 m), and Kadiyayla (1235 m) (Fig. 1).

In 1961, an area of 11 338 ha in the northern part of the Uludag Mt was declared a national park, owing to its rich biological diversity, different habitats, zonation of its plant communities at various altitudes, and unique geomorphological structure. The boundaries of the Uludag National Park were extended to 12 732 ha in 1996 (Fig. 2).



Fig. 1. Map of the Uludag Mt.

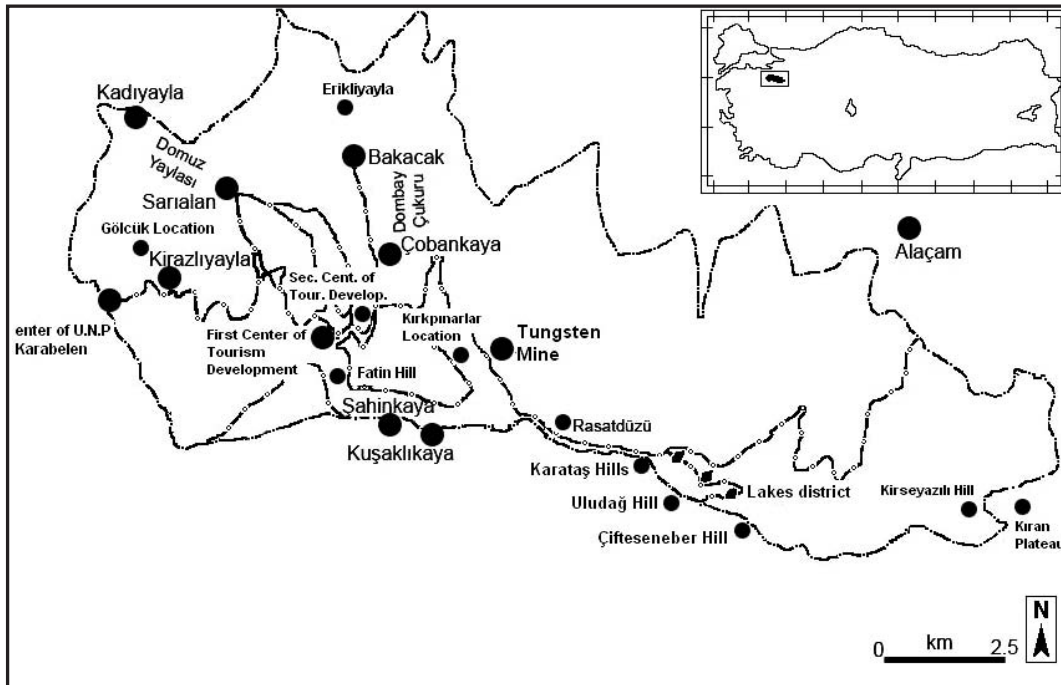


Fig. 2. Map of the Uludag National Park.

The Uludag Mt is one of the 122 Important Plant Areas (IPA No: 18) in Turkey defined by Özhatay & al. (2003), with an “Emergency” status for conservation priorities. It was adopted as a Floristic Diversity Center (SWA No: 20) by the Turkish Ministry of Environment and the Society for Protection of Nature (DHKD), representative of the International Bird Life in Turkey. Furthermore, the mountain is accepted as an Important

Bird Area (IBA No: 8) because of the reproductive populations of Lammergeyer (*Gypaetus barbatus*) and Golden Eagle (*Aquila chrysaetos*), and the numerous habitats protected by the Bern Convention in the mountain.

The geomorphological structure of the mountain is very interesting. It is composed of Paleozoic rocks with magmatic characteristics. The first signs of the Pleistocene glaciations in Turkey were discovered in this area.

In the latest Glacial time the alpine regions were covered with glaciers. Because of the abrasion of glaciers, nine glacial lakes were formed between 2200 m and 2300 m a.s.l. The four largest are Aynalı, Kilimli, Buzlu, and Kara. The place is also known as the Lakes District. The moraines in the areas surrounding these lakes provide another evidence of the Pleistocene glaciations (Anonymous 1994).

The climate of the mountain changes gradually from low altitudes to the summit. While the lower slopes facing Bursa city have a subtype of the Mediterranean climate, in the upper parts the climate is very cold and icy (Akman 1990). Owing to these changes in its climate and the geomorphologic structure, six vegetation belts can be distinguished in the Uludag. Here is a description of these belts and their characteristic plants (Kaynak & al. 2008).

*Lauretum* (up to 350 m): characterized by maquis vegetation consisting of *Arbutus unedo* L., *A. andrachne* L., *Erica arborea* L., *Laurus nobilis* L., *Olea europea* L., *Quercus coccifera* L., *Phillyrea latifolia* L., *Juniperus oxycedrus* L. subsp. *oxycedrus*, *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engl., *Cercis siliquastrum* L. subsp. *siliquastrum*, *Calicotome villosa* (Poir.) Link, *Spartium junceum* L., *Cistus creticus* L., and *C. salviifolius* L.

*Castanetum* (from 350 m to 700 m): *Castanea sativa* L., *Quercus* species, *Corylus avellana* L. var. *avellana*, *Crataegus monogyna* Jacq. subsp. *monogyna*, *Cornus mas* L. and *Rosa canina* L. are the dominant tree and shrub species in this belt.

*Fagetum* (from 700 m to 1500 m): characterized by pure *Fagus orientalis* Lipsky forests and mixed forests of *F. orientalis*, *Carpinus betulus* L., *C. sativa* Mill., *Populus tremula* L., and *Pinus nigra* Arn. subsp. *nigra* var. *caramanica* (Loudon) Rehder.

*Pinetum* (between 1000 m and 1200 m): mixed forests mostly of *P. nigra* subsp. *nigra* var. *caramanica*, *F. orientalis* and *C. betulus* grow in this belt.

*Abietum* (from 1500 m to 2100 m): this belt is dominated by *Abies nordmanniana* (Stev.) Spach subsp. *bornmuelleriana* (Matff.) Coode & Cullen forests. *Juniperus communis* L. var. *saxatilis* Pall., *Vaccinium myrtillus* L., *Prunus divaricata* Ledeb. var. *divaricata*, *Sorbus aucuparia* L., and *Salix caprea* L. are also presented in there.

*Alpinetum* (from 1900 m to 2543 m): subalpine and alpine zones can be found in different parts of the mountain comprising very different habitats, such as alpine open stony and rocky slopes, calcareous soils and rocks crevices, alpine and rocky grasslands, snowbeds, damp

meadows and marshy grounds. This belt is characterized by hard cushion plant communities consisting of *Acatolimon ulucinum* (Willd. ex Schult.) Boiss. ssp. *ulucinum* var. *ulucinum*, *Astragalus ptilodes* Boiss. var. *ptilodes*, *Festuca punctoria* Sm. and *F. cyllenica* Boiss. Most endemic plants are distributed in these areas, such as *Aubrieta olympica* Boiss., *Arabis drabiformis* Boiss., *Gypsophila olympica* Boiss., *Dianthus leucophaeus* Sibth. & Sm. subsp. *leucophaeus*, *D. recognitus* Schischk., *Silene olympica* Boiss., *S. falcata* Sibth. & Sm., *Rumex olympicus* Boiss., *Linum olympicum* Boiss., *Erodium sibthorpiatum* subsp. *sibthorpiatum*, *Erodium olympicum* Gemici & Leblebici, *Astragalus sibthorpiatus* Boiss., *Olymposciadium caespitosum* (Sm.) Wolff, *Heracleum humile* Sm., *Senecio olympicus* Boiss., *Achillea multifida* (DC.) Boiss., *Cirsium leucopsis* DC., *Carduus olympicus* Boiss. subsp. *olympicus*, *Centaurea drabifolia* Sm. subsp. *drabifolia*, *Scorzonera pygmaea* Sibth. & Sm. subsp. *pygmaea*, *Sideritis dichotoma* Huter, *Galium olympicum* Boiss., *Allium sibthorpiatum* Schult. & Schult. f., *Allium olympicum* Boiss., *Allium flavum* L. subsp. *flavum* var. *minus* Boiss., *Muscari bourgaei* Baker, and *Gagea bithynica* Pascher and *Crocus biflorus* Mill. subsp. *pulchricolor* (Herbert) B. Mathew.

Furthermore, one of the two important peatlands in Turkey is present above the timberline in the study area. In these scattered out in patches areas the dominant taxa are as follows: *Sphagnum* species, *Vaccinium myrtillus*, *Scleranthus annuus* L., *Spergularia buconii* (Scheele) Aschers. & Graebn., *Parnassia palustris* L., *Bruckenthalia spiculifolia* L., *Pinguicula balcanica* L. subsp. *pontica* Casper, *Euphrasia salisburgensis* Funck, *Juncus anatolicus* Snogerup, *Eleocharis quinqueflora* (Hartm.) O. Schwarz, and *Eriophorum latifolium* Hoppe.

## Material and methods

The material for this study consists of nearly 6500 vascular plant specimens collected from the Uludag between 1999 and 2007. These specimens were identified with the help of the *Flora of Turkey and The East Aegean Islands* (Davis 1965–1985; Davis & al. 1988; Güner & al. 2000) and other floras (Boissier 1867–1888; Tutin & al. 1964–1980; Guest & Townsend 1966–1985; Meikle 1977–1985; Strid & Tan 1997), and different publications (Rasbach & al. 1968; Kaynak & al. 1996; Kreutz 1998; Doğan 1999). Some doubtful specimens were compared with the specimens in the herbaria of GAZI and ANK.

The authors' abbreviations follow Brummit & Powell (1992). All collected plant taxa during the study are kept at the Herbarium of Uludag University, Faculty of Arts and Sciences, Biology Department (BULU).

All identified plant taxa are listed in alphabetical order. After the plant name and authors' abbreviations, the floristic list gives the number of localities, habitats, collection dates, collectors, herbarium accession numbers, phytogeographical regions, life forms, and threat categories (Ekim & al. 2000; IUCN 2001) for endemic or rare taxa. Life form categories were identified according to Raunkiaer (1934). One or two asterisks preceding a plant name indicate a new record for the A2 or B2 square, respectively (Özhatay & Çırpıcı 1986; Donner 1990; Yıldırımli & Akan 1995; Kaynak 1997a, b, c; Yıldırımli 1999, 2000, 2001, 2002, 2003; Ocak & Tokur 2000; Türe & Tokur 2000; Kaynak & al. 2003; Günay Daşkın & Kaynak 2006).

The abbreviations used in the locations and the plant list are as follows: *C.*: *Corylus*; Ch: Chamaephytes; CR: Critically Endangered; Crp.: Cryptophytes; D: Ruziye Daşkın; DD: Data Deficient; E: Eyüp Erdoğan; E. E.: Euxin Element; E. M. E.: East Mediterranean Element; EN: Endangered; E. T.: Endemic to Turkey; E. U.: Endemic to Uludag; E. S. E.: Euro-Siberian Element; *F.*: *Festuca*; FCTD: First Center of Tourism Development; Hcrp: Hemicryptophytes; H. E. E.: Hircano-Euxine Element; I. T. E.: Irano-Turanian Element; *J.*: *Juniperus*; K: Gönül Kaynak; LC: Least Concern; M.: Mediterranean; NT: Near Threatened; *Q.*: *Quercus*; SCTD: Second Center of Tourism Development; *P.*: *Pinus*; Th: Therophytes; UNP.: Uludag National Park; VU: Vulnerable; Y: Özer Yılmaz.

### List of locations in the Uludag

1. **A2 (A) Bursa: İnegöl**, entrance of Kiran village, 650 m, 22.08.2006, D.
2. İnegöl, Kiran Village to Kiran Plateau, 1140–1700 m, 20.07.2004, K, D, Y.
3. İnegöl, Kiran Plateau, 1850–1900 m, 26.05.2004, K, D, Y.
4. İnegöl, above Kiran Plateau to Kirseyazılı elevation, 40°03'N, 29°18'E, 1900–2200 m, 20.07.2004, K, D, Y.
5. İnegöl, Kirseyazılı elevation, 40°04'N, 29°18'E, 2256 m, 20.07.2004, K, D, Y.
6. İnegöl, around Hamidiye village, 850 m, 20.07.2005, K, Y.
7. İnegöl, Hamidiye to Kestanealan village, 900–950 m, 20.07.2005, K, Y.
8. İnegöl, around Kestanealan village, 700–750 m, 20.07.2005, K, Y.
9. İnegöl, Cerrah to Çiftlik village, 40°04'N, 29°13'E, 820 m, 22.08.2006, D.
10. İnegöl, above Çayyaka vilage to Boğazova, 13.06.2001, K, D, Y.
11. İnegöl, Sule V. to Işık (Turgutalp) village, 1 km, 40°02'N, 29°24'E, 531 m.
12. İnegöl, around Fevziye village, 40°01'N, 29°22'E, 935 m.
13. İnegöl, Elmaçayır V. to İnayet village, 40°01'N, 29°23'E, 930 m.
14. **B2 Bursa: İnegöl**, around Oylat Cave, 39°54–56'N, 29°35'E, 905 m.
15. İnegöl, between İnegöl and Oylat, 900 m.
16. İnegöl, between Oylat and Mesruriye village, 1 km, 39°56'N, 29°35'E, 895 m.
17. İnegöl, Mesruriye, Alaçam forest depot 1071 m, 39°54'N, 29°34'E, 26.10.2006, K, D, Y.
18. İnegöl, around Mesruriye village, 39°54'N, 29°34'E, 1065 m, 16.07.2005, K, Y.
19. **B2 Bursa: İnegöl**, 1 km to Mesruriye Oylat road fork, 39°56'N, 29°36'E, 1053 m, 26.10.2006, K, D, Y.
20. İnegöl, Çayyaka Village to Boğazova, 750–880 m, 13.06.2001, K, D, Y.
21. İnegöl, Boğazova, 39°56'N, 29°24'E, 1100 m, 13.06.2001, K, D, Y.
22. İnegöl, Boğazova to İclaliye village, 39°57'N, 29°28'E, 1300 m, 19.07.2007, K, Y.
23. İnegöl, Boğazova to Hayriye village, 1300 m, 19.07.2007, K, Y.
24. İnegöl, Kestanealan to İclaliye, 39°58'N, 29°28'E, 1091 m, 19.07.2007, K, Y.
25. İnegöl, Oylat to Tahtaköprü, 39°58'N, 29°37'E, 398 m, 30.05.2006, K, D, Y.
26. İnegöl, Tahtaköprü Domaniç road fork to Domaniç, 1 km, 39°55'N, 29°39'E, 620 m, 30.05.2006, K, D, Y.
27. İnegöl, 10 km to Domaniç, 39°53'N, 29°39'E, 1148 m, 30.05.2006, K, D, Y.
28. İnegöl, 5 km to Domaniç, 39°50'N, 29°38'E, 1032 m, 30.05.2006, K, D, Y.
29. **A2 (A) Bursa: Keles**, Epçeler to Küçükdeliler vilage, 2 km, 40°00'N, 29°13'E, 1100 m, 23.04.2003, D.
30. Keles, Küçükdeliler to Bursa, 3 km, 40°00'N, 29°11'E, 950 m, 23.04.2003, D.
31. Keles, above Dağdibi village, 1120 m, 27.05.2003, K, D, Y.
32. Keles, above Pınarcık village, 1200–1400 m, 09.07.2003, K, D, Y.



33. Keles, above Pınarcık village, 5–7 km to Dutçalık Locality, 40°00'N, 29°16'E, 1295–1330 m, 17.07.2006, K, D, Y.
34. Keles, Dutçalık Locality, 40°00'N, 29°17'E, 1700 m.
35. Keles, Dutçalık to Bozova Plateau, 1800–1850 m, 09.07.2003, K, D, Y.
36. Keles, Bozova Plateau, 1920 m, 09.07.2003, K, D, Y.
37. Keles, above Bozova Plateau, Çavuşdüzü, 1950–2120 m, 09.07.2003, K, D, Y.
38. Keles, Küçükdeliler to Büyükdeliler village, 1100 m, 19.03.2004, D, Y.
39. **B2 Bursa: U.**; Keles, exist of Pınarcık village, 1 km, 39°59'N, 29°14'E, 1061 m, 17.07.2006, K, D, Y.
40. Keles, exist of Pınarcık, 3 km, 39°59'N, 29°13'E, 1060 m, 17.07.2006, K, D, Y.
41. Keles, above Pınarcık, 39°59'N, 29°16'E, 1236 m, 06.10.2006, K, D, Y.
42. Keles, above Kozacı Valley, 39°52'N, 29°15'E, 830 m, 25.05.2006, K, D, Y.
43. Keles, around Davutlar village, 39°49'N, 29°16'E, 765 m, 25.05.2006, K, D, Y.
44. Keles, around Denizler village, 39°48'N, 29°16'E, 787 m, 25.05.2006, K, D, Y.
45. Keles, around Baraklı village, 39°59'N, 29°13'E, 745 m, 10.07.2006, K, D, Y.
46. Keles, around Baraklı lake, 39°58'N, 29°17'E, 1266 m.
47. Keles, entrance of Baraklı village to Keles, 5 km, 17.04.2003, K, D, Y.
48. Keles, entrance of Baraklı to Keles, 16 km, 1310 m, 17.04.2003, K, D, Y.
49. Keles, entrance of Baraklı to Kl., 21 km, 1200 m, 17.04.2003, K, D, Y.
50. Keles, around Kocayayla, 39°56'N, 29°15–16'E, 1270 m.
51. Keles, Kendirli Plateau, 1250 m, 13.06.2001, K, D, Y.
52. Keles, 6 km to Sorgun, 910–950 m, 17.04.2003, K, D, Y.
53. Keles, Gelemiş-Sorgun, 1–3 km, 39°53–52'N, 29°15–16'E, 658–915 m, 17.04.2003, K, D, Y.
54. Keles, Gelemiş-Sorgun, 4–6 km, 39°54–58'N, 29°16–17'E, 826–1265 m, 19.04.2006, K, D, Y.
55. Keles, around Sorgun, 1000 m, 27.06.2005, K, Y.
56. Keles, Sorgun-Boğazova, 4 km, 39°54'N, 29°20'E, 1050 m, 19.04.2006, K, D, Y.
57. Keles, Sorgun-Tunçbilek road fork, 39°52'N, 29°14'E, 940 m, 19.04.2006, K, D, Y.
58. Keles, Kocakovacık to Sorgun, 39°50'N, 29°20'E, 885 m, 30.05.2006, K, D, Y.
59. Keles, Sorgun to Gelemiş village, 39°52'N, 29°18'E, 1009 m, 30.05.2006, K, D, Y.
60. Keles, around Gelemiş village, 39°53'N, 29°16'E, 742 m, 10.07.2006, K, D, Y.
61. Keles, Sorgun to Boğazova, 2 km, 39°54'N, 29°20'E, 1062 m, 10.07.2006, K, D, Y.
62. Keles, Sorgun to Boğazova, 5 km, 39°54'N, 29°20'E, 1024 m, 10.07.2006, K, D, Y.
63. Keles, Sorgun to Boğazova, 6 km, 39°55'N, 29°20'E, 1030 m, 10.07.2006, K, D, Y.
64. **A2 (A) Bursa: Kestel**, around Alaçam village, 900 m.
65. Kestel, above Alaçam village, 1–3 km, 1000–1200 m.
66. Kestel, above Alaçam village, 3–5 km, 40°05–06'N, 29°16'E, 1300–1600 m.
67. Kestel, above Alaçam village, 6–8 km, 40°04–06'N, 29°16–18'E, 1700–1850 m.
68. Kestel, Alaçam to Lakes District, 40°05'N, 29°16'E, 1900–1950 m, 08.08.2006, K, D, Y.
69. Kestel, above Derekızık village, 40°08'N, 29°13'E, 855 m, 24.05.2006, K, D, Y.
70. Kestel, above Derekızık village, Kürekli Locality, 40°08'N, 29°12'E, 1000–1100 m, 24.05.2006, K, D, Y.
71. Kestel, around Ümitalan road fork, 40°10'N, 29°21'E, 521 m, 30.05.2006, K, D, Y.
72. Kestel, around Babasultan village, 40°06'N, 29°22'E, 600 m, 20.06.2006, D, E.
73. Kestel, around Gözede village, 40°09'N, 29°17'E, 560 m, 20.06.2006, D, E.
74. Kestel, above Sayfiye village, 40°06'N, 29°20'E, 1103 m, 20.06.2006, D, E.
75. Kestel, above Kozluören village, 40°07'N, 29°21'E, 560 m, 20.06.2006, D, E.
76. Kestel, around Saitabat Waterfall, 560 m, 05.07.2001, K, D, Y.
77. Kestel, above Saitabat village, 40°08'N, 29°14'E, 880 m, 24.08.2006, D, Y.
78. Kestel, above Osmaniye village, 40°08'N, 29°15'E, 780 m, 24.08.2006, D, Y.
79. **A2 (A) Bursa: Nilüfer**, Maksempınar village to Unçukuru village, 1 km, 350 m.
80. **B2 Bursa: Orhaneli**, around Orhaneli Thermo-electric Plant, 39°53'N, 28°58'E, 470 m, 23.03.2006, K, D, Y.
81. **A2 (A) Bursa: Osmangazi**, above Çekirge, 350 m, 09.06.2001, D, Y.
82. Osmangazi, above Teferrüç, 550 m, 29.03.2003, D, Y.
83. Osmangazi, on UNP road, above İnkaya village, 450 m, D, Y.

84. Osmangazi, on UNP road, 1–km after İnkaya vil-  
lage, 450–500 m.
85. Osmangazi, on UNP road, around Hüseyinalan  
village, 1000–1010 m.
86. Osmangazi, on UNP road, exist of Kirazlı village,  
850 m, 21.07.2003, K, D, Y.
87. Osmangazi, on UNP road, above Kirazlı, Kara-  
kaya Locality, 960 m, 21.07.2003, K, D, Y.
88. Osmangazi, on UNP road, above Kirazlı, Leyle-  
kkaya Locality, 1000 m, 21.07.2003, K, D, Y.
89. Osmangazi, on UNP road, Süleymaniye village,  
40°08'N, 29°03'E, 1000 m.
90. Osmangazi, on UNP road, around Yeşil Tarla  
Deer Farm, 1020 m, 24.05.2003, D.
91. Osmangazi, 2 km to entrance of UNP (Karabe-  
len), 1600 m, 18.05.2002, D.
92. Osmangazi, UNP Soğukpınar road fork to  
Soğukpınar, 1–3 km, 1100 m, 09.06.2001, D.
93. Osmangazi, UNP Soğukpınar road fork to  
Soğukpınar, 4–7 km, 1150 m, 09.06.2001, D.
94. Osmangazi, 1 km to Soğukpınar, 40°02'N,  
29°07'E, 985 m, 30.10.2004, D.
95. Osmangazi, 1 km to Bağlı village, 1100 m,  
08.07.2005, K, Y.
96. Osmangazi, around entrance of UNP (Karabe-  
len), 1320–1370 m.
97. Osmangazi, UNP, Karabelen to Kirazlıyaıyla,  
1 km, 1600 m, 08.05.2004, D.
98. Osmangazi, UNP, around Kirazlıyaıyla, 1500–1505 m.
99. Osmangazi, UNP, Kirazlıyaıyla, Gölcük Locality,  
40°07'N, 29°05'E, 1473 m.
100. Osmangazi, UNP, Kirazlıyaıyla to FCTD, 5 km,  
1650 m, 19.05.2003, D.
101. Osmangazi, UNP, around FCTD, 1850 m,  
29.07.2004, D, Y, E.
102. Osmangazi, UNP, Kirazlıyaıyla to Sarıalan,  
1500–1650 m, 05.08.2005, K.
103. Osmangazi, UNP, around Sarıalan, 1600–  
1610 m, 16.07.2003, D, Y.
104. Osmangazi, UNP, around Çobankaya camping  
area, 1750–1780 m.
105. Osmangazi, UNP, Çobankaya to Bakacak, 2 km,  
40°08'N, 29°08'E, 1700 m.
106. Osmangazi, UNP, around Bakacak, 1770 m,  
19.05.2003, D.
107. Osmangazi, UNP, Kadiyaıyla, 40°09'N, 29°05'E,  
1236 m, 22.04.2006, D.
108. Osmangazi, UNP, Erikliyaıyla, 40°09'N, 29°06'E,  
1233–1250 m, 22.04.2006, D.
109. Osmangazi, UNP, Domuzuaylası, 40°08'N,  
29°05'E, 1388 m, 22.04.2006, D.
110. Osmangazi, UNP, between SCTD and Çoban-  
kaya, Dombayçukuru Location, 1800–1900 m.
111. Osmangazi, UNP, around Fatin Hill, 1950 m,  
19.07.2001, D.
112. Osmangazi, UNP, Şahinkaya to Kuşaklıkaya,  
2100–2200 m, 19.07.2001, D.
113. Osmangazi, UNP, around Şahinkaya Hill,  
2110 m, 07.08.2003, D, Y.
114. Osmangazi, UNP, around Kuşaklıkaya Hill,  
2100–2200 m, 07.08.2003, D, Y.
115. Osmangazi, UNP, Kuşaklıkaya to Küçük Zirve,  
2250 m, 07.08.2003, D, Y.
116. Osmangazi, UNP, Kuşaklıkaya to Kırkpınarlar  
Locality, 2200–1900 m, 07.08.2003, D, Y.
117. Osmangazi, UNP, Kırkpınarlar Location, around  
Çayırılı stream, 1900–1750 m, 07.08.2003, D, Y.
118. Osmangazi, UNP, around SCTD, 1800 m.
119. Osmangazi, UNP, above SCTD to Tungsten Mine,  
40°06'N, 29°09'E, 1830–2100 m, 12.06.2004, D.
120. Osmangazi, UNP, lower parts of Kuşaklıkaya,  
2068–1750 m, 01.07.2004, K, D, Y, E.
121. Osmangazi, UNP, Kuşaklıkaya to FCTD, 2220–  
1900 m, 29.07.2004, D, Y, E.
122. Osmangazi, UNP, at Tungsten Mine road,  
1900 m, 26.09.2004, D, Y.
123. Osmangazi, UNP, around Tungsten Mine,  
1950 m, 29.06.2002, D.
124. Osmangazi, UNP, above Tungsten Mine to  
Rasatdüzü, 40°05'N, 29°11'E, 2000–2230 m,  
29.06.2002, D.
125. Osmangazi, UNP, Rasatdüzü to Lakes District,  
2300–2430 m, 29.06.2002, D.
126. Osmangazi, UNP, around Lakes District,  
08.08.2006, K, D, 2210–2307 m.
127. Osmangazi, Gökçeören village, 40°08'N,  
28°59'E, 512 m, 19.05.2006, D, E.
128. Osmangazi, Mürseller village, 40°05'N, 29°01'E,  
708 m, 19.05.2006, D, E.
129. Osmangazi, on Keles road, 5 km after Doğançı  
Dam, 350 m, 22.06.2003, D, Y.
130. Osmangazi, on Keles road, 2 km to Çaybaşı vil-  
lage, 40°03'N, 29°02'E, 495 m, 19.05.2006, D, E.
131. Osmangazi, Çaybaşı to Soğukpınar village,  
3 km, 450 m, 03.03.2002, D, Y.
132. Osmangazi, on Keles road, around Uluçam-  
Dağakça road fork, 40°03'N, 28°58'E, 480 m,  
15.05.2006, K, D, E.

133. Osmangazi, on Keles road, around Seferişişıklar-Göynükbelen road fork, 40°01'N, 29°06'E, 700–720 m, 15.05.2006, K, D, E.
134. Osmangazi, around Soğukpınar-Karaislah road fork, 40°01'N, 29°06'E, 744–796 m, 19.05.2006, D, E.
135. Osmangazi, Soğukpınar-Karaislah road fork to Soğukpınar, 40°01'N, 29°07–08'E, 890 m.
136. Osmangazi, entrance of Soğukpınar village, 900–1000 m.
137. Osmangazi, above Soğukpınar village, 1000–1100 m, 27.05.2003, K, D, Y.
138. Osmangazi, above Soğukpınar to Keten Plateau, 3 km, 1280 m, 22.05.2003, K, D, Y.
139. Osmangazi, above Soğukpınar, Keten Plateau, 1300 m, 22.05.2003, K, D, Y.
140. Osmangazi, Soğukpınar, above Keten Plateau, 1400–1600 m, 22.06.2003, D, Y.
141. Osmangazi, Soğukpınar, above Aras Valley, 1450–1850 m.
142. **A2 (A) Bursa: Yıldırım;** Kaplıkaya Valley, 600–900 m, 22.10.2007, K.
143. Yıldırım, above Cumalıkızık village, 40°10'N, 29°10'E, 850 m, 24.08.2006, D.
144. Yıldırım, above Hamamlıkızık village, 40°10'N, 29°11'E, 337–388 m, 24.08.2006, D.
145. **B2 Kütahya:** entrance of Domaniç, 39°51'N, 29°38'E, 30.05.2006, K, D, Y.
146. **B2 Kütahya:** Domaniç Tavşanlı road, 5 km, 39°47'N, 29°35'E, 844 m, 30.05.2006, K, D, Y.
147. **B2 Kütahya:** Domaniç; around Çarşamba village, 39°45'N, 29°33'E, 810 m, 30.05.2006, K, D, Y.
148. **B2 Kütahya:** Domaniç; Çarşamba to Çamlıca village, 2 km, 39°46'N, 29°31'E, 853 m, 30.05.2006, K, D, Y.
149. **B2 Kütahya:** Domaniç; Çarşamba to Fırhanlar village, 2 km, 39°45'N, 29°29'E, 720 m, 30.05.2006, K, D, Y.
150. **B2 Kütahya:** Domaniç; 2 km to Sarıot village, 39°47'N, 29°26'E, 1063 m, 30.05.2006, K, D, Y.

## Results and discussion

### Floristic composition, life forms and phytogeographical spectra

A total of 1309 taxa (888 species, 286 subspecies, 130 varieties and five hybrids), belonging to 488 genera and 102 families, are reported in the floristic list. Thirty of these taxa belong to *Pteridophyta* and 1279 taxa

to *Spermatophyta*. The subdivision Gymnosperms has only 11 taxa and Angiosperms has 1268. Furthermore, 1062 taxa belong to Dicotyledones and 206 taxa belong to Monocotyledones (Table 1).

*Asteraceae* is the largest family in the study area, with 173 taxa. The second- and third-largest families are *Fabaceae* and *Poaceae*, and *Lamiaceae* with 94 and 78 taxa, respectively. The other larger groups are *Brassicaceae* (70 taxa), *Scrophulariaceae* (64 taxa), *Liliaceae* (57 taxa), *Caryophyllaceae* (56 taxa), *Apiaceae* (53 taxa), *Rosaceae* (46 taxa), and *Boraginaceae* (44 taxa).

The genus *Trifolium* ranks first with 25 taxa. *Veronica* comes second with 19 taxa. *Verbascum* and *Hypericum* are third with 18 taxa, *Ranunculus* is fourth with 17 taxa, and *Ornithogalum* is fifth with 16 taxa. The other richer genera are *Centaurea* and *Carex* (15), *Vicia* and *Galium* (14), *Epilobium* (13) and *Alyssum*, *Silene*, *Rumex*, *Anthemis*, and *Allium* (12). These genera are relatively widespread throughout Turkey. Furthermore, the members of *Veronica*, *Ranunculus*, *Trifolium*, *Galium*, and *Ornithogalum* frequently grow in humid and wet habitats, which are very abundant in the study area.

The distribution of 1309 taxa according to phytogeographical elements is as follows: Euro-Siberian 252 (19.24%), Mediterranean 151 (11.54%), Irano-Turanian 50 (3.82%) and multiregional or unknown 856 (65.40%). Although the study area is located in the Mediterranean phytogeographical region, the dominance of Euro-Siberian elements can be explained by the fact that the altitude of the study area is very high and its climate becomes cooler with height.

The results obtained from this study were compared with those from other researches conduct-

Table 1. The number of taxa according to taxonomic categories.

	<i>Pteridophyta</i>	SPERMATOPHYTA		Total	
		<i>Gymnospermae</i>	ANGIOSPERMAE		
			<i>Dicotyledonae</i>		<i>Monocotyledonae</i>
Families	8	4	80	10	102
Genera	12	6	391	79	488
Species	23	8	706	151	888
Subspecies	7	1	233	45	286
Varieties	–	2	119	9	130
Hybrids	–	–	4	1	5
Taxa	30	11	1062	206	1309
% rate	2.29	0.84	81.13	15.74	100

ed in the nearby areas (Çırpıcı 1989; Gemici & al. 1993; Kaynak 1997a, b, c; Yarıcı 1999; Ocağ & Tokur 2000; Türe & Tokur 2000; Erdoğan 2005; Günay Daşkın & Kaynak 2006) regarding the total number of taxa, endemism rates and phytogeographical regions (Table 2).

**Table 2.** Comparison between the present survey and other studies in terms of the total numbers of taxa, endemism rates and phytogeographical regions.

Survey	Total number of taxa	Mediterranean (%)	Euro-Siberian (%)	Irano-Turanian (%)	Pluriregional (%)	Endemism (%)
I	1309	11.54	19.24	3.82	65.40	12.9
II	906	23.5	15.9	1.3	60.6	3.6
III	706	2.38	16.0	1.13	60.48	3.54
IV	635	19.5	17.3	1.3	61.9	5.4
V	282	24.7	16.6	1.5	57.2	9.4
VI	456	16.8	8.8	10.5	63.82	7.8
VII	505	15.7	10.5	7.3	76.5	5.9
VIII	890	13.37	13.14	10.67	62.82	13.0
IX	321	27.41	11.82	0.93	59.81	0.6

Survey I – results of this study; Survey II – Kaynak (1997a, b, c); Survey III – Günay Daşkın & Kaynak (2006); Survey IV – Erdoğan (2005); Survey V – Gemici & al. (1993); Survey VI – Ocağ & Tokur (2000); Survey VII – Türe & Tokur (2000); Survey VIII – Çırpıcı (1989); Survey IX – Yarıcı (1999).

The distribution of taxa according to Raunkiaer's life forms is as follows: hemicryptophytes 719 (55%), therophytes 267 (20.4%), cryptophytes 198 (15.1%), phanerophytes 97 (7.4%), and chamaephytes 28 (2.1%). Within the life form range of the study area, the dominance of hemicryptophytes, therophytes and cryptophytes can be explained by the abundant humid and forest terrains in the study area and by the fact that hemicryptophytes are also the most common life form in the temperate regions of the world.

### The endemic and rare taxa in the study area and their threat categories

One hundred and sixty-nine endemic plant taxa were determined in the research area. Thirty-one of these taxa are known only from the Uludag. The rate of endemism is 12.9%. As Table 2 shows, the endemism rates in the Murat and Uludag Mts are higher than those in the other areas. This indicates a rich plant diversity in the study area. The reasons for such a high plant diversity are as follows:

- a wide variety of habitats such as maquis, *Quercus* shrubs, pure or mixed forests, open places, ruderal areas, water- and streamsides, marshy grounds, alpine *Juniperus* shrubs, alpine stony and rocky slopes, calcareous scree and crevices, cliffs, alpine grasslands, alpine damp meadows and peatlands;
- different vegetation zones occurring at different altitudes and very different microclimates prevailing within these zones;
- an interesting geomorphological structure of the study area;
- a large number of endemic and rare plant taxa growing in the area.

According to Ekim & al. (2000), the distribution of threat categories of endemic plants in the study area is as follows: eight taxa CR, 20 taxa EN, 20 taxa VU, five taxa DD, 31 taxa NT, and 85 taxa LC. Except for these endemic taxa, 15 rare taxa were also determined. These taxa and their threat categories (Ekim & al. 2000) are as follows: *Erysimum pusillum* VU, *E. graecum* DD, *Isatis cappadocica* subsp. *macrocarpa* VU, *Alcea lavaterifolia* VU, *Trifolium repens* subsp. *orphanideum* VU, *Potentilla aurea* subsp. *chrysocraspeda* VU, *Saxifraga sempervivum* VU, *Erigeron olympicus* VU, *Verbascum ovalifolium* subsp. *thracicum* EN, *Aristolochia sempervirens* VU, *Centaurea inermis* VU, *Gentiana lutea* L. subsp. *symphyandra* EN, *Salvia fruticosa* VU, *Sideritis taurica* VU and *Asperula nitida* subsp. *nitida* VU. Although in the 1940s *Gentiana lutea* L. subsp. *symphyandra* (Murb.) Hayek had a wide distribution in the study area, it is very restricted today because of the excessive collection of its rhizomes for medical purposes.

Furthermore, the distribution of *Cirsium eriophorum*, *Telekia speciosa*, *Cyclamen coum* var. *coum*, *Gentianella caucasica*, *Teucrium lamiifolium* subsp. *lamiifolium*, *T. montanum*, *Phlomis tuberosa*, *Tulipa sylvestris*, *Colchicum umbrosum*, *Iris kerneriana*, *I. purpureobracteata*, *Crocus flavus* subsp. *dissectus*, *Epipactis bithynica*, and *Dactylorhiza maculata* subsp. *maculata* are very limited, but they are not included in any risk categories. Of these taxa, *C. eriophorum* with a doubtful record in the flora of Turkey was collected on the Uludag and its presence in Turkey has been confirmed (Daşkın & al. 2006). *D. maculata* subsp. *maculata* was also collected on the Uludag and is given as a new record for the flora of Turkey (Daşkın & al. 2007). Moreover, the distribution of *T. spinosa*, *Hieracium beypazariense* and *P. tuberosa* in most of West Turkey has been determined.



## Plant List – I

New records for squares: A2 – \*; B2 – \*\*

### PTERIDOPHYTA

#### Adiantaceae

1. *Adiantum capillus-veneris* L., 83, on wet rocks, 25.05.2001, D, BULU 13336, Crp.
2. *Cheilanthes marantae* (L.) Domin subsp. *marantae*, 134, on stony slopes, 27.05.2003, K, D, Y, BULU 15390, Crp.

#### Aspidiaceae

3. *Dryopteris caucasica* (A. Braun) Fraser-Jenk. & Corley, 74, in the forest, BULU 27796, Crp.
4. *D. filix-mas* Schott, 67, at edge of forest, 18.07.2002, D, Y, BULU 14462; 103, rocks, BULU 17562, Crp.
5. *D. pallida* Fomin subsp. *pallida*, 141, in forest openings, 06.06.2002, K, D, Y, BULU 14085, Crp.
6. *Polystichum aculeatum* (L.) Roth, 67, on damp rocks, 01.09.2004, D, E, BULU 23227, Crp.
7. *P. lonchitis* (L.) Roth, 116, on alpine rocky slopes, BULU 17933; 74, u. f., BULU 23215, Crp.
8. *P. setiferum* (Forssk.) Moore ex Woyunnar, 34, on rocky slopes, 17.07.2006, K, D, BULU 28223, Crp.

#### Aspleniaceae

9. *Asplenium adiantum-nigrum* L., 103, on rocks, 16.07.2003, D, Y, BULU 17561; 74, under forest, BULU 27798, Crp.
10. *A. ceterach* L. subsp. *ceterach*, 104, at roadsides, 19.07.2001, D, BULU 13453; 29, Q. scrub, 23.04.2003, D, BULU 14806, Crp.
11. *A. onopteris* L., 82, in the forest, 29.03.2003, D, BULU 14701, Crp.
12. *A. ruta-muraria* L. subsp. *ruta-muraria*, 37, on alpine rocks, BULU 17536, Crp.
13. *A. scolopendrium* L. subsp. *scolopendrium*, 74, in the forest, BULU 27792, Crp.
14. *A. septentrionale* (L.) Hoffm. subsp. *septentrionale*, 4, on damp rocks, BULU 20434; 126, on alpine rocks, BULU 28360, Crp.
15. *A. trichomanes* L. subsp. *trichomanes*, 104, on rocks, 19.07.2001, D, BULU 13448; 53, rocky slopes, 17.04.2003, K, D, Y, BULU 14789, Crp.
16. *A. viride* Huds., 126, in rock crevices, BULU 28327, Crp.

#### Athyriaceae

17. *Athyrium distentifolium* Tausch ex Opiz, 126, on alpine rocks, BULU 28314, Crp.

18. *A. filix-femina* Roth, 4, at edges of forest, BULU 20364, Crp.
19. *Cystopteris alpina* (Lam.) Desv., 126, on alpine damp rocks, BULU 28319, Crp.
20. *C. fragilis* (L.) Bernh., 56, on rocks, BULU 26681, Crp.
21. *Gymnocarpium dryopteris* Newman, 67, on damp rocks, 01.09.2004, D, E, BULU 23224, Crp.

#### Dennstaedtiaceae

22. *Pteridium aquilinum* (L.) Kuhn, 33, in the forest, BULU 28213, Crp.

#### Equisetaceae

23. *Equisetum arvense* L., 98, at watersides, 25.05.2001, D, BULU 13341, Crp.
24. *E. hyemale* L., 133, in the forest, 07.05.2004, D, BULU 18701, Crp.
25. *E. palustre* L., 11, at watersides, BULU 28448, Crp.
26. *E. telmateia* Ehrh., 142, at streamsides, BULU 29368, Crp.

#### Ophioglossaceae

27. *Botrychium lunaria* (L.) Sw., 105, among *J. communis* communities, 16.07.2003, D, Y, BULU 17610, Crp.

#### Polypodiaceae

28. *Polypodium cambricum* L. subsp. *australe* (Fée) Greuter & Burdet, 14, on wet rocks, 26.10.2006, K, D, Y, BULU 28634; 142, in the forest, BULU 29365, Crp.
29. *P. interjectum* Shivas, 142, under in the forest, 22.10.2007, K, BULU 29366, Crp.
30. *P. vulgare* L., 2, on slopes, 20.07.2004, K, D, Y, BULU 20363, Crp.

### SPERMATOPHYTA

#### Gymnospermae

#### Cupressaceae

31. *Cupressus sempervirens* L., 130, at roadsides, BULU 27334 A, Ph.
32. *Juniperus communis* L. var. *saxatilis* Pall., 141, on rocky slopes, 22.05.2003, K, D, Y, BULU 15274; 113, on alpine slopes, 07.08.2003, D, Y, BULU 17887, Ph.
33. *J. excelsa* M. Bieb. subsp. *excelsa*, 57, in open places, 17.04.2003, K, D, Y, BULU 14785, Ph.
34. *J. foetidissima* Willd., 62, on stony slopes, BULU 28131; 150, f.o., BULU 27690, Ph.

35. *J. oxycedrus* L. subsp. *oxycedrus*, 84, in maquis, 25.05.2001, D, BULU 13582, Ph.

#### **Ephedraceae**

36. *Ephedra major* Host, 55, on rocky slopes, 27.06.2005, K, Y, BULU 26268, Ph.

#### **Pinaceae**

37. *Abies nordmanniana* (Stev.) Spach subsp. *bornmuelleriana* (Matff.) Coode & Cullen, 100, 19.05.2003, D, BULU 15174; 89, in mixed forest, 02.04.2004, D, BULU 18219 A; 2, 26.05.2004, K, D, Y, BULU 19545 A, E. T., LC., Ph.
38. *Pinus brutia* Ten. var. *brutia*, 132, in mixed forest, 19.05.2006, D, E, BULU 27291 A, E. M. E., Ph.
39. *P. nigra* Arn. subsp. *nigra* var. *caramanica* (Loudon) Rehder, 143, in mixed forest, BULU 28490 A; 50, forest, 08.07.2005, K, D, Y, BULU 26221A, Ph.
40. *P. sylvestris* L. var. *hamata* (Steven) Fomin, 17, in mixed forest, 16.07.2005, K, Y, BULU 26388, E. S. E., Ph.

#### **Taxaceae**

41. *Taxus baccata* L., 87, at roadsides, BULU 17672, Ph.

#### **Angiospermae**

##### **Monocotyledonae (Liliopsida)**

##### **Alismataceae**

42. *Alisma plantago-aquatica* L., 46, at watersides, 08.07.2005, K, Y, BULU 26218, E. S. E., Hcrp.

##### **Amaryllidaceae**

43. *Galanthus plicatus* M. Bieb. subsp. *byzantinus* (Baker) D.A. Webb, 79, in rocky places, 23.03.2006, K, D, Y, BULU 26576, E. E., Crp.
44. *G. gracilis* Čelak., 84, at fieldsides, 03.03.2002, D, BULU 13463, E. M. E., Crp.

##### **Araceae**

45. *Arisarum vulgare* Targ.-Tozz. subsp. *vulgare*, 135, in stony places, 19.04.2006, K, D, Y, BULU 26613, Crp.
46. *Arum maculatum* L., 128, in Q. forest, BULU 27255, Crp.
47. *Dracunculus vulgaris* Schott, 86, among Q. scrub, BULU 17791, Crp.

##### **Cyperaceae**

48. *Carex divisa* Huds., 141, on alpine stony slopes, 16.06.2004, D, Y, E, BULU 19875, E. S. E., Crp.
49. *C. divulsa* Stokes subsp. *divulsa*, 133, at watersides, 07.05.2004, D, BULU 18744, E. S. E., Crp.

50. *C. echinata* Murray, 134, in open places, BULU 27395, E. S. E., Crp.
51. *C. flacca* Schreb. subsp. *serrulata* (Biv.) Malag., 128, in Q. forest, BULU 27258, M. E., Crp.
52. *C. hirta* L., 133, on alpine stony slopes, 07.05.2004, D, BULU 18742, E. S. E., Crp.
53. *C. kitaibeliana* Degen ex Bech., 124, on alpine stony slopes, BULU 14604, Crp.
- \*54. *C. melanostachya* Willd., 135, on stony slopes, 16.06.2004, D, Y, E, BULU 19746, Crp.
- \*55. *C. nigra* (L.) Reich. subsp. *nigra*, 116, on alpine stony slopes, BULU 17978 A, Crp.
56. *C. nigra* subsp. *alpina* (Gaudin) Lemke, 3, in wet meadows, BULU 19601, E. S. E., U. E., CR., Crp.
57. *C. ovalis* Gooden., 67, in wet open places, 02.07.2003, K, D, Y, BULU 17327, E. S. E., Crp.
58. *C. panicea* L., 34, at watersides, 09.07.2003, K, D, Y, BULU 17370, E. S. E., Crp.
59. *C. pendula* Huds., 24, at watersides, BULU 29292, E. S. E., Crp.
- \*\*60. *C. remota* L., 62, on alpine stony slopes, 10.07.2006, K, D, BULU 28107, E. S. E., Crp.
61. *C. tristis* M. Bieb., 139, in open places, BULU 15302 A, H. E. E., Crp.
62. *C. umbrosa* Host subsp. *huetiana* (Boiss.) Soó, 114, on alpine slopes, BULU 17921, E. S. E., Crp.
63. *Eleocharis quinqueflora* (Hartm.) O. Schwarz, 141, at watersides, 06.06.2002, K, D, Y, BULU 14174, Crp.
64. *E. palustris* (L.) Roem. & Schult., 50, on marshy ground, 19.05.2006, D, E, BULU 27426 B, Crp.
65. *Eriophorum latifolium* Hoppe, 118, in peat, 12.07.2007, K, Y, BULU 29241, Hcrp.
66. *Isolepis setacea* R. Br., 1, at wet roadsides, BULU 28429, Th.
67. *Pycreus flavescens* P. Beauv. ex Rchb., 144, at watersides, BULU 28535.
68. *Scirpus sylvaticus* L., 62, at watersides, BULU 28102, Crp.

##### **Dioscoreaceae**

69. *Tamus communis* L. subsp. *cretica* (L.) Kit Tan, 98, at watersides, 25.05.2001, D, BULU 13338, Crp.

##### **Iridaceae**

70. *Crocus biflorus* Mill. subsp. *pulchricolor* (Herb.) B. Mathew, 3, in meadows, BULU 19600; 125, alpine slopes, 29.06.2002, D, BULU 14595, E. S. E., E. T., NT., Crp.

71. *C. chrysanthus* Herb., 85, in Q. scrub, 19.03.2005, D, BULU 26126, Crp.
72. *C. flavus* Weston subsp. *dissectus* T. Baytop & B. Mathew, 79, in forest openings, 23.03.2006, K, D, Y, BULU 26563, E. T., VU., Crp.
73. *C. flavus* subsp. *flavus*, 84, in maquis, 03.03.2002, D, BULU 13457, E. S. E., Crp.
74. *C. gargaricus* Herb. subsp. *gargaricus*, 104, in open places, 08.05.2004, D, BULU 18805, E. S. E., E. T., NT., Crp.
75. *C. gargaricus* subsp. *herbertii* B. Mathew, 109, in meadows, BULU 26747, U. E., EN., Crp.
76. *C. pallasi* Goldb. subsp. *pallasi*, 135, on stony slopes, 24.10.2004, D, E, BULU 23714, Crp.
77. *C. pulchellus* Herb., 90, in Q. *petraea* forest, 30.10.2004, D, BULU BULU 23766, E. M. E., Crp.
78. *Gladiolus italicus* Mill., 43, at fieldsides, BULU 27530, Crp.
- \*79. *Iris kerneriana* Asch. & Sint. ex Baker, 120, in forest openings, 01.07.2004, K, D, Y, E, BULU 20119, E. S. E., E. T., LC., Crp.
- \*80. *I. purpleobracteata* B. Mathew & T. Baytop, 141, on rocky slopes, 16.06.2004, D, Y, E, BULU 19770, E. M. E., E. T., NT., Crp.
81. *I. suaveolens* Boiss. & Reut., 141, on rocky slopes, 06.06.2002, K, D, Y, 14171, E. M. E., Crp.

#### Juncaceae

82. *Juncus acutus* L., 50, on marshy ground, 19.05.2006, D, E, BULU 27426, Crp.
83. *J. anatolicus* S. Snogerup, 117, in peat, BULU 17979, E. M. E., E. T., LC., Crp.
84. *J. bufonius* L., 143, at wet roadsides, 19.06.2002, K, Y, BULU 14221, Th.
85. *J. conglomeratus* L., 122, at wet roadsides, BULU 23577, E. S. E., Hcrp.
86. *J. effusus* L., 2, at watersides, BULU 20427, Crp.
87. *J. inflexus* L., 1, at watersides, BULU 28430, Hcrp.
88. *J. minutulus* V.I. Krecz. & Gontsch., 118, at wet roadsides, 11.08.2008, K, D, BULU 29260, Th.
89. *J. striatus* Schousb. ex E. Mey., 1, at watersides, BULU 28431, M. E., Crp.
90. *Luzula campestris* DC., 89, in forest openings, 02.04.2004, D, BULU 18241, E. S. E., Crp.
91. *L. forsteri* DC., 127, in the forest, BULU 27206 A, E. S. E., Crp.
92. *L. multiflora* (Ehrh.) Lej., 107, in meadows, BULU 26719, Crp.
93. *L. pseudosudetica* Krecz., 99, in wet meadows, 24.05.2003, D, BULU 15340, E. E., Crp.
94. *L. spicata* (L.) DC., 104, in open places, 23.05.2002, K, D, Y, BULU 14026, Crp.
95. *L. sylvatica* (Huds.) Gaudin, 106, in the forest, BULU 15200, E. S. E., Crp.

#### Liliaceae

- \*96. *Allium cappadocicum* Boiss., 141, on rocky slopes, 16.06.2004, D, Y, E, BULU 19891, I. T. E., E. T., LC., Crp.
97. *A. guttatum* Steven subsp. *guttatum*, 126, on alpine slopes, BULU 28378, Crp.
98. *A. guttatum* subsp. *sardoum* (Moris) Stearn, 114, on alpine stony slopes, BULU 17920, M. E., Crp.
99. *A. flavum* L. subsp. *flavum* var. *minus* Boiss., 126, on alpine rocky slopes, BULU 28377, E. E., E. T., VU., Crp.
- \*\*100. *A. jubatum* Macbride, 61, on rocky slopes, BULU 28064, E. E., Crp.
- \*101. *A. lycaonicum* Siehe ex Hayek, 141, rocky slopes, 06.06.2002, K, D, Y, BULU 14164, Crp.
102. *A. olympicum* Boiss., 68, at watersides, BULU 28295, E. E., E. T., LC., Crp.
103. *A. paniculatum* L. subsp. *paniculatum*, 78, in the forest, BULU 28584, Crp.
104. *A. porrum* L., 21, in open places, 19.07.2007, K, Y, BULU 29303, Crp.
105. *A. scorodoprassum* L. subsp. *rotundum* (L.) Stearn, 60, at roadsides, BULU 28044, Crp.
106. *A. sibthorpiatum* Schult. & Schult. f., 112, on alpine stony slopes, 07.08.2003, D, Y, BULU 17894, E. T., LC., Crp.
107. *A. stamineum* Boiss., 40, at stony roadsides, BULU 28170, E. M. E., Crp.
108. *Asparagus acutifolius* L., 52, on stony slopes, BULU 14787, Crp.
109. *A. officinalis* L., 149, on stony slopes, BULU 27687, Crp.
110. *Asphodelus aestivus* Brot., 141, in forest openings, 06.06.2002, K, D, Y, BULU 14167, Crp.
111. *Asphodeline taurica* (Pall.) Kunth, 37, on alpine slopes, BULU 17490, E. M. E., Crp.
112. *Colchicum umbrosum* Steven, 50, in meadows, 06.10.2006, K, D, Y, BULU 28617, E. E., Crp.
- \*113. *Eremurus spectabilis* M. Bieb., 141, in forest openings, 15.06.2003, D, Y, BULU 14617, I. T. E., Crp.
114. *Fritillaria bithynica* Baker, 80, Q. scrub, BULU 26604, E. M. E., E. T., NT., Crp.

115. *F. pontica* Wahlenb., 127, in the forest, BULU 27191, E. S. E., Crp.
116. *Gagea bithynica* Pascher, 50, in meadows, 07.05.2004, D, BULU 18770; 97, forest openings, BULU 18795, E. M. E., E. T., LC., Crp.
117. *G. bohemica* (Zauschn.) Schult. & Schult. f., 67, in meadows, 02.05.2002, K, D, Y, BULU 13663, Crp.
118. *G. chrysantha* (Jan) Schult. & Schult. f., 48, in forest openings, BULU 14755, M. E., Crp.
119. *G. fistulosa* Ker Gawl., 35, in forest openings, 06.05.2004, K, D, Y, BULU 18572, Crp.
120. *G. granatellii* Parl., 29, in Q. scrub, BULU 14810, M. E., Crp.
- \*121. *G. peduncularis* (J. & C. Presl) Pascher, 36, among *J. communis* communities, BULU 18589, M. E., Crp.
122. *G. pratensis* (Pers.) Dumort., 85, in open places, 17.03.2004, D, BULU 18199, E. S. E., Crp.
123. *G. villosa* (M. Bieb.) Duby var. *villosa*, 93, in fields, BULU 14719, M. E., Crp.
124. *Hyacinthella lineata* (Steud.) Chouard, 136, on stony slopes, 13.04.2003, D, BULU 14727, E. T., LC., Crp.
125. *Muscari armeniacum* Leichtlin ex Baker, 70, in the forest, BULU 27477, Crp.
126. *M. bourgaei* Baker, 125, among *J. communis*-*F. punctoria* communities, 29.06.2002, D, BULU 14596, E. T., LC., Crp.
127. *M. neglectum* Guss., 127, in Q. scrub, BULU 27167, Crp.
128. *M. tenuiflorum* Tausch, 135, on stony slopes, 16.06.2004, D, Y, E, BULU 19737, Crp.
129. *Nectaroscordum siculum* (Ucria) Lindl. subsp. *bulgaricum* (Janka) Stearn, 65, at edges of forest, 09.06.2003, K, BULU 15566, Crp.
130. *Ornithogalum armeniacum* Baker, 141, on rocky slopes, 16.06.2004, D, Y, E, BULU 19893, E. M. E., Crp.
131. *O. comosum* L., 92, in the forest, BULU 13417, Crp.
132. *O. fimbriatum* Willd., 110, at roadsides, 25.05.2001, D, BULU 13352, E. M. E., Crp.
133. *O. joschtiae* Speta, 3, among *J. communis* communities, BULU 19592, E. E., U. E., EN., Crp.
134. *O. montanum* Cyr., 67, in open places, 02.05.2002, K, D, Y, BULU 13661, E. M. E., Crp.
135. *O. mysum* Speta, 50, in open places, 17.04.2003, K, D, Y, BULU 14750, E. T., EN., Crp.
136. *O. narbonense* L., 95, at fieldsides, BULU 26183, Crp.
137. *O. nutans* L., 138, in the forest, BULU 15251, E. M. E., Crp.
138. *O. oligophyllum* E.D. Clarke, 101, among *J. communis* communities, 19.05.2003, D, BULU 15186; 48, at watersides, BULU 14756, Crp.
139. *O. orthophyllum* Ten., 106, in the forest, 23.05.2002, K, D, Y, BULU 14036, Crp.
140. *O. platyphyllum* Boiss., 67, in open places, 02.05.2002, K, D, Y, BULU 13660, I. T. E., Crp.
- \*\*141. *O. pyrenaicum* L., 146, in open places, BULU 27616, Crp.
142. *O. sigmoideum* Freyn & Sint., 29, in Q. scrub, BULU 14814, E. S. E., Crp.
143. *O. ulophyllum* Hand.-Mazz., 59, on stony slopes, BULU 27727, Crp.
144. *O. uluense* Speta, 124, on alpine stony slopes, 08.07.2006, D, E, BULU 27956, E. T., VU., Crp.
145. *O. wiedemanii* Boiss., 107, in open places, BULU 26720, Crp.
146. *Polygonatum orientale* Desf., 27, at edges of forest, BULU 27573, E. E., Crp.
147. *Ruscus aculeatus* L., 84, in maquis, 03.03.2002, D, BULU 13451, Ph.
148. *R. hypoglossum* L., 74, in the forest, BULU 27836, E. S. E., Ph.
149. *Scilla autumnalis* L., 50, in open places, 06.10.2006, K, D, Y, BULU 28616, Crp.
150. *S. bifolia* L., 109, in forest openings, BULU 26755, M. E., Crp.
151. *Smilax excelsa* L., 135, in forest openings, 27.05.2003, K, D, Y, BULU 15458, Ph.
152. *Tulipa sylvestris* L., 110, on stony slopes, 23.05.2002, K, D, Y, BULU 14078, Crp.
- Orchidaceae**
153. *Anacamptis pyramidalis* Rich., 93, at watersides, BULU 13405, Crp.
154. *Cephalanthera damasonium* (Mill.) Druce, 130, in the forest, BULU 27335, Crp.
155. *C. longifolia* (L.) Fritsch, 84, in maquis, 19.05.2003, D, BULU 15321, Crp.
156. *C. rubra* (L.) Rich., 58, in forest openings, BULU 27711, Crp.
157. *Dactylorhiza × abantiana* H. Baumann & Künkele (*D. iberica* × *D. nieschalkiorum*), 118, at watersides, 27.07.2006, K, Y, BULU 28778, Crp.
158. *D. iberica* (M. Bieb. ex Willd.) Soò, 62, at watersides, BULU 28113, E. M. E., Crp.



159. *D. maculata* (L.) Soó subsp. *maculata*, 18, in wet open places, 24.07.2005, K, Y, BULU 26606, A new record for flora of Turkey, Crp.
160. *D. nieschalkiorum* H. Baumann & Künkele, 34, at watersides, 09.07.2003, K, D, Y, BULU 17412, E. T., LC., Crp.
161. *D. romana* (Seb.) Soó subsp. *romana*, 4, at watersides, BULU 20502, M. E., Crp.
162. *Epipactis bithynica* Robatsch, 102, in forest openings, BULU 26441, E. T., VU., Crp.
163. *Limodorum abortivum* (L.) Sw. var. *rubrum* H. Sund. ex Kretz, 140, in the forest, BULU 15719, Crp.
164. *Orchis anatolica* Boiss., 118, among *J. communis* communities, 24.05.2003, D, BULU 15329, Crp.
165. *O. mascula* L. subsp. *pinetorum* (Boiss. & Kotschy) G. Camus, 141, in forest openings, 06.06.2002, K, D, Y, BULU 14173, E. M. E., Crp.
166. *O. pallens* L., 119, on stony slopes, BULU 19656, E. S. E., Crp.
167. *O. purpurea* Huds., 138, in the forest, BULU 15255, E. S. E., Crp.
168. *Platanthera chlorantha* (Custer) Rchb., 127, in the forest, BULU 27192, Crp.
- Poaceae (Gramineae)**
169. *Aegilops geniculata* Roth, 130, at stony roadsides, BULU 27338, M. E., Th.
170. *Ae. triuncialis* L. subsp. *triuncialis*, 148, at fieldsides, BULU 27652, Th.
171. *Ae. umbellulata* Zhuk. subsp. *umbellulata*, 146, in forest openings, BULU 27621, Th.
172. *Agrostis canina* L., 144, at wet roadsides, BULU 28531, E. S. E., Crp.
- \*173. *A. capillaris* L. var. *aristata* (Boiss.) Dogan, 86, at fieldsides, BULU 17800, E. S. E., Hcrp.
174. *A. olympica* (Boiss.) Bor, 126, on alpine slopes, BULU 28343, E. S. E., Hcrp.
175. *Alopecurus aequalis* Sobol., 50, at watersides, 15.05.2006, K, D, E, BULU 27140, E. S. E., Crp.
176. *A. gerardii* Vill. var. *gerardii*, 101, among *J. communis* communities, 19.05.2003, D, BULU 15184, M. E., Crp.
177. *A. lanatus* Sibth. & Sm., 124, on alpine stony slopes, BULU 14602, E. M. E., E. T., LC., Crp.
178. *A. myosuroides* Huds. var. *myosuroides*, 127, in open places, BULU 27215, E. S. E., Hcrp.
179. *A. vaginatus* (Willd.) Boiss., 124, on alpine stony slopes, 29.06.2002, D, BULU 14603, Crp.
180. *Anthoxanthum odoratum* L. subsp. *odoratum*, 70, in the forest, BULU 27484, Hcrp.
181. *Arrhenatherum elatius* (L.) P. Beauv. subsp. *elatius*, 84, on slopes, 24.05.2003, D, BULU 15318, E. S. E., Th.
182. *Avena barbata* Pott ex Link subsp. *barbata*, 127, in open places, BULU 27207, M. E., Hcrp.
183. *A. eriantha* Durieu, 50, in the forest, 15.05.2006, K, D, E, BULU 27131, Th.
184. *Bellardiochloa violacea* (Bellardi) Chiov., 4, on alpine stony slopes, BULU 20511, E. S. E., Hcrp.
185. *Brachypodium sylvaticum* (Huds.) P. Beauv., 128, in open places, BULU 27256 A, E. S. E., Hcrp.
186. *Briza media* L., 103, at roadsides, 16.07.2003, D, Y, BULU 17602, Hcrp.
187. *Bromus arvensis* L., 132, on stony slopes, BULU 27069 A, Th.
188. *B. cappadocicus* Boiss. & Bal. subsp. *cappadocicus*, 150, in forest openings, BULU 27700, Th.
189. *B. commutatus* Schrad., 72, at roadsides, BULU 27785, Th.
190. *B. hordeaceus* L. subsp. *hordeaceus*, 143, in the forest, 19.06.2002, K, Y, BULU 14218, Th.
191. *B. hordeaceus* subsp. *molliformis* (Lloyd) Maire & Weiller, 134, at roadsides, BULU 27387, M. E., Th.
192. *B. intermedius* Guss., 86, at fieldsides, BULU 17803, Th.
193. *B. japonicus* Thunb. subsp. *japonicus*, 42, on stony slopes, BULU 27497, Th.
- \*/\*\*194. *B. racemosus* L., 149, on stony slopes, BULU 27688 B, E. S. E., Th.
195. *B. scoparius* L., 132, on stony slopes, 19.05.2006, D, E, BULU 27326, Th.
196. *B. sterilis* L., 43, at fieldsides, BULU 27531 B, Th.
197. *B. tectorum* L., 134, at roadsides, BULU 27391, Th.
198. *Catabrosa aquatica* (L.) P. Beauv., 46, at watersides, 07.05. 2004, D, BULU 18644, Hcrp.
199. *Catapodium rigidum* (L.) C. E. Hubb. ex Dony subsp. *rigidum* var. *rigidum*, 75, at wet roadsides, BULU 27892 B, Hcrp.
200. *Cynodon dactylon* Pers. var. *villosus* Regel, 12, at roadsides, BULU 28475, Hcrp.
201. *Cynosurus echinatus* L., 72, on slopes, BULU 27786, M. E., Th.
202. *C. effusus* Link, 75, at roadsides, BULU 27892, M. E., Th.
203. *Dactylis glomerata* L. subsp. *glomerata*, 65, at roadsides, 02.07.2003, K, D, Y, BULU 17165; 71, at roadsides, BULU 27549, Hcrp.

204. *D. glomerata* subsp. *hispanica* (Roth) Nyman, 31, at fieldsides, BULU 15392, Hcrp.
205. *Danthonia decumbens* (L.) DC., 37, on alpine rocky slopes, BULU 17493, Hcrp.
206. *Deschampsia caespitosa* (L.) P. Beauv., 4, on rocky slopes, BULU 20506, Hcrp.
207. *D. flexuosa* (L.) Trin., 122, at roadsides, BULU 23565, E. S. E., Crp.
208. *Digitaria sanguinalis* (L.) Scop., 144, at watersides, BULU 28534, Hcrp.
209. *Echinochloa colonum* Link, 144, at watersides, BULU 28536, Hcrp.
210. *E. crus-galli* (L.) P. Beauv., 11, at wet roadsides, BULU 28466, Hcrp.
211. *Festuca arundinacea* Schreb. subsp. *arundinacea*, 70, in the forest, BULU 27482; 50, under forest, 07.05.2004, D, BULU 18781 B, Hcrp.
212. *F. cyllenica* Boiss. & Heldr. subsp. *uluana* Markgr.-Dann., 119, on stony slopes, 08.07.2006, D, E, BULU 27935, E. E., E. T., NT., Hcrp.
213. *F. decolorata* Markgr.-Dann., 101, at roadsides, BULU 20616, E. E., U. E., CR., Hcrp.
214. *F. heterophylla* Lam., 87, on slopes, BULU 17697, Hcrp.
215. *F. jeanpertii* (St.-Yves) Markgr. subsp. *jeanpertii*, 10, on stony slopes, BULU 12090, Hcrp.
216. *F. paphlagonica* (St.-Yves) Markgr.-Dann. subsp. *paphlagonica*, 111, on alpine slopes, BULU 13308; 4, on alpine slopes, BULU 20510, E. E., E.T., NT., Hcrp.
217. *F. punctoria* Sibth. & Sm., 37, on alpine rocky slopes, BULU 17492, E. M. E., U. E., EN., Hcrp.
218. *F. rubra* L. subsp. *pseudorivularis* Markgr.-Dann., 103, on stony slopes, BULU 17605, E. E., U. E., CR., Hcrp.
219. *Helictotrichon pubescens* (Huds.) Pilg. subsp. *pubescens*, 112, on alpine stony slopes, BULU 13305, Hcrp.
220. *Holcus lanatus* L., 77, at roadsides, BULU 28560, Hcrp.
221. *Hordelymus europaeus* (L.) Jensen, 11, in the forest, BULU 28467, E. S. E., Hcrp.
222. *Hordeum geniculatum* All., 132, on slopes, 07.05.2004, D, BULU 18692, Hcrp.
223. *Leersia oryzoides* (L.) Sw., 127, in open places, BULU 27165 B, Crp.
224. *Lolium multiflorum* Lam., 65, in the forest, 18.07.2002, D, Y, BULU 14406, Th.
225. *L. perenne* L., 134, at roadsides, BULU 27392, E. S. E., Hcrp.
226. *Melica ciliata* L. subsp. *ciliata*, 61, at stony roadsides, BULU 28053, Hcrp.
227. *M. uniflora* Retz., 127, in Q. scrub, BULU 27206, E. S. E., Th.
228. *Narduus stricta* L., 67, at watersides, 01.09.2004, D, E, BULU 23411, E. S. E., Hcrp.
229. *Phleum alpinum* L., 127, on alpine stony slopes, BULU 28014, E. S. E., Crp.
230. *P. exaratum* Hochst. ex Griseb. subsp. *exaratum*, 141, on rocky slopes, 16.06.2004, D, Y, E, BULU 19910 B; 28, on stony slopes, BULU 27592 A, Th.
231. *Piptatherum miliaceum* (L.) Coss. subsp. *thomasii* (Duby) Freitag, 12, at roadsides, BULU 28474, Hcrp.
232. *Poa alpina* L. subsp. *fallax* F. Herm., 119, on stony slopes, BULU 19650, Hcrp.
233. *P. annua* L., 72, at wet roadsides, BULU 27787, Th.
234. *P. bulbosa* L., 50, in the forest, 07.05.2004, D, BULU 18778, Crp.
235. *P. compressa* L., 130, on stony slopes, BULU 27344, Hcrp.
236. *P. nemoralis* L., 99, in meadows, 26.09.2004, D, BULU 23579, Hcrp.
237. *P. pratensis* L., 26, at roadsides, BULU 27563 A, Crp.
238. *P. supina* Schrad., 125, among *J. communis*-*F. punctoria* communities, 12.06.2004, D, BULU 19667, E. S. E., Crp.
239. *P. trivialis* L., 118, at roadsides, 12.06.2004, D, BULU 19651, Hcrp.
240. *Polypogon viridis* (Gouan) Breistr., 1, in the forest, BULU 28432, Hcrp.
241. *Secale cereale* L. var. *cereale*, 84, at roadsides, 24.05.2003, D, BULU 15357, Th.
242. *Setaria viridis* (L.) P. Beauv., 94, at fieldsides, BULU 23792, Hcrp.
243. *Taeniatherum caput-medusae* (L.) Nevski subsp. *crinitum* (Schreb.) Melderis, 135, at stony roadsides, 16.06.2004, D, Y, E, BULU 19748, I. T. E., Th.
244. *Trisetum flavescens* (L.) Pers., 132, in the forest, 19.05.2006, D, E, BULU 27324, E. S. E., Hcrp.
245. *Triticum durum* Desf., 71, at roadsides, BULU 27550, Th.
246. *Vulpia bromoides* (L.) Gray, 128, at roadsides, BULU 27259 B, E. S. E., Th.
247. *V. ciliata* Dumort. subsp. *ciliata*, 134, at roadsides, BULU 27367 B, Th.

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