



A study on flora of Çakmak Dam and its surroundings (Çarşamba, Samsun/Turkey)

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Abstract

This research was carried out from 2007 to 2009 in order to determine the flora of the Çakmak Dam (Çarşamba-Samsun) and its surroundings. In the area, 311 taxa belonging to 214 genera and 70 families were determined (214 species, 61 subspecies and 36 varieties). The families with the most taxa in the research area are Asteraceae with 31 taxa (9.96 %), Leguminosae with 29 taxa (9.32 %) and Gramineae with 28 taxa (9.00 %). Genera represented by the highest number of species are *Trifolium* L. (7 taxa), *Salvia* L. (6 taxa), *Vicia* L. (5 taxa) and *Geranium* L. (5 taxa). The distribution rates of taxa into phytogeographical regions are as follows: 25.72 % Euro-Siberian, 9.00 % Mediterranean, 1.28 % Irano-Turanien and 63.98 % pluriregional or of unknown phytogeographic origin. The number of endemic taxa within the study area is 3 (0.96 %).

Key Words: *Flora, Çakmak Dam, Samsun, Turkey*

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Çakmak barajı ve çevresinin florası üzerine bir araştırma (Çarşamba, Samsun/Türkiye)

Özet

Bu araştırma 2007-2009 yılları arasında, Çakmak Barajı (Çarşamba-Samsun) ve çevresinin florasını tespit etmek üzere yapılmıştır. Araştırma alanında, 70 familyaya ait 214 cins ve toplam 311 takson tespit edilmiştir (214 tür, 61 alttür ve 36 varyete). Araştırma alanında en fazla taksona sahip familyalar, 31 takson ile Asteraceae (9.96 %), 29 takson ile Leguminosae (9.32 %) ve 28 takson ile Gramineae (9.00 %) 'dir. En çok tür ile temsil edilen cinsler *Trifolium* L. (7 takson), *Salvia* L. (6 takson), *Vicia* L. (5 takson) ve *Geranium* L. (5 takson)'dur. Taksonların fitocoğrafik bölgelere dağılım oranları şu şekildedir: Euro-Siberian 25.72 % , Akdeniz 9.00 % , Irano-Turanien 1.28 % ve coğrafik bölgesi bilinmeyenler veya birden fazla bölgede yayılış gösterenler 63.98 % ' dir. Çalışma alanındaki endemik takson sayısı 3 (0.96 %) 'dür.

Anahtar Kelimeler: *Flora, Çakmak Barajı, Samsun, Türkiye*

1.Introduction

Dams have been constructed in order to prevent floods, to supply drinking and domestic water to generate energy and for irrigation purposes since the old times. They have a great deal of positive and negative effects on the environment besides their benefits like controlling stream regimes, consequently preventing floods obtaining domestic and irrigation water from the stored water and generating energy. Dams which contribute to the national economy from many aspects like irrigation, drinking water supply, flood control, electricity generation, fishing, tourism are also effective in increasing the living and culture level of the region that they were constructed. Meanwhile, the new environment created by the dam also supports the arrival of different species to the area (Tahmiscioğlu et al., 2007).

This research was carried out to determine the flora of Çakmak Dam and its surroundings in Samsun province. Our research area, the region Çakmak Dam, which have been constructed in 1985-1988, is the source of Samsun's

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drinking water (Anonymous, 1991). After the construction of dam, the vegetation of the area has been extensively destroyed by antropogenic effects and the research area will be flooded, therefore the biological diversity has been affected by this project. For this reason, the population of plants at the research area should be examined scientifically. Some floristic studies were also carried out in localities close to the research area by Kılınç and Özen (1988), Engin and Korkmaz (1991), Kutbay et al. (1995), Kılınç et al. (1998) and Özen and Kılınç (2002), but no regular floristic study has been performed in our research area, the region Çakmak Dam and its existing endemic plants in the region and to evaluate the effectiveness of dam construction on flora and finally to contribute to our knowledge of the flora of Samsun.

The research area is located on the Abdal river, in 30 km. south-eastern of the city of Samsun. According to the grid-square system adopted for the Flora of Turkey (Davis, 1965-1985), the study area is in the A6 square. The study area is bordered in the north by Yukarıağcagüney village, in the south by Gökçeçakmak village, in the west by Çakmak Dam and the east by Kırbıyıklar village (Figure 1). Therefore, the research area is approximately 4 km long. The altitude of the study area varies between 100 and 250 m.

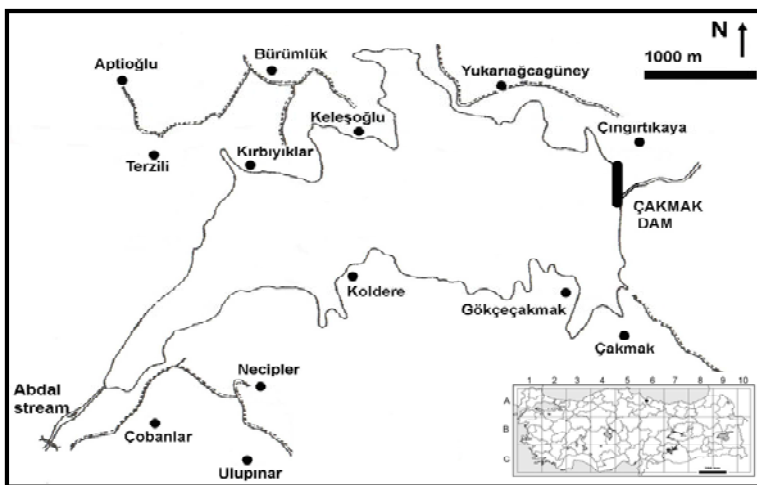


Figure 1. Map of the study area.

The geological structure of the research area mostly contains volcanic rocks belonging to the Neogen period. The most common soil type in the research area is the brown forest soil. Grayish-brown soils, alluvial and colluvial soil groups are also present locally in the riverside (Anonymous, 1991).

We used meteorological data obtained from the nearest meteorological stations Samsun and Çarşamba to determine the climate in the region (Anonymous, 2008). In Samsun and Çarşamba, the average annual temperature is 15.1 °C and 14.6 °C, respectively. The average annual precipitation is 702.4 mm in Samsun and 713.7 mm in Çarşamba. The most rainy months of the year are November and the lowest precipitation is found in July and June in Samsun and Çarşamba, respectively. The ombrothermic diagram was prepared using Walter's method (Figure 2 and 3). The rainfall regime of the study area is "autumn-winter-spring-summer" of West Mediterranean precipitation origin (Akman, 1999; Kılınç et al., 2006).

The main vegetation types observed to occur in the research area are forest vegetation, shrub vegetation, hydrophytic and rocky vegetation. Forest vegetation mostly includes *Pinus sylvestris* L., *Pinus nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe, *Acer campestre* L. subsp. *campestre*, *Fagus orientalis* Lipsky, *Quercus cerris* L. var. *cerris*, *Populus alba* L., *Coryllus avellana* L. var. *avellana*, *Carpinus betulus* L., *Carpinus orientalis* Miller subsp. *orientalis*, *Salix alba* L., *Salix babylonica* L., *Juglans regia* L., *Platanus orientalis* L., *Castanea sativa* Miller, *Robinia pseudoacacia* L., *Ulmus glabra* Hudson and *Morus alba* L. Furthermore, there exist also some plants in the shrub vegetation such as *Rubus canescens* DC var. *canescens*, *Juniperus oxycedrus* L. subsp. *oxycedrus*, *Rhododendron luteum* Sweet, *Spartium junceum* L., *Ilex aquifolium* L. and *Ligustrum vulgare* L. Hydrophytic vegetation is widespread along the riverside and Çakmak Dam. This vegetation includes *Equisetum ramosissimum* Desf., *Pteridium aquilinum* (L.) Kuhn., *Asplenium adiantum-nigrum* L., *Cardamine bulbifera* (L.) Crantz, *Epilobium hirsutum* L., *Sonchus oleraceus* L., *Veronica anagallis-aquatica* L. subsp. *anagallis-aquatica*, *Mentha longifolia* (L.) Hudson subsp. *longifolia*, *Typha latifolia* L., *Typha angustifolia* L., *Juncus inflexus* L., *Cyperus longus* L. and *Carex divisa* Hudson. *Minuartia micrantha* Schischk., *Lotus corniculatus* L. var. *corniculatus*, *Sedum pallidum* Bieb. var. *bithynicum* (Boiss.) Chamberlain, *Crepis foetida* L. subsp. *rheadifolia* (Bieb.) Celak and *Origanum vulgare* L. subsp. *vulgare* are commonly occurred on the rocks in the research area.

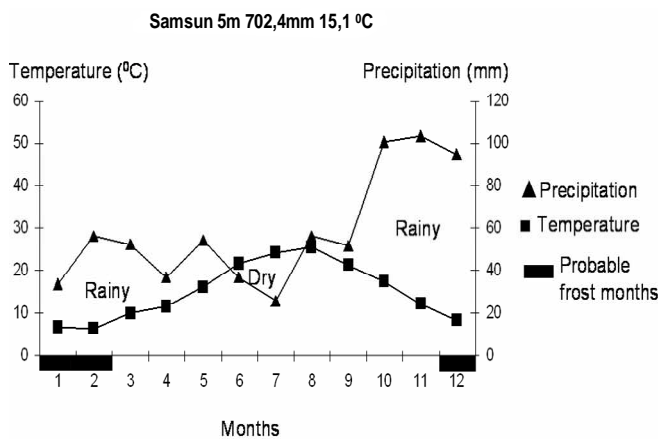


Figure 2. Ombrothermic diagram of Samsun.

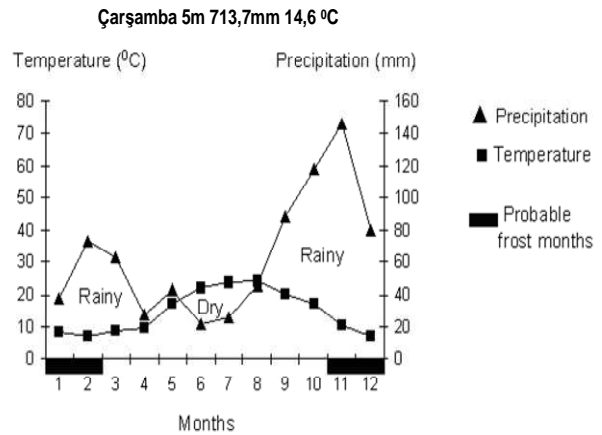


Figure 3. Ombrothermic diagram of Çarşamba.

2. Materials and methods

The materials of this study includes 684 plant specimens collected from the Çakmak Dam and its surrounding, in order to determine the floristic structure of the study area in 2007-2009. The research area is situated between $36^{\circ} 39' 06.99'' / 36^{\circ} 34' 28.24''$ E longitude and between $41^{\circ} 07'22.75'' / 41^{\circ} 05' 51.57''$ N latitude in Samsun province.

The specimens were dried using standard herbarium methods. The majority of the specimens were identified with the help of the *Flora of Turkey and The East Aegean Islands* (Davis 1965-1985; Davis et al., 1988) and the *Flora Europaea* (Tutin et al., 1964-1980). All of the plant specimens are kept in the herbarium of Ondokuz Mayıs University, Biology Department, Samsun (OMUB).

The plant taxa of the Çakmak Dam and its surroundings are listed in the appendix. All the taxa in the floristic list are given according to the order in *Flora of Turkey and The East Aegean Islands* (Davis 1965-1985; Davis et al., 1988). In the list, the following details are given: family and taxon name, authors of the species, locality, habitat, altitude, collection date, collector names, herbarium number. In addition, the phytogeographical region, IUCN (2001) threat categories and endemism rate also given.

The data of this study were compared with those of other studies (Kılınç and Özen; 1988, Engin and Korkmaz, 1991; Kutbay et al., 1995; Kılınç et al., 1998 and Özen and Kılınç, 2002). The authors of species names are given according to Brummitt and Powell (2001).

Abbreviations

The abbreviations used in the text and the appendix are Euxine (Eux.), Euro-Siberian element (Euro-Sib.), Hyrcano-Euxine element (Hyr-Eux.), Mediterranean element (Medit.), Irano-Turanien element (Ir-Tur.), Cosmopolitan (Cosm.), East (E.), Endemic (End.), North (N.), North-east (N.E.), South (S.), South-east (S.E.), Adnan Akçin (A.A.), Tülay Aytaş Akçin (T.A.), Least concern (L.C.).

3. Results

THE FLORISTIC LIST

PTERIDOPHYTA

EQUISETACEAE

Equisetum ramosissimum Desf.

1 km E. of Çakmak Dam, roadsides and slopes, 100 m, 01.05.2007, T.A 056 & A.A., widespread.

E. telmateia Ehrh.

1 km S. of Çakmak Dam, roadsides, 120 m, 05.06.2007, T.A. 141 & A.A.

HYPOLEPIDACEAE

Pteridium aquilinum (L.) Kuhn

2 km N. of Çakmak Dam, slopes, 115 m, 01.05.2007, T.A. 050 & A.A., widespread.

ASPLENIACEAE

Asplenium adiantum-nigrum L.

1 km N.E. of Çakmak Dam, wet meadows, 115 m, 21.08.2008, T.A. 237 & A.A.

POLYPODIACEAE

Polypodium vulgare L. subsp. *vulgare*

2 km N.E. of Çakmak Dam, open places, 120 m, 11.08.2008, T.A. 303 & A.A.

SPERMATOPHYTA

GYMNOSPERMAE

PINACEAE

Pinus sylvestris L.

2 km N. of Çakmak Dam, open forest, 175 m, 11.09.2008, T.A. 304 & A.A.

P. nigra Arn. subsp. *pallasiana* (Lamb.) Holmboe

1 km N.E. of Çakmak Dam, forest, 250 m, 05.06.2007, T.A. 065 & A.A.

P. brutia Ten.

2 km N.E. of Çakmak Dam, forest, 185 m, 07.10.2008, T.A. 305 & A.A.

CUPRESSACEAE

Juniperus oxycedrus L. subsp. *oxycedrus*

3 km N. of Çakmak Dam, open forest, 145 m, 05.06.2007, T.A. 157 & A.A.

ANGIOSPERMAE

DICOTYLEDONAE

RANUNCULACEAE

Helleborus orientalis Lam.

Yağbasan village, roadsides and fallow fields, 120 m, 13.04.2007, T.A. 016 & A.A.

Clematis vitalba L.

1 km S.E. of Çakmak Dam, meadows, 140 m, 05.06.2007, T.A. 140 & A.A.

Ranunculus neapolitanus Ten.

Güzelyurt village, 130 m, open hillsides, 13.04.2007, T.A. 029 & A.A.

R. muricatus L.

1 km E. of Çakmak Dam, Esençay side, open places, 120 m, 13.04.2007, T.A. 010 & A.A.

R. arvensis L.

E. of Çakmak Dam, open places and fallow fields, 125 m, 10.07.2008, T.A. 157 & A.A., widespread.

PAPAVERACEAE

Papaver rhoeas L.

2 km S. of Çakmak Dam, 125 m, wet meadows, 21.05.2007, T.A. 113 & A.A.

Fumaria officinalis L.

3 km S.E. of Çakmak Dam, roadsides, 130 m, 21.05.2007, T.A. 093 & A.A.

BRASSICACEAE (CRUCIFERAE)

Raphanus raphanistrum L.

Yağbasan village, 120 m, fields and open places, 13.04.2007, T.A. 028 & A.A.

Cardaria draba (L.) Desv. subsp. *draba*

1 km S.E. of Çakmak Dam, fallow fields, 135 m, 21.05.2007, T.A. 127 & A.A., widespread.

Capsella bursa-pastoris (L.) Medik.

2 km E. of Çakmak Dam, Esençay near, 110 m, 13.04.2007, T.A. 007 & A.A., Cosm.

Alyssum alyssoides (L.) L.

N.E. of Çakmak Dam, rocky limostene slopes, 21.05.2007, T.A. 146 & A.A.

Nasturtium officinale R.Br.

1 km E. of Çakmak Dam, riverside, 130 m, 21.05.2007, T.A. 058 & A.A., widespread.

Cardamine bulbifera (L.) Crantz

3 km N.E. of Çakmak Dam, riverside, 120 m, 01.05.2007, T.A. 062 & A.A., Euro-Sib.

C. tenera Gmel. apud Meyer

Güzelyurt village, 120 m, fallow fields and open places, 13.04.2007, T.A. 031 & A.A.

Sisymbrium altissimum L.

2 km of E. of Çakmak Dam, roadsides, 120 m, 01.05.2007, T.A. 047 & A.A.

CISTACEAE

Cistus creticus L.

1 km N. of Çakmak Dam, open places and open hillsides, 210 m, 22.06.2007, T.A. 059 & A.A., Medit.

Helianthemum nummularium (L.) Miller subsp. *nummularium*

2 km N.E. of Çakmak Dam, rocky limostene slopes, 135 m, 11.08.2008, T.A. 306 & A.A.

VIOLACEAE

Viola odorata L.

1 km E. of Çakmak Dam, Esençay near, open places, 120 m, 13.04.2007, T.A. 011 & A.A.

V. sieheana Becker

N.E. of Çakmak Dam, Esençay near, 100 m, open places, 13.04.2007, T.A. 015 & A.A.

V. kitaibeliana Roem & Schult

1 km N.E. of Çakmak Dam, rocky place, 125 m, 05.06.2007, T.A. 064 & A.A.

CARYOPHYLLACEAE

Minuartia micrantha Schischk

2 km S. of Çakmak Dam, rocky limestone slopes, 130 m, 21.05.2007, T.A. 099 & A.A.
Stellaria media (L.) Vill. subsp. *media*
 1 km E. of Çakmak Dam, Esençay near, open places, 140 m, 13.04.2007, T.A. 014 & A.A.
S. holostea L.
 Güzelyurt village, roadside and open hillsides, 130 m, 13.04.2007, T.A. 033 & A.A., Euro-Sib.
Cerastium fontanum Baumg. subsp. *triviale* (Link.) Jalas
 Esençay side, open places, 100 m, 13.04.2007, T.A. 005 & A.A.
Dianthus orientalis Adams
 S.E. of Çakmak Dam, rocky slopes, 175 m, T.A. 186 & A.A.
Petrorrhagia prolifera (L.) Ball & Heywood
 2 km N.E. of Çakmak Dam, open hillsides, 135 m, 10.07.2008, T.A. 158 & A.A.
Silene otites (L.) Wibel
 S. of Çakmak Dam, open places, 120 m, 05.06.2007, T.A. 143 & A.A.
S. vulgaris (Moench.) Garcke var. *vulgaris*
 1 km S.E. of Çakmak Dam, meadows and fallow fields, 230 m, 11.09.2008, T.A. 289 & A.A.
S. dichotoma Ehrh. subsp. *euxina* (Rupr.) Coode & Culter
 3 km S.E. of Çakmak Dam, roadsides, 155 m, 11.08.2008, T.A. 307 & A.A., Eux.

S. gallica L.
 2 km E. of Çakmak Dam, fallow fields, 120 m, 11.08.2008, T.A. 308 & A.A., Cosm.

POLYGONACEAE

Polygonum persicaria L.
 2 km S. of Çakmak Dam, open hillsides, 130 m, 21.08.2008, T.A. 232 & A.A.
P. convolvulus L.
 1 km N. of Çakmak Dam, meadows, 130 m, 11.08.2008, T.A. 309 & A.A.
Rumex crispus L.
 E. of Çakmak Dam, moist places, 180 m, 01.05.2007, T.A. 052 & A.A.
R. conglomeratus Murray
 1 km E. of Çakmak Dam, meadows, 130 m, 10.07.2008, T.A. 171 & A.A.

CHENOPODIACEAE

Chenopodium murale L.
 Yağbasan village, fallow fields, 130 m, 13.04.2007, T.A. 022 & A.A., Cosm.
C. album L. subsp. *album* var. *album*
 1 km E. of Çakmak Dam, moist places and fallow fields, 120 m, T.A. 250 & A.A.

PHYTOLACCACEAE

Phytolacca americana L.
 2 km E. of Çakmak Dam, open hillsides, 130 m, 10.07.2008, T.A. 176 & A.A.

HYPERICACEAE(GUTTIFERAE)

Hypericum androsaemum L.
 3 km E. of Çakmak Dam, moist places, 165 m, 10.07.2008, T.A. 167 & A.A.
H. perforatum L.
 3 km N.E. of Çakmak Dam, slopes, 185 m, 10.07.2008, T.A. 156 & A.A., Med.
H. perforatum L.
 2 km S. of Çakmak Dam, rocky slopes, 140 m, 05.06.2007, T.A. 138 & A.A.

MALVACEAE

Malva sylvestris L.
 N.E. of Çakmak Dam, open places, 130 m, 22.06.2007, T.A. 123 & A.A.
M. neglecta Wallr.
 3 km S.E. of Çakmak Dam, roadsides, 165 m, 11.09.2008, T.A. 284 & A.A.
Lavatera punctata All.
 E. of Çakmak Dam, fallow fields, 140 m, 10.07.2008, T.A. 169 & A.A.
Alcea setosa (Boiss.) Alef.
 3 km N.E. of Çakmak Dam, meadows, 200 m, 11.09.2008, T.A. 310 & A.A., Med.

LINACEAE

Linum tenuifolium L.
 1 km E. of Çakmak Dam, slopes, 130 m, 05.06.2007, T.A. 150 & A.A.

GERANIACEAE

Geranium purpureum Vill.
 S.E. of Çakmak Dam, roadsides and open hillsides, 125 m, 01.05.2007, T.A. 055 & A.A.
G. rotundifolium L.
 2 km N.E. of Çakmak Dam, rocky places, 150 m, 05.06.2007, T.A. 060 & A.A.
G. molle L. subsp. *molle*
 1 km E. of Çakmak Dam, open places, 125 m, 05.06.2007, T.A. 059 & A.A.
G. columbinum L.
 E. of Çakmak Dam, roadsides and open hillsides, 145 m, 01.05.2007, T.A. 057 & A.A.
G. asphodeloides Burm. fil. subsp. *asphodeloides*
 3 km E. of Çakmak Dam, meadows and slopes, 185 m, 01.05.2007, T.A. 067 & A.A., Euro-Sib.

- Erodium cicutarium* (L.) L' Herit subsp. *cutarium*
S.E. of Çakmak Dam, meadows, 130 m, 10.07.2008, T.A. 196 & A.A.
E. acaule (L.) Becherer & Thell.
3 km E. of Çakmak Dam, roadsides, 230 m, 21.08.2008, T.A. 311 & A.A., Med.

ACERACEAE

- Acer campestre* L. subsp. *campestre*
S. of Çakmak Dam, forest, 250 m, 21.05.2007, T.A. 116 & A.A.

VITACEAE

- Vitis sylvestris* Gmelin
1 km of N.E. of Çakmak Dam, forest, 120 m, 10.07.2008, T.A. 249 & A.A.

RHAMNACEAE

- Frangula alnus* Miller subsp. *alnus*
2 km N. of Çakmak Dam, meadows and forest, 185 m, 21.08.2008, T.A. 248 & A.A., Euro-Sib.

AQUIFOLIACEAE (ILICACEAE)

- Ilex aquifolium* L.
Yağbasan village, meadows, 175 m, 13.04.2007, T.A. 024 & A.A.

ANACARDIACEAE

- Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler
Northern slopes of Çakmak Dam, rocky places and slopes, 150 m, 11.09.2008, T.A. 312 & A.A., Med.

FABACEAE (LEGUMINOSAE)

- Genista tinctoria* L.
3 km S.E. of Çakmak Dam, rocky limostene slopes, 175 m, 10.07.2008, T.A. 191 & A.A., Euro-Sib.
Spartium junceum L.
E. of Çakmak Dam, slopes and open hillsides, 230 m, 21.08.2008, T.A. 292 & A.A., Med.
Robinia pseudoacacia L.
E. of Çakmak Dam, roadsides, 120 m, 01.05.2007, T.A. 048 & A.A., Cosm.
Galega officinalis L.
1 km E. of Çakmak Dam, moist and open places, 140 m, T.A. 160 & A.A., Euro-Sib.
Psoralea bituminosa L.
1 km S. of Çakmak Dam, roadsides, 110 m, 21.05.2007, T.A. 087 & A.A.
Vicia cracca L. subsp. *cracca*
2 km S.E. of Çakmak Dam, open places, 130 m, 05.06.2007, T.A. 134 & A.A., Euro-Sib.
V. cracca L. subsp. *stenophylla* Vel.
Esençay side, open places, 110 m, 22.06.2007, T.A. 266 & A.A.
V. hybrida L.
N.E. of Çakmak Dam, slopes, 135 m, 10.07.2008, T.A. 343 & A.A.
V. sativa L. subsp. *nigra* (L.) Ehrh. var. *nigra*
1 km S.E. of Çakmak Dam, fields, 135 m, 22.06.2007, T.A. 063 & A.A.
V. narborensis L. var. *narborensis*
S.E. of Çakmak Dam, open hillsides, 120 m, 05.06.2007, T.A. 266 & A.A.
Lathyrus aureus (Stev.) Brandza
2 km N.E. of Çakmak Dam, meadows, 130 m, 05.06.2007, T.A. 074 & A.A., Eux.
L. laxiflorus (Desf.) O. Kunte subsp. *laxiflorus*
S. of Çakmak Dam, meadows, 125 m, 21.05.2007, T.A. 106 & A.A.
L. inconspicuus L.
2 km E. of Çakmak Dam, open hillsides, 185 m, 01.05.2007, T.A. 076 & A.A.
Trifolium repens L. var. *repens*
1 km S. of Çakmak Dam, moist places, 130 m, 21.05.2007, T.A. 096 & A.A.
T. fragiferum L. var. *fragiferum*
S. of Çakmak Dam, open places, 130 m, 21.05.2007, T.A. 097 & A.A.
T. resupinatum L. var. *microcephalum*
2 km N.E. of Çakmak Dam, roadsides, 150 m, 22.06.2007, T.A. 265 & A.A.
T. pratense L. var. *pratense*
1 km E. of Çakmak Dam, open places, 130 m, 21.08.2008, T.A. 313 & A.A.
T. canescens Willd.
1 km S. of Çakmak Dam, stream sides and wet places, 120 m, 10.07.2008, T.A. 344 & A.A., Eux.
T. stellatum L. var. *stellatum*
N.E. of Çakmak Dam, roadsides, 240 m, 10.07.2008, T.A. 345 & A.A.
T. arvense L. var. *arvense*
2 km N.E. of Çakmak Dam, roadsides, 125 m, 21.08.2008, T.A. 314 & A.A.
Melilotus alba Desr.
S.E. of Çakmak Dam, roadsides, 135 m, 11.09.2008, T.A. 295 & A.A.
Medicago minima (L.) Bart. var. *minima*
1 km S.E. of Çakmak Dam, open places and slopes, 05.06.2007, T.A. 136 & A.A.
M. polymorpha L. var. *polymorpha*
1 km E. of Çakmak Dam, open hillsides, 130 m, 01.05.2007, T.A. 082 & A.A.
Dorycnium pentaphyllum Scop. subsp. *herbaceum* (Vill.) Rouy

- 1 km S. of Çakmak Dam, roadsides, 135 m, 21.05.2007, T.A. 108 & A.A.
Lotus corniculatus L. var. *corniculatus*
 2 km E. of Çakmak Dam, open hillsides and rocky places, 150 m, 01.05.2007, T.A. 081 & A.A., widespread.
Hymenocarpus circinnatus (L.) Savi
 1 km E. of Çakmak Dam, open forest, 130 m, 05.06.2007, T.A. 103 & A.A., Med.
Coronilla scorpioides (L.) Koch
 E. of Çakmak Dam, slopes and open hillsides, 130 m, T.A. 054 & A.A.
C. orientalis Miller var. *orientalis*
 2 km S.E. of Çakmak Dam, roadsides, 130 m, 10.07.2008, T.A. 195 & A.A.
C. varia L. subsp. *varia*
 3 km E. of Çakmak Dam, meadows, 200 m, 21.08.2008, T.A. 315 & A.A.

ROSACEAE

- Laurocerasus officinalis* Roemer
 1 km S. of Çakmak Dam, open forest, 135 m, 21.05.2007, T.A. 131 & A.A.
Prunus spinosa L. subsp. *dasyphylla* (Schur) Domin
 E. of Çakmak Dam, open places, 130 m, 01.05.2007, T.A. 064 & A.A., Euro-Sib.
Cerasus avium (L.) Moench
 2 km S. of Çakmak Dam, open forest, 150 m, 21.05.2007, T.A. 128 & A.A.
Filipendula vulgaris Moench
 2 km N.E. of Çakmak Dam, open places, 10.07.2008, T.A. 111 & A.A., Euro-Sib.
Rubus canescens D.C. var. *canescens*
 1 km S.E. of Çakmak Dam, meadows, 130 m, 21.08.2008, T.A. 316 & A.A.
Potentilla recta L. (Group B)
 1 km N. of Çakmak Dam, roadside, 130 m, 10.07.2008, T.A. 115 & A.A.
P. reptans L.
 2 km S. of Çakmak Dam, roadsides, 185 m, 21.05.2007, T.A. 101 & A.A., widespread.
Fragaria vesca L.
 1 km E. of Çakmak Dam, moist places and slopes, 125 m, 01.05.2007, T.A. 061 & A.A.
Agrimonia eupatoria L.
 2 km of S.E. of Çakmak Dam, river banks, 170 m, 10.07.2008, T.A. 180 & A.A.
Sanguisorba minor Scop. subsp. *muricata* (Spach) Briq.
 S. of Çakmak Dam, open places, 150 m, 05.06.2007, T.A. 135 & A.A.
Rosa canina L.
 Esençay side, open places and stream sides, 105 m, 01.05.2007, T.A. 037 & A.A.
Mespilus germanica L.
 1 km S.E. of Çakmak Dam, open places, 120 m, 10.07.2008, T.A. 170 & A.A., Hyr-Eux.
Crataegus monogyna Jacq. subsp. *monogyna*
 Yağbasan village, roadsides, 120 m, 13.04.2007, T.A. 025 & A.A.
Malus sylvestris Miller subsp. *orientalis* (A. Uglitzkich) Browicz var. *orientalis*
 2 km S. of Çakmak Dam, forest, 150 m, 21.05.2007, T.A. 130 & A.A.

LYTHRACEAE

- Lythrum salicaria* L.
 2 km E. of Çakmak Dam, meadows, 175 m, 10.07.2008, T.A. 163 & A.A., Euro-Sib.

ONOGRACEAE

- Epilobium hirsutum* L.
 E. of Çakmak Dam, wet places, 125 m, 10.07.2008, T.A. 199 & A.A.
E. montanum L.
 1 km N.E. of Çakmak Dam, stream sides, 115 m, 11.09.2008, T.A. 317 & A.A., Euro-Sib.

CRASSULACEAE

- Sedum pallidum* Bieb. var. *bithynicum* (Boiss.) Chamberlain
 1 km S.E. of Çakmak Dam, rocky places, 125 m, 10.07.2008, T.A. 183 & A.A., Eux.

SAXIFRAGACEAE

- Saxifraga cymbalaria* L. var. *cymbalaria*
 2 km S.E. of Çakmak Dam, moist places, 135 m, 10.07.2008, T.A. 210 & A.A.

APIACEAE (UMBELLIFERAE)

- Eryngium creticum* Lam.
 2 km N.E. of Çakmak Dam, fallow fields, 230 m, 21.08.2008, T.A. 308 & A.A., Med.
Chaerophyllum byzantinum Boiss.
 1 km E. of Çakmak Dam, wet places, 135 m, 07.10.2008, T.A. 319 & A.A., Eux.
Bifora radians Bieb.
 1 km S. of Çakmak Dam, roadsides and open places, 200 m, 21.05.2007, T.A. 100 & A.A.
Pimpinella corymbosa Boiss.
 E. of Çakmak Dam, slopes and rocky places, 130 m, 21.08.2008, T.A. 229 & A.A., Ir-Tur.
Oenanthe silaifolia Bieb.
 2 km E. of Çakmak Dam, wet places, 135 m, 10.07.2008, T.A. 154 & A.A.
Foeniculum vulgare Miller
 Saraçlı village, wet places, 230 m, 10.07.2008, T.A. 216 & A.A.

- Pastinaca sativa* L. subsp. *urens* (Req. ex Godron) Celak
1 km N.E. of Çakmak Dam, meadows, 140 m, 11.09.2008, T.A. 320 & A.A.
Torilis leptophylla (L.) Reichb.
2 km S.E. of Çakmak Dam, wet places, 125 m, 10.07.2008, T.A. 165 & A.A.

ARALIACEAE

- Hedera helix* L.
Near Yağbasan village, 125 m, 13.04.2007, T.A. 026 & A.A.

CORNACEAE

- Cornus mas* L.
Esençay side, meadows, 110 m, 01.05.2007, T.A. 038 & A.A.

CAPRIFOLIACEAE

- Sambucus ebulus* L.
2 km N.E. of Çakmak Dam, roadsides, 250 m, 10.07.2008, T.A. 214 & A.A., Euro-Sib.

DIPSACACEAE

- Dipsacus laciniatus* L.
2 km S.E. of Çakmak Dam, roadsides, 135 m, 11.09.2008, T.A. 321 & A.A.
Knautia degenii Borbas ex Formanek
1 km E. of Çakmak Dam, roadsides, 125 m, 10.07.2008, T.A. 208 & A.A., End., L.C.
Scabiosa columbaria L. subsp. *columbaria* var. *columbaria*
2 km E. of Çakmak Dam, rocky limostene slopes, 145 m, 11.09.2008, T.A. 297 & A.A.

ASTERACEAE (COMPOSITAE)

- Xanthium spinosum* L.
2 km N.E. of Çakmak Dam, open hillsides, 150 m, 07.10.2008, T.A. 322 & A.A.
Inula vulgaris (Lam.) Trevisan
1 km E. of Çakmak Dam, rocky place, 120 m, 21.08.2008, T.A. 219 & A.A., Euro-Sib.
I. graveolens (L.) Desf.
N. of Çakmak Dam, stony slopes, 130 m, 21.08.2008, T.A. 220 & A.A., Med.
Filago eriocephala Guss.
3 km E. of Çakmak Dam, open places, 175 m, 21.08.2008, T.A. 251 & A.A., Med.
Solidago virgaurea L. subsp. *virgaurea*
2 km N.E. of Çakmak Dam, open places, 185 m, 21.08.2008, T.A. 208 & A.A., Euro-Sib.
Conyza canadensis (L.) Cronquist
N.E. of Çakmak Dam, river banks, 130 m, 07.10.2008, T.A. 323 & A.A., Culture.
Bellis perennis L.
Esençay side, wet places, 100 m, 13.04.2007, T.A. 008 & A.A., Euro-Sib.
Senecio aquaticus Hill. subsp. *erraticus* (Bertol) Matthews
N.E. of Çakmak Dam, meadows, 130 m, 21.08.2008, T.A. 228 & A.A., Euro-Sib.
S. vulgaris L.
Near Esençay, open places, 105 m, 13.04.2007, T.A. 012 & A.A.
Tussilago farfara L.
Esençay side, roadsides, 110 m, 13.04.2007, T.A. 020 & A.A., Euro-Sib.
Eupatorium cannabinum L.
1 km N. of Çakmak Dam, stream sides and wet places, 115 m, 21.08.2008, T.A. 224 & A.A., Euro-Sib.
Anthemis tinctoria L. var. *tinctoria*
2 km S. of Çakmak Dam, open places and fields, 120 m, 21.05.2007, T.A. 110 & A.A.
Tanacetum poteriifolium (Ledeb.) Grierson
E. of Çakmak Dam, meadows, 130 m, 10.07.2008, T.A. 162 & A.A., Eux.
T. parthenium (L.) Schultz Bip.
1 km N. E. of Çakmak Dam, moist places, 140 m, 11.09.2008, T.A. 324 & A.A.
Onopordum acanthium L.
E. of Çakmak Dam, roadsides and rocky slopes, 135 m, 11.09.2008, T.A. 299 & A.A.
Cirsium polunii Davis & Parris
2 km N.E. of Çakmak Dam, roadsides, 130 m, 07.10.2008, T.A. 325 & A.A.
C. vulgare (Savi) Ten
S.E. of Çakmak Dam, roadsides, 135 m, 07.10.2008, T.A. 326 & A.A.
Carduus acicularis Bertol.
Esençay side, stony slopes, 110 m, 01.05.2007, T.A. 040 & A.A., Med.
Centaurea iberica Trev ex Sprengel
Near Esençay, open places, 100 m, 01.05.2007, T.A. 041 & A.A., widespread.
Carlina vulgaris L.
N.E. of Çakmak Dam, rocky slopes, 135 m, 21.08.2008, T.A. 235 & A.A.
Scolymus hispanicus L.
1 km N.E. of Çakmak Dam, roadsides, 115 m, 21.08.2008, T.A. 234 & A.A., Med.
Cichorium intybus L.
E. of Çakmak Dam, fallow fields, 175 m, 10.07.2008, T.A. 155 & A.A.
Picris hieracioides L.

- N.E. of Çakmak Dam, roadsides, 125 m, 21.08.2008, T.A. 221 & A.A., Euro-Sib.
P. strigosa Bieb. subsp. *macrotricha* H.W. Lack
 E. of Çakmak Dam, rocky limostene slopes, 235 m, 01.05.2007, T.A. 079 & A.A., Ir-Tur.
Sonchus asper (L.) Hill. subsp. *glaucescens* (Jordan) Ball.
 S. of Çakmak Dam, open places, 135 m, 21.05.2007, T.A. 126 & A.A.
S. oleraceus L.
 E. of Çakmak Dam, wet places, 145 m, 01.05.2007, T.A. 072 & A.A.
Lapsana communis L. subsp. *intermedia* (Bieb.) Hayek
 1 km E. of Çakmak Dam, wet places, 120 m, 01.05.2007, T.A. 046 & A.A.
Taraxacum scaturiginosum G. Hagl.
 1 km N.E. of Çakmak Dam, slopes, 110 m, 01.05.2007, T.A. 050 & A.A.
T. macrolepium Schischkin
 Güzelyurt village, roadsides, 200 m, 13.04.2007, T.A. 032 & A.A.
Chondrilla juncea L. var. *juncea*
 N. of Çakmak Dam, rocky places, 140 m, 07.10.2008, T.A. 301 & A.A.
Crepis foetida L. subsp. *rheadifolia* (Bieb.) Celak
 1 km E. of Çakmak Dam, rocky places and slopes, 125 m, 10.07.2008, T.A. 185 & A.A.

CAMPANULACEAE

- Campanula latifolia* L.
 E. of Çakmak Dam, wet places and open forest, 235 m, 21.08.2008, T.A. 281 & A.A., Euro-Sib.
C. rapunculoides L. subsp. *rapunculoides*
 2 km E. of Çakmak Dam, moist places, 140 m, 10.07.2008, T.A. 212 & A.A., Euro-Sib.
C. latiloba A. DC. subsp. *latiloba*
 E. of Çakmak Dam, open hillsides, 125 m, 10.07.2008, T.A. 175 & A.A., Eux., End., L.C.

ERICACEAE

- Rhododendron luteum* Sweet
 Near Yağbasan village, open forest, 115 m, 13.04.2007, T.A. 023 & A.A., Eux.
Arbutus andrachne L.
 1 km N.E. of Çakmak Dam, rocky places and slopes, 140 m, 11.09.2008, T.A. 327 & A.A.

PRIMULACEAE

- Primula vulgaris* Huds. subsp. *sibthorpii* (Hoffmanns) W.W. Sm & Forrest
 Yağbasan village, open places, 120 m, 13.04.2007, T.A. 019 & A.A., Eux.
Cyclamen coum Miller var. *coum*
 Near Yağbasan village, slopes, 110 m, 13.04.2007, T.A. 011 & A.A.
Lysimachia vulgaris L.
 2 km E. of Çakmak Dam, wet places, 130 m, 10.07.2008, T.A. 174 & A.A.
Anagallis arvensis L. var. *arvensis*
 E. of Çakmak Dam, open places and roadsides, 01.05.2007, T.A. 045 & A.A.

OLEACEAE

- Fraxinus angustifolia* Vahl. subsp. *oxycarpa* (Bieb. ex Willd) Franco & Rocha Afonso
 S. of Çakmak Dam, open places and meadows, 13.04.2007, T.A. 129 & A.A., Euro-Sib.
Ligustrum vulgare L.
 1 km N.E. of Çakmak Dam, meadows, 130 m, 21.08.2008, T.A. 241 & A.A., Euro-Sib.
Phillyrea latifolia L.
 N. of Çakmak Dam, slopes and meadows, 230 m, 21.05.2007, T.A. 073 & A.A., Med.

APOCYNACEAE

- Vinca major* L. subsp. *hirsuta* (Boiss.) Stearn
 Near Esençay, meadows, 120 m, 13.04.2007, T.A. 006 & A.A., Eux.

GENTIANACEAE

- Blackstonia perfoliata* (L.) Hudson subsp. *perfoliata*
 1 km E. of Çakmak Dam, roadsides, 130 m, 10.07.2008, T.A. 194 & A.A.
Centaureum pulchellum (Swartz) Druce
 E. of Çakmak Dam, slopes, 130 m, 10.07.2008, T.A. 187 & A.A.

CONVOLVULACEAE

- Convolvulus arvensis* L.
 S. of Çakmak Dam, roadsides, 135 m, 05.06.2007, T.A. 137 & A.A.
Calystegia silvatica (Kit.) Griseb.
 S. of Çakmak Dam, meadows, 125 m, 21.05.2007, T.A. 091 & A.A.

BORAGINACEAE

- Myosotis ramosissima* Rochel ex Schultes subsp. *ramosissima*
 E. of Çakmak Dam, roadsides, 135 m, 01.05.2007, T.A. 103 & A.A.
M. arvensis (L.) Hill. subsp. *arvensis*
 S.E. of Çakmak Dam, open places, 125 m, 10.07.2008, T.A. 136 & A.A., Euro-Sib.
Cynoglossum officinale L.
 Near Esençay, open places, 115 m, 01.05.2007, T.A. 036 & A.A., Euro-Sib.
C. creticum Miller
 E. of Çakmak Dam, roadsides, 150 m, 01.05.2007, T.A. 086 & A.A.

Echium italicum L.

N.E. of Çakmak Dam, fallow fields, 135 m, 10.07.2008, T.A. 161 & A.A., Med.

E. vulgare L.

N.E. of Çakmak Dam, roadsides, 230 m, 21.08.2008, T.A. 328 & A.A.

Trachystemon orientalis (L.) G. Don

Esençay side, open forest, 130 m, 13.04.2007, T.A. 018 & A.A., Eux.

Anchusa azurea Miller var. *azurea*

E. of Çakmak Dam, fallow fields, 125 m, 22.06.2007, T.A. 140 & A.A.

SOLANACEAE

Solanum nigrum L.

1 km E. of Çakmak Dam, roadsides and open places, 125 m, 21.08.2008, T.A. 230 & A.A., Cosm.

S. dulcamara L.

E. of Çakmak Dam, slopes and open hillsides, 125 m, 10.07.2008, T.A. 201 & A.A., Euro-Sib.

Physalis alkekengi L.

E. of Çakmak Dam, meadows and roadsides, 135 m, 21.08.2008, T.A. 227 & A.A.

Datura stramonium L.

Güzelyurt village, roadsides, 125 m, 11.09.2008, T.A. 258 & A.A., Cosm.

Hyoscyamus niger L.

E. of Çakmak Dam, open places and rocky slopes, 145 m, 11.09.2008, T.A. 274 & A.A., widespread.

SCROPHULARIACEAE

Verbascum spectabile Bieb. var. *spectabile*

E. of Çakmak Dam, wet places, 130 m, 05.06.2007, T.A. 188 & A.A.

V. speciosum Schrader

1 km N.E. of Çakmak Dam, slopes, 140 m, 21.08.2008, T.A. 346 & A.A.

Scrophularia scopolii [Hoppe ex] Pers var. *scopolii*

Yağbasan village, roadsides, 110 m, 13.04.2007, T.A. 030 & A.A., widespread.

Antirrhinum majus L. subsp. *majus*

N.E. of Çakmak Dam, roadsides, 130 m, 05.06.2008, T.A. 142 & A.A.

Veronica polita Fries

Near Esençay, open places, 115 m, 13.04.2007, T.A. 009 & A.A.

V. persica Poiret

1 km S. of Çakmak Dam, roadsides, 125 m, 13.04.2007, T.A. 116 & A.A.

V. anagallis-aquatica L. subsp. *anagallis-aquatica*

N. of Çakmak Dam, moist places, 170 m, 21.05.2007, T.A. 119 & A.A., Cosm.

V. chamaedrys L.

Near Esençay, open places, 110 m, 01.05.2007, T.A. 118 & A.A., Euro-Sib.

Parentucellia latifolia (L.) Caruel subsp. *latifolia*

S.E. of Çakmak Dam, wet places, 140 m, 01.05.2007, T.A. 053 & A.A., Med.

OROBANCHACEAE

Orobanche ramosa L.

S. of Çakmak Dam, roadsides, 125 m, 21.05.2007, T.A. 094 & A.A.

O. minor Sm.

2 km E. of Çakmak Dam, roadsides, 130 m, 01.05.2007, T.A. 083 & A.A.

VERBENACEAE

Verbena officinalis L.

N.E. of Çakmak Dam, meadows, 150 m, 11.09.2008, T.A. 329 & A.A., widespread.

LAMIACEAE (LABIATAE)

Teucrium chamaedrys L. subsp. *chamaedrys*

E. of Çakmak Dam, slopes and open hillsides, 130 m, 10.07.2008, T.A. 207 & A.A., Euro-Sib.

T. polium L.

N.E. of Çakmak Dam, open hillsides, 135 m, 11.09.2008, T.A. 330 & A.A.

Lamium purpureum L. var. *purpureum*

Yağbasan village, roadsides, 185 m, 13.04.2007, T.A. 027 & A.A., Euro-Sib.

L. album L.

Near Güzelyurt village, open places, 125 m, 21.05.2007, T.A. 119 & A.A., Euro-Sib.

Stachys balansae Boiss & Kotschy subsp. *balansae*

S. of Çakmak Dam, wet places, 160 m, 21.05.2007, T.A. 107 & A.A.

S. byzantina C. Koch

N.E. of Çakmak Dam, rocky places, 145 m, 11.09.2008, T.A. 277 & A.A., Euro-Sib.

S. sylvatica L.

S. of Çakmak Dam, wet places, 135 m, 21.05.2007, T.A. 095 & A.A., Euro-Sib.

S. annua (L.) L. subsp. *annua* var. *annua*

E. of Çakmak Dam, open places and moist places, 115 m, 01.05.2007, T.A. 051 & A.A., widespread.

Glechoma hederacea L.

Esençay side, open places, 100 m, 13.04.2007, T.A. 004 & A.A., Euro-Sib.

Prunella vulgaris L.

S. of Çakmak Dam, open places, 110 m, 21.05.2007, T.A. 092 & A.A., Euro-Sib.

P. laciniota (L.) L.

N.E. of Çakmak Dam, open places, 125 m, 10.07.2008, T.A. 132 & A.A., Euro-Sib.

Origanum vulgare L. subsp. *vulgare*

S.E. of Çakmak Dam, rocky slopes, 200 m, 10.07.2008, T.A. 208 & A.A., Euro-Sib.

Satureja hortensis L.

1 km S.E. of Çakmak Dam, roadsides, 125 m, 07.10.2008, T.A. 331 & A.A.

Calamintha nepeta (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball

N. of Çakmak Dam, fallow fields, 230 m, 07.10.2008, T.A. 302 & A.A.

Clinopodium vulgare L. subsp. *vulgare*

N.E. of Çakmak Dam, rocky places, 125 m, 21.08.2008, T.A. 238 & A.A.

Thymus sipyleus Boiss. subsp. *rosulans*

2 km N. of Çakmak Dam, rocky slopes, 250 m, 21.08.2008, T.A. 215 & A.A.

Mentha pulegium L.

N.E. of Çakmak Dam, wet places, 120 m, 21.08.2008, T.A. 225 & A.A.

M. longifolia (L.) Hudson subsp. *longifolia*

S.E. of Çakmak Dam, stream sides, 130 m, 10.07.2008, T.A. 202 & A.A.

Salvia tomentosa Miller

1 km E. of Çakmak Dam, rocky limostene slopes, 135 m, 11.09.2008, T.A. 332 & A.A., Med.

S. viridis L.

Güzelyurt village, roadsides, 140 m, 10.07.2008, T.A. 282 & A.A., Med.

S. forskahlei L.

E. of Çakmak Dam, meadows, 125 m, 01.05.2007, T.A. 085 & A.A., Eux.

S. glutinosa L.

1 km E. of Çakmak Dam, slopes, 145 m, 10.07.2008, T.A. 173 & A.A., Hyr-Eux.

S. verbenaca L.

E. of Çakmak Dam, roadsides, 185 m, 10.07.2008, T.A. 287 & A.A., Med.

S. verticillata L. subsp. *verticillata*

2 km E. of Çakmak Dam, roadsides and open hillsides, 120 m, 10.07.2008, Euro-Sib.

PLANTAGINACEAE

Plantago major L. subsp. *major*

N. of Çakmak Dam, wet places, 120 m, 21.08.2008, T.A. 246 & A.A.

P. lanceolata L.

S. of Çakmak Dam, roadsides, 120 m, 21.05.2007, T.A. 088 & A.A.

THYMELAEACEAE

Daphne pontica L.

N. of Çakmak Dam, forest, 150 m, 10.07.2008, T.A. 174 & A.A., Eux.

EUPHORBIACEAE

Mercurialis annua L.

1 km N.E. of Çakmak Dam, open forest, 140 m, 13.04.2007, T.A. 073 & A.A.

Euphorbia orientalis L.

E. of Çakmak Dam, fallow fields and roadsides, 125 m, 10.07.2008, T.A. 168 & A.A., Ir-Tur.

E. stricta L.

Near Esençay, open places, 110 m, 13.04.2007, T.A. 002 & A.A., Euro-Sib.

E. helioscopia L.

Esençay side, open places, 120 m, 13.04.2007, T.A. 001 & A.A.

E. rigida Bieb.

Güzelyurt village, roadsides, 125 m, 13.04.2007, T.A. 034 & A.A., Med.

URTICACEAE

Urtica dioica L.

E. of Çakmak Dam, moist places, 115 m, 01.05.2007, T.A. 069 & A.A., Euro-Sib.

MORACEAE

Morus alba L.

1 km E. of Çakmak Dam, roadsides, 125 m, 05.06.2007, T.A. 145 & A.A., Culture.

Ficus carica L. subsp. *carica*

S. of Çakmak Dam, fields, 200 m, 21.05.2007, T.A. 127 & A.A., Widespread.

ULMACEAE

Ulmus glabra Hudson

N.E. of Çakmak Dam, forest, 145 m, 21.05.2007, T.A. 112 & A.A., Euro-Sib.

JUGLANDACEAE

Juglans regia L.

1 km S.E. of Çakmak Dam, open forest, 250 m, 10.07.2008, T.A. 196 & A.A.

PLATANACEAE

Platanus orientalis L.

S. of Çakmak Dam, forest, 185 m, 21.05.2007, T.A. 211 & A.A.

FAGACEAE

Fagus orientalis Lipsky.

S. of Çakmak Dam, forest, 150 m, 21.05.2007, T.A. 120 & A.A.

Castanea sativa Miller

S.E. of Çakmak Dam, forest, 230 m, 22.06.2007, T.A. 117 & A.A.

Quercus infectoria Olivier subsp. *infectoria*

N.E. of Çakmak Dam, forest, 185 m, 11.09.2008, T.A. 333 & A.A., Euro-Sib.

Q. cerris L. var. *cerris*

S. of Çakmak Dam, forest, 145 m, 21.05.2007, T.A. 124 & A.A., Med.

CORYLACEAE

Carpinus betulus L.

S. of Çakmak Dam, forest, 150 m, 21.05.2007, T.A. 114 & A.A., Euro-Sib.

C. orientalis Miller subsp. *orientalis*

N.E. of Çakmak Dam, forest, 140 m, 11.09.2008, T.A. 298 & A.A.

Corylus avellana L. var. *avellana*

N.E. of Çakmak Dam, roadsides, 135 m, 10.07.2008, T.A. 206 & A.A., Euro-Sib.

C. maxima Miller

S. of Çakmak Dam, fields, 150 m, 01.05.2007, T.A. 125 & A.A., Euro-Sib., Culture.

SALICACEAE

Salix alba L.

E. of Çakmak Dam, forest, 125 m, 22.06.2007, T.A. 148 & A.A., Euro-Sib.

S. babylonica L.

S. of Çakmak Dam, forest, 155 m, 01.05.2007, T.A. 121 & A.A., Culture.

Populus alba L.

S.E. of Çakmak Dam, forest, 140 m, 01.05.2007, T.A. 133 & A.A., Euro-Sib.

P. nigra L. subsp. *nigra*

N.E. of Çakmak Dam, stream sides, 185 m, 21.05.2007, T.A. 105 & A.A.

RUBIACEAE

Asperula involucrata Wahlenb.

S.E. of Çakmak Dam, open places, 135 m, 10.07.2008, T.A. 159 & A.A., Eux.

A. orientalis Boiss & Hohen.

S. of Çakmak Dam, roadsides and slopes, 120 m, 21.05.2007, T.A. 090 & A.A., Ir-Tur.

A. arvensis L.

E. of Çakmak Dam, open places, 115 m, 01.05.2007, T.A. 077 & A.A., Med.

Galium rotundifolium L.

Güzelyurt village, open forest, 135 m, 22.06.2007, T.A. 148 & A.A., Euro-Sib.

G. verum L. subsp. *verum*

S.E. of Çakmak Dam, rocky places, 130 m, 10.07.2008, T.A. 203 & A.A., Euro-Sib.

G. paschale Forsskal.

S.E. of Çakmak Dam, meadows, 145 m, 21.08.2008, T.A. 334 & A.A., Med.

GYMNOSPERMAE

MONOCOTYLEDONAE

ALISMATACEAE

Alisma plantago-aquatica L.

1 km E. of Çakmak Dam, river banks, 135 m, 11.09.2008, T.A. 335 & A.A., Euro-Sib.

ARACEAE

Arum euxinum R. Mill.

N.E. of Çakmak Dam, open forest, 140 m, 22.06.2007, T.A. 213 & A.A., Eux., End., L.C.

LILIACEAE

Smilax excelsa L.

N. of Çakmak Dam, meadows, 130 m, 21.05.2007, T.A. 085 & A.A., Eux.

Ruscus aculeatus L. var. *aculeatus*

E. of Çakmak Dam, meadows, 130 m, 11.09.2008, T.A. 264 & A.A..

Allium scorodoprasum L. subsp. *jajlae*

N.E. of Çakmak Dam, fallow fields, 150 m, 05.06.2007, T.A. 196 & A.A., Eux.

Ornithogalum sigmoideum Freyn & Sint.

Yağbasan village, roadsides, 125 m, 13.04.2007, T.A. 021 & A.A., Euro-Sib.

O. umbellatum L.

Near Yağbasan village, fallow fields, 120 m, 13.04.2007, T.A. 013 & A.A.

Muscari neglectum Guss.

Near Esençay, open places, 100 m, 13.04.2007, T.A. 003 & A.A.

Fritillaria pontica Wahlenb.

Yağbasan village, meadows, 110 m, 13.04.2007, T.A. 017 & A.A., Euro-Sib.

ORCHIDACEAE

Neottia nidus-avis (L.) LCM Richard

Near Ağcagüney village, open forest, 150 m, 10.07.2008, T.A. 217 & A.A., Euro-Sib.

Platanthera chlorontha (Custer) Reichb.

Near Yağbasan village, open forest, 145 m, 10.07.2008, T.A. 215 & A.A.

Ophrys holoserica (Burm. fil.) Greuter subsp. *holoserica*

S. of Çakmak Dam, open forest and wet places, 145 m, 21.05.2007, T.A. 109 & A.A., Med.

O. oestriifera Bieb. subsp. *oestriifera*

S.E. of Çakmak Dam, open forest, 140 m, 10.07.2008, T.A. 206 & A.A.

Serapias vomeracea (Burm. fil.) Briq. subsp. *laxiflora* (Soo) Gözl & Reinhard
Ağcagüney village, roadsides, 120 m, 01.05.2007, T.A. 043 & A.A., Med.

Anacamptis pyramidalis (L.) L.C.M. Richard

E. of Çakmak Dam, wet places, 10.07.2008, T.A. 153 & A.A.

Orchis spitzelii Sauter ex W. Koch

Ağcagüney village, moist places, 130 m, 01.05.2007, T.A. 042 & A.A., Med.

DIOSCOREACEAE

Tamus communis L. subsp. *communis*

Near Esençay, meadows, 100 m, 01.05.2007, T.A. 039 & A.A.

TYPHACEAE

Typha latifolia L.

E. of Çakmak Dam, stream sides, 120 m, 10.07.2008, T.A. 198 & A.A.

T. angustifolia L.

E. of Çakmak Dam, river banks, 120 m, 10.07.2008, T.A. 197 & A.A.

JUNCACEAE

Juncus inflexus L.

1 km E. of Çakmak Dam, stream sides, 125 m, 10.07.2008, T.A. 166 & A.A.

Luzula forsteri (Sm.) DC.

N.E. of Çakmak Dam, slopes, 135 m, 21.08.2008, T.A. 271 & A.A., Euro-Sib.

CYPERACEAE

Cyperus longus L.

E. of Çakmak Dam, stream sides, 130 m, 05.06.2007, T.A. 144 & A.A.

Schoenoplectus lacustris (L.) Palla subsp. *tabernaemontani* (C.C. Gmelin) A. & D. Löve

E. of Çakmak Dam, stream sides, 120 m, 10.07.2008, T.A. 172 & A.A.

Carex divulsa Stokes subsp. *divulsa*

E. of Çakmak Dam, roadsides and open places, 200 m, 01.05.2007, T.A. 074 & A.A., Euro-Sib.

C. divisa Hudson

Yağbasan village, stream sides, 125 m, 10.07.2008, T.A. 152 & A.A., Euro-Sib.

C. flacca Schreber subsp. *serrulata*

E. of Çakmak Dam, roadsides and slopes, 135 m, 01.05.2007, T.A. 070 & A.A., Med.

POACEAE(GRAMINEAE)

Brachypodium sylvaticum (Hudson) P. Beauv.

1 km S. of Çakmak Dam, rocky slopes, 185 m, 11.09.2008, T.A. 336 & A.A., Euro-Sib.

Aegilops geniculata Roth.

N.E. of Çakmak Dam, rocky limostene slopes, 230 m, 10.07.2008, T.A. 178 & A.A., Med.

Hordeum murinum L. subsp. *glaucum* (Steudel) Tzvelev

S. of Çakmak Dam, roadsides, 110 m, 21.05.2007, T.A. 098 & A.A.

Bromus hordeaceus L. subsp. *hordeaceus*

E. of Çakmak Dam, roadsides, 120 m, 05.06.2007, T.A. 149 & A.A.

B. intermedius Guss.

N.E. of Çakmak Dam, open places, 250 m, 01.05.2007, T.A. 084 & A.A.

B. squarrosus L.

1 km E. of Çakmak Dam, open places and slopes, 140 m, 10.07.2008, T.A. 293 & A.A.

B. madritensis L.

E. of Çakmak Dam, slopes, 135 m, 01.05.2007, T.A. 071 & A.A.

Avena fatua L. var. *fatua*

N.E. of Çakmak Dam, fallow fields, 135 m, 11.09.2008, T.A. 337 & A.A.

Rostraria cristata (L.) Tzvelev var. *cristata*

1 km E. of Çakmak Dam, rocky slopes, 140 m, 21.08.2008, T.A. 338 & A.A.

Holcus lanatus L.

E. of Çakmak Dam, wet places, 125 m, 10.07.2008, T.A. 164 & A.A., Euro-Sib.

Alopecurus myosuroides Hudson var. *myosuroides*

Güzelyurt village, roadsides, 125 m, 13.04.2007, T.A. 035 & A.A., Euro-Sib., widespread.

Festuca arundinacea Schreber subsp. *arundinacea*

E. of Çakmak Dam, stream sides, 130 m, 11.09.2008, T.A. 300 & A.A.

F. heterophylla Lam.

N.E. of Çakmak Dam, open places and slopes, 120 m, 10.07.2008, T.A. 182 & A.A., Euro-Sib.

Lolium perenne L.

S.E. of Çakmak Dam, roadsides, 125 m, 10.07.2008, T.A. 190 & A.A., Euro-Sib.

Vulpia myuros (L.) C.C. Gmelin

N.E. of Çakmak Dam, fallow fields, 130 m, 10.07.2008, T.A. 296 & A.A.

Poa annua L.

1 km E. of Çakmak Dam, roadsides, 140 m, 01.05.2007, T.A. 049 & A.A.

P. trivialis L.

N.E. of Çakmak Dam, meadows, 125 m, 10.07.2008, T.A. 294 & A.A.

- P. pratensis* L.
1 km N.E. of Çakmak Dam, open places, 135 m, 21.08.2008, T.A. 339 & A.A.
- P. nemoralis* L.
E. of Çakmak Dam, roadsides, 130 m, 10.07.2008, T.A. 184 & A.A.
- Dactylis glomerata* L. subsp. *hispanica* (Roth.) Nyman
Near Güzelyurt village, roadsides, 130 m, 21.05.2007, T.A. 104 & A.A.
- Cynosurus cristatus* L.
2 km E. of Çakmak Dam, slopes and rocky place, 175 m, 10.07.2008, T.A. 164 & A.A., Euro-Sib.
- C. echinatus* L.
N.E. of Çakmak Dam, roadsides, 125 m, 21.08.2008, T.A. 269 & A.A., Med.
- Briza media* L.
Güzelyurt village, rocky slopes, 135 m, 21.08.2008, T.A. 340 & A.A.
- Stipa bromoides* (L.) Dörfler
1 km N.E. of Çakmak Dam, open places, 140 m, 11.09.2008, T.A. 341 & A.A., Med.
- Cynodon dactylon* (L.) Pers var. *dactylon*
Yağbasan village, slopes, 130 m, 21.08.2008, T.A. 231 & A.A.
- Setaria glauca* (L.) P. Beauv.
E. of Çakmak Dam, fallow fields, 130 m, 11.09.2008, T.A. 342 & A.A.
- Sorghum halepense* (L.) Pers var. *halepense*
S.E. of Çakmak Dam, roadsides, 140 m, 10.07.2008, T.A. 209 & A.A.
- Bothriochloa ischaemum* (L.) Keng.
Saraçlı village, roadsides, 120 m, 21.08.2008, T.A. 347 & A.A.

4. Discussion

The present study examines the flora of Çakmak Dam and its surroundings. In the studies performed in the region over 2 years, 311 taxa were identified. Five of them belong to Pteridophyta and 306 belong to Spermatophyta divisions. Gymnosperms and Angiosperms comprised 4 and 302 taxa, respectively. Of these, 249 taxa belong to the Dicotyledones, while the other 53 taxa belong to Monocotyledonae. The dispersion of the plant taxa that were defined in the study area according to large taxonomical groups is shown in Table 1.

Table 1. The dispersion of taxa into large taxonomical groups.

	Number of Families	Number of Genera	Number of Taxa
Pteridophyta	4	4	5
Spermatophyta	66	210	306
Gymnospermae	2	2	4
Angiospermae	64	208	302
Dicotyledonae	55	171	249
Monocotyledonae	9	41	53
Total	70	214	311

The region is a very important relictual refuge for plant species that are ancient Mediterranean flora such as *Phillyrea latifolia* L. (Oleaceae), *Arbutus andrachne* L. (Ericaceae) and *Cistus creticus* L. (Cistaceae) (Eminağaoğlu et al., 2006). The presence of these relict plant species in the region is largely due to the fact that the Caucasus was separated from the severe effects glacial retreats during the last Ice Age (Atalay 2006; Eminağaoğlu et al., 2008).

According to our observations, construction of Çakmak Dam led to clear differentiation of the vegetation at studied localities. The sites above the dam were occupied mainly by meadow vegetation which were infrequent below the dam. It could be explained by a lower moisture content above the dam. More favorable hydrological conditions above the dam led to distributed more abundant some plants such as *Equisetum ramosissimum*, *Pteridium aquilinum*, *Asplenium adiantum-nigrum*, *Veronica anagallis-aquatica* subsp. *anagallis-aquatica*, *Mentha longifolia* subsp. *longifolia*, *Typha latifolia*, *Typha angustifolia*, *Juncus inflexus*, *Cyperus longus* and *Carex divisa*. The distribution of these species also depends on suitable environmental conditions for their establishment.

The species of the study area, categorised according to phytogeographical region can be listed as follows: Euro-Siberian elements 80 (13 Eux., 4 H. Eux.) (25.72 %), Mediterranean elements 28 (9.00 %) and Irano-Turanien elements 4 (1.28 %). The remaining 199 taxa (63.98 %) are pluri-regional or of unknown phytogeographic origin (Figure 4). The Euro-Siberian elements in the area are more common than the other phytogeographic region elements, because the area is located in the Euro-Siberian phytogeographic region. The presence of Mediterranean elements in the research area occupy the second place shows that the study area partly influenced by Mediterranean climate. The prevalence of Irano-Turanien elements in the study area was low (1.28 %), because of the Eastern Black Sea

Mountains, which act as a barrier along the sea shore and separate the region into coastal and interior areas (Uzun and Terzioğlu, 2008). Additionally, the high altitude mountains in this region include a large number of elements belonging to the Irano-Turanien phytogeographical region (5.99 %) (Palabaş Uzun and Anşın, 2006).

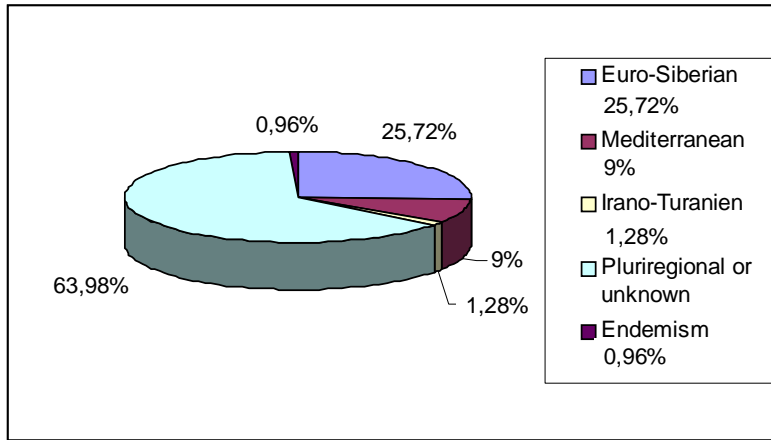


Figure 4. The spectrum of floristic elements in the research area.

The results of the studies conducted in close and similar areas, along with phytogeographical distribution are presented in Table 2. Euro-Siberian elements seems to be dominant in all areas studied. According to Table 2, the endemism rate is 0.96 % in the present study. Compared with studies conducted in close and similar regions, the rate of endemism is very low. However, the endemism rate of Black Sea Region is about 16 % (Anşın et al., 2002). The main reason for the low endemism ratio observed this study can be explained by the area is located at low altitude. Endemism rate is rather low near to the sea level regions due to low climatic and edaphic diversity. Additionally, low endemism rate can also be explained on the basis of the presence of more stable environmental factors when compared with the Central, Eastern and South Anatolian regions of Turkey. The similarity of the study area to the Black Sea region and the lack of extreme ecological factors may be one of the most important reasons for the low endemism ratio of the study area (Anşın, 1982; Kutbay and Kılınc, 1995). In addition, ecological diversity was decreased due to increasing antropogenic factors (i.e overgrazing, destruction etc.). As a result, the number of endemic species are comparatively low in our research area. Similar results were obtained from other floristic studies in the Eastern Black Sea Region of Turkey (Anşın 1979, 2002; Kikvidze and Ohsawa ,2001; Özen and Kılınc, 2002). Threat categories for three endemic taxa, which are *Knautia degenii* Borbas ex Formanek, *Campanula latiloba* A. DC. subsp. *latiloba* and *Arum euxinum* R. Mill, are Least Concern (LC) (IUCN 2001) (Ekim et al., 2000).

Table 2. A comparison of the phytogeographical elements and endemism.

Research Area	1	2	3	4	5
Euro-Siberian	25.72	21.76	25.19	44.21	28.43
Mediterranean	9.00	13.06	9.65	6.53	11.44
Irano-Turanien	1.28	4.05	2.29	3.26	4.90
Pluriregional or unknown	63.98	—	—	54.22	55.23
Endemism	0.96	5.30	3.43	2.61	4.29

1. Flora of Çakmak Dam and its surroundings 2. Bafra-Altinkaya Baraj Gölü alanının Baraj Gövdesi Şahinkaya Boğazı Arasında Kalan Kesimi ve Yakın Civarının Florası 3. Flora of Nebyan Dağı (Samsun- Bafra) 4. Samsun Kocadağ ve Çevresinin Florası. 5.The flora and vegetation of Kunduz Forest (Vezirköprü/ Samsun).

The largest 10 families according to taxa number are shown in Figure 5. Asteraceae is first with 31 taxa followed by Leguminosae (29), Gramineae (28), Labiatae (26), Rosaceae (14), Caryophyllaceae (10), Umbelliferae (8), Boraginaceae (8), Scrophulariaceae (8) and Cruciferae (8). The total ratio of the 10 major families is 54.63 %, with the remaining families comprising 45.37 %. A comparison between our results and those reported by others from close and similar regions revealed that the sequence of the 3 largest families in the our study is the same for the flora of the area of Bafra-Altinkaya Dam lake (Engin and Korkmaz, 1991) and flora of Nebyan Dağı (Samsun-Bafra) (Kutbay et al., 1995) (Table 3). Differences in the rank of several families might be due to the results of dissimilarities in climates and habitats. Furthermore, the order of highly represented families in our study is generally compatible with the Flora of Turkey (Davis, 1965-1985). Asteraceae is not only the largest family in the Flora of Turkey (Güner et al., 2000), but also the largest and most widespread family of flowering plants in the world (Good, 1974; Uzun and Terzioğlu, 2008).

Additionally, the members of this family include many diaspores that are easily dispersed (Terzioğlu and Anşın, 2001). Leguminosae is the second largest family in the Flora of Turkey. These families have a wide ecological tolerance.

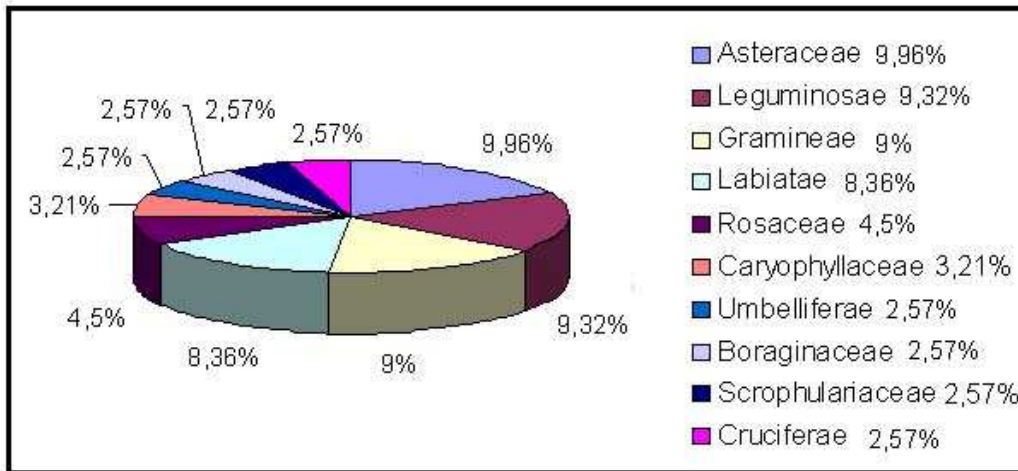


Figure 5. Distribution of the largest families in the research area.

Lamiaceae is the third largest family in the Flora of Turkey but in our study this family occurred in fourth rank. In our study, the third largest family is Gramineae. The possible reasons of the occurrence of this family at the study site, the species of this family are known as abundant in numbers around wetland environments.

The genera containing the highest number of species in this study are listed in Table 4. The genus *Trifolium* L. ranks first with 7 taxa (2.25 %). *Salvia* L. ranks second with 6 taxa (1.92 %) and *Vicia* L. and *Geranium* L. ranks third with 5 taxa (1.60 %).

Table 3. Comparison of the largest families in the Çakmak Dam and its environs and neighbouring areas (Numbering are below Table 2).

Families	Compared studies (taxa number and percentage)				
	1	2	3	4	5
Asteraceae	31 (9.96)	60 (13.51)	71 (11.62)	34 (11.11)	21 (6.53)
Leguminosae	29 (9.32)	39 (8.78)	62 (10.14)	33 (10.78)	34 (10.78)
Gramineae	28 (9.00)	28 (6.30)	43 (6.87)	13 (4.24)	15 (4.90)
Labiatae	26 (8.36)	22 (4.95)	41 (6.87)	26 (8.49)	18 (5.88)
Rosaceae	14 (4.50)	13 (2.47)	24 (4.09)	12 (3.92)	21 (6.86)
Caryophyllaceae	10 (3.21)	15 (3.37)	16 (2.61)	17 (5.55)	8 (2.61)
Umbelliferae	8 (2.57)	—	20 (3.27)	—	—
Boraginaceae	8 (2.57)	11 (2.47)	19 (3.10)	7 (2.28)	9 (2.94)
Scrophulariaceae	8 (2.57)	16 (3.60)	28 (4.41)	17 (5.55)	11 (3.59)
Cruciferae	8 (2.57)	24 (5.40)	22 (3.60)	15 (4.87)	12 (3.92)

Table 4. The genera containing the highest number of taxa.

Genera	Number of Taxa	Rate (%)
<i>Trifolium</i>	7	2.25
<i>Salvia</i>	6	1.92
<i>Vicia</i>	5	1.60
<i>Geranium</i>	5	1.60
<i>Silene</i>	4	1.28
<i>Veronica</i>	4	1.28
<i>Stachys</i>	4	1.28
<i>Euphorbia</i>	4	1.28
<i>Bromus</i>	4	1.28
<i>Poa</i>	4	1.28
Total	47	15.05

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