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ZELİHA BAHÇECİOĞLU

BAYRAM YILDIZ

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A Study on The Microfungi of Sivas Province

Zeliha BAHÇECİOĞLU

Inönü University, Faculty of Sciences and Arts, Department of Biology, Malatya - TURKEY

Bayram YILDIZ

Balıkesir University, Faculty of Sciences and Arts, Department of Biology, Balıkesir - TURKEY

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Abstract: In this article, the microfungi grown in Sivas province and their hosts are given. The research was carried out between 1996 and 1998. Approximately 2700 vascular plant specimens infected and non-infected with microfungi were collected from the area. At the end of the studies on the host specimens, 38 families, 171 genera and 315 taxa were established, and 44 host specimens are given at the generic level.

On the other hand, 199 microfungi species (201 taxa) found on the collected host specimens were established. These species belong to 49 genera and 14 families. More than half of the species (115 species) belong to *Basidiomycotina*. *Ascomycotina* and *Deuteromycotina* are represented 56 and 28 species, respectively. 72 species are new records for Turkey. Five microfungi are given at the generic level.

Key Words: Microfungi, Sivas province, new records

Sivas Yöresi Mikrofungusları Üzerinde Bir Araştırma

Özet: Bu makalede Sivas il sınırları içerisinde bulunan mikrofunguslar ve konukçuları verilmiştir. Araştırma 1996-1998 yılları arasında yapılmıştır. Vegetasyon periyodunda yürütülen arazi çalışmalarında, üzerinde mikrofungus bulunan ve bulunmayan 2700 kadar vasküler bitki örneği toplanmıştır. Bu örnekler üzerinde yapılan çalışmalar sonucunda 38 familya ve 171 genusa dahil tür, alt tür ve varyete düzeyinde 315 konukçu taksonu tespit edilmiştir. 44 konukçu örneği ise genus düzeyinde verilmiştir.

Diğer taraftan konukçu türler üzerinde 199 mikrofungus türünün (tür ve varyete düzeyinde 201 taxon) bulunduğu belirlenmiştir. Bu türlerden 115'i *Basidiomycotina*, 56'sı *Ascomycotina*, 28'i ise *Deuteromycotina*'ya dahildir. 72 tür Türkiye için yeni kayıttır. 5 mikrofungus örneği genus düzeyinde verilmiştir.

Anahtar Sözcükler: Mikrofungus, Sivas ili, yeni kayıtlar.

Introduction

Microfungi growing on cultivated plants have been well studied in Turkey. However, studies on the microfungi growing on the natural plants of Turkey are rarer, although recently research has been carried out on such microfungi (Karaboz & Öner, 1982; Öner et al. 1984; Bahçecioğlu & Işıloğlu, 1995; Bahçecioğlu & Yıldız, 1996, 2000, 2001; Bahçecioğlu, 1997, 1998, 2001; Işıloğlu & Bahçecioğlu, 1997; Tamer et al., 1998; Bahçecioğlu & Gjaerum, 2003). A study was carried out by us on microfungi found on the flowering plants grown naturally in Sivas province in 1996-1998.

Floristically Sivas is one of the richest areas of Turkey (Davis, 1965-1985; Davis et al., 1988; Çelik & Yıldız; 1991; Civelek 1992; Yıldız 1996; Güner et al., 2000). The factors determining this are geographical location, soil type, and climate. Sivas is situated in the Irano-Turanian region, but the northern border of the province is close to the Euro-Siberian region and is a typical transitional belt between the 2 phytogeographical regions. For this reason, some species which are elements of the Euro-Siberian region like *Pinus sylvestris* L., *Fagus orientalis* Lipsky, *Populus tremula* L., *Carpinus betulus* L. and some deciduous *Quercus* species are common in the

north of the province (Civelek, 1992; Yıldız, 1996). The east of the province is on the Anatolian Diagonal, which is one of the main endemic centers of Turkey. According to the grid square system adopted by Davis in the Flora of Turkey, Sivas is located in the squares A6, A7, B6 and B7 (Figure 1).

Gypsaceous areas containing many endemic species are common in the center of the province. Around Kangal and Gürün districts marly hills have a special flora (Yıldız & Bahçecioğlu, 2001). The Mountains are found in the province as Yıldız, Köse, Bey, Gürlevik, Yılanlı and Tecer are relatively isolated and rich in vascular plants. Hygrophytic vegetation is restricted to Hafik and Tödürge lake shores and along Kızılırmak and Kelkit rivers (Çelik & Yıldız, 1991; Civelek, 1992; Yıldız, 1996). There are some brooks on Köse and Yıldız mountains. These wetlands have rich hygrophytic vegetation (Civelek, 1992; Yıldız, 1996).

Sivas thus possesses a rich flowering plant flora. It is known that richness of host species is an important factor in microfungi diversity (Walker, 1957; Braun, 1987;

Vanky, 1987). For this reason the province is rich in microfungi flora.

Materials and Methods

Research materials were collected during 1996-1998, between May and October in each year. During the field study, 2700 flowering plant specimens, infected and non-infected with microfungi, were collected from the study area. It is difficult to determine the infected host specimens due to the host plants being destroyed by the microfungi. For this reason, efforts were made to collect both microfungi infected and non-infected samples where possible. The specimens were prepared according to established herbarium techniques.

The Flora of Turkey (Davis, 1965-1985; Davis et al. 1988) was the main source used for the identification of the host specimens. Some doubtful identifications were checked using Flora Europaea (Tutin et al., 1964-1980), Flora of Iraq (Townsend & Guest, 1966-1978), Flora Iranica (Rechinger, 1967-1988) and some revisions (Tan & Yıldız, 1988; Yıldırım, 1988; İlarıslan, 1996; Aytaç,

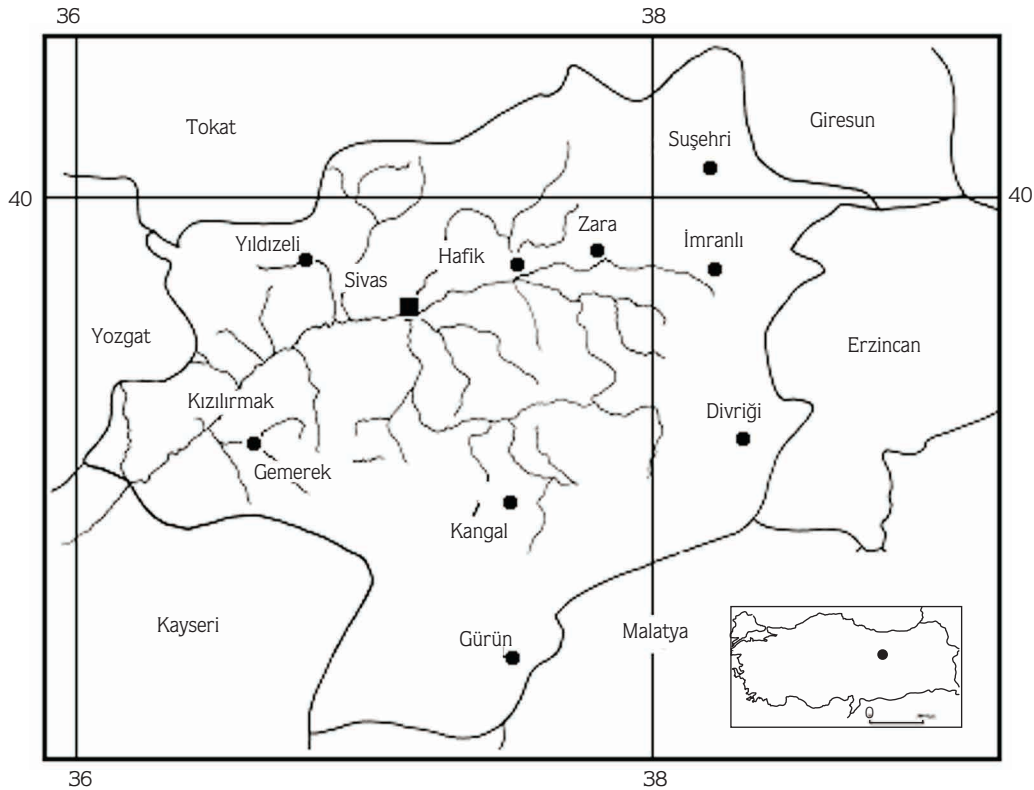


Figure 1. Geographic map of Sivas province

1997). Some related literature was also utilized for identifications (Seçmen & Leblebici, 1997; Baytop & Mathew, 1984) Due to material deficiency some specimens were not determined at the specific level. These samples are given at the generic level.

After the identification of host specimens, the microfungi found on them were studied. The microfungi were determined using the relevant literature (Lindau, 1901; Yaçevski, 1913, 1917; Grove, 1935, 1967; Vassilevski & Karakulin, 1937, 1950; Munk, 1957; Walker, 1957; Karel, 1958; Gauman, 1959; Wilson & Henderson, 1966; Seymour, 1967; Tomilin, 1979; Cummins & Hiratsuka, 1983; Elizabeth et al., 1984; Braun, 1987; Vanky, 1987, 1994; Vasilyeva, 1987; Wiese, 1987; Denchev, 1995; Farr et al. 1995). The taxa are listed in the Appendix. All taxa in the list are given in alphabetical order. Data in the list appears in the following order:

- i. The legitimate name (in bold) and the author of the microfungus species.
- ii. The legitimate name (in italic) and author of the host species.
- iii. Family of the host species in parentheses.
- iv. The location (1 or 2) of specimens collected from the area. The localities are described as much detail as possible. The grid squares used in The Flora of Turkey are given for each locality. The name of collector Z. Bahçecioğlu is abbreviated to ZB
- v. New records are marked with an asterisk.

The author abbreviations of vascular plants were checked using Brummit and Powell (1992) and the author abbreviations of fungi using Kirk and Ansell (1992).

Plants included in this list are deposited in the Herbarium of the Biology Department of İnönü University.

Results and Discussion

At the end of the studies on 2700 infected and non-infected host specimens collected from the study area, 38 families, 171 genera and 315 host species were established. Due to inadequate materials some host specimens were not determined at the specific level. In this respect, 44 host specimens are given at the generic

level in the Appendix. Some large host families in terms of species numbers are given in Table 1.

As seen from the Table 1, 5 families, namely *Asteraceae*, *Poaceae*, *Fabaceae*, *Rosaceae* and *Lamiaceae* contain 91 (53.21%) out of 171 genera and 191 (61.21%) out of 315 host species. According to these results parasitic fungi prefer the plants belonging to these families as hosts. Because the species belonging to these families are common, the spores of the microfungi are easily carried to these hosts by vectors.

Table 1. The host genera and species totals of the major families.

Families	Number of Genera	Spp. number	%
<i>Asteraceae</i>	35	85	27.98
<i>Poaceae</i>	18	36	11.42
<i>Fabaceae</i>	15	29	9.20
<i>Rosaceae</i>	12	23	7.30
<i>Lamiaceae</i>	11	18	5.71
<i>Apiaceae</i>	9	14	4.44
<i>Caryophyllaceae</i>	5	12	3.80
<i>Rubiaceae</i>	3	8	2.53
<i>Polygonaceae</i>	4	8	2.53
<i>Cyperaceae</i>	3	7	2.22
<i>Brassicaceae</i>	5	7	2.22
<i>Scrophulariaceae</i>	6	7	2.22
Other families (26)	45	61	19.36
TOTAL	171	315	100

In the second phase of the study, the microfungi species found on the hosts were named. At the end of this period, 14 families, 49 genera and 199 species belonging to 3 subdivisions, namely *Ascomycotina*, *Basydiomycotina* and *Deuteromycotina*, were established. Microfungi specimens belonging to 5 genera were collected in the study area, but due to insufficient literature, these genera were not determined at the specific level. With the addition of these, the total number of genera comes to 54. If each of these genera is regarded as a species, the number of species comes to 204. These genera are given at end of the Appendix. The genera and the species belonging to the subdivisions are given in Table 2. The numbers of genera that were not determined at the species level are given in parentheses.

The main reason for the substantial presence of species belonging to the subdivision *Basidiomycotina* is that this includes some of the genera, such as *Puccinia* and *Uromyces*, with many species and a wide world distribution.

Table 2. Genera and species numbers of the subdivisions.

Subdivisions	Number of genera	Number of species	(%)
<i>Basidiomycotina</i>	11	115	57.79
<i>Ascomycotina</i>	16 + (4)	56	28.14
<i>Deuteromycotina</i>	22 + (1)	28	14.07
TOTAL	49 + (5)	199	100

The species determined in the research area belong to 14 families. These families are listed in Table 3. The genera and the species numbers of these families are shown in the same table.

Table 3. Genera and species totals of the families found in the study area.

Families	Number of genera	Number of species	(%)
<i>Pucciniaceae (Basidiomycotina)</i>	6	103	51.75
<i>Erysiphaceae (Ascomycotina)</i>	7	34	17.08
<i>Sphaeropsidaceae (Deuteromycotina)</i>	12	16	8.04
<i>Pleosporaceae (Ascomycotina)</i>	5	14	7.03
<i>Dematiaceae (Deuteromycotina)</i>	7	8	4.02
<i>Mycosphaerellaceae (Ascomycotina)</i>	2	6	3.01
<i>Ustilaginaceae (Basidiomycotina)</i>	1	5	2.51
<i>Tilletiaceae (Basidiomycotina)</i>	2	3	1.5
<i>Melanconiaceae (Deuteromycotina)</i>	2	2	1.01
<i>Moniliaceae (Deuteromycotina)</i>	1	2	1.01
<i>Coleosporaceae (Basidiomycotina)</i>	1	2	1.01
<i>Melampsoraceae (Basidiomycotina)</i>	1	2	1.01
<i>Hypocreaceae (Ascomycotina)</i>	1	1	0.51
<i>Trybliaceae (Ascomycotina)</i>	1	1	0.51
TOTAL	49	199	100

The largest family is *Pucciniaceae*, which contains 103 species in the study area. In other words 51.75 % of microfungi established in Sivas province belong to *Pucciniaceae*.

As seen from Table 3, 4 families, namely *Pucciniaceae*, *Erysiphaceae*, *Sphaeropsidaceae* and *Pleosporaceae*, include 167 species. In other words, 83.91% of the microfungi flora of Sivas province belong to 4 families. The other 10 families contain 32 (16.09%) species.

According to species numbers, the largest genera in the research area are *Puccinia* Pers. (65 species), *Uromyces* (Link) Unger (27 species), and *Erysiphe* DC. (19 species). These 3 genera contain 111 (56%) species

Table 4. Species totals and percentages of the large genera in the study area.

Genera	Species totals	%
<i>Puccinia (Basidiomycotina)</i>	65	32.66
<i>Uromyces (Basidiomycotina)</i>	27	13.56
<i>Erysiphe (Ascomycotina)</i>	19	9.54
<i>Sphaerotheca (Ascomycotina)</i>	7	3.51
<i>Pleospora (Ascomycotina)</i>	6	3.01
<i>Phragmidium (Basidiomycotina)</i>	6	3.01
<i>Ustilago (Basidiomycotina)</i>	5	2.51
<i>Strickeria (Ascomycotina)</i>	4	2.01
<i>Didymella (Ascomycotina)</i>	3	1.50
<i>Mycosphaerella (Ascomycotina)</i>	3	1.50
TOTAL	143	71
Others (39)	56	39
TOTAL	199	100

(Table 4). These genera contain many species, and most of the species belonging to these genera are common in the world.

The genera which contain 143 species given in Table 4 constitute 71% of the microfungi flora of Sivas. The other 39 genera are represented by 1 or 2 species in the area.

More than a quarter of the microfungi species found in the area live on host species belonging to *Asteraceae*. As a whole, 154 (77%) microfungi species found in the area live on hosts belonging to 10 families (Table 5). From the point of view of species numbers, the families listed in Table 5 are rich in species and quite common, for which the vectors easily transport the fungi spores to them.

Plant resist the entry and spread of pathogens depending on the morphological and anatomical structure and biochemical potentialities of both the host and

Table 5. The numbers of microfungi species found on the host families.

Families of host species	Number of microfungi species	Families of host species	Number of microfungi species
<i>Asteraceae</i>	57	<i>Lamiaceae</i>	10
<i>Fabaceae</i>	25	<i>Apiaceae</i>	7
<i>Poaceae</i>	17	<i>Polygonaceae</i>	6
<i>Rosaceae</i>	17	<i>Brassicaceae</i>	6
<i>Caryophyllaceae</i>	13	<i>Rubiaceae</i>	4

pathogen (Manner, 1993). The nature of mechanical barriers to entry and spread have been considered by some mycologists. A thick cuticle may prevent the penetration of pathogens to the host tissue. It has been observed that a thick outer cell wall and cuticle are more resistant to entry (Manner, 1993).

The results obtained from this study supported the previous findings. Hair type, for example, prevents pathogen spores or germinations tubes entering the epidermis and stomata. Hairiness is an important barrier to pathogens. Although *Brassicaceae*, *Boraginaceae* and *Scrophulariaceae* are common and contain many species, parasitic fungi were seldom found on them (Cummins & Hiratsuka, 1983; Manners 1993; Denchev, 1995). In the study area, many of the species belonging to these families, like *Alyssum* spp. (*Brassicaceae*), *Onosma* spp. (*Boraginaceae*), and *Verbascum* spp. (*Scrophulariaceae*) are densely hairy. The fungi spores probably do not germinate among the hairs or the germination tubes do not enter the host tissue passing the hairs.

From the point of view of host preference, some species are very tolerant. *Levelliula taurica* (Lev.) Arnaud was found on 28 and *Puccinia graminis* Pers on 24 host species (Table 6).

The fungi that can live on different host species are widespread. Moreover, the spread of fungi depends on the host community. *Cirsium arvense* (L.) Scop., for example, is very common and can be found different habitats and fungi prefer it as a host.

Table 6. Some fungi and numbers of host species.

Microfungi species	Number of host species
<i>Levelliula taurica</i>	28
<i>Puccinia graminis</i>	24
<i>Erysiphe cichoracearum</i>	10
<i>P. calcitrapae</i>	7
<i>P. centaurea</i>	7
<i>P. achillea</i>	7
<i>Puccinia cyanii</i>	6
<i>P. persistens</i>	6
<i>Sphaerotheca fusca</i>	6
<i>Puccinia caricicola</i>	5
<i>P. punctata</i>	5

Seventy-two species out of 199 determined from the study area are new records for Turkey. In other words, 38% of the microfungi species that determined from Sivas province were collected for the first time from Turkey. Some of these new records have been published previously (Bahçecioğlu & Yıldız, 2000; Bahçecioğlu, 2001; Bahçecioğlu & Gjaerum, 2003). These records show that more study on the microflora of Turkey is needed. In addition, some new hosts were found for 12 microfungi species. New and previously known hosts of these species are given in Table 7.

As a result of this study carried out in Sivas province, 72 new records were established for Turkey. Some new hosts were also established for 12 species. For future studies on microfungi, 2700 specimens were added to the herbaria.

Table 7. The new and the known hosts of some microfungi species

Microfungi spp.	New hosts	Hosts known previously
<i>Mycosphaerella fusca</i>	<i>Aethionema</i>	<i>Gladiolus</i>
<i>Didymosphaeria mathiolae</i>	<i>Fibigia</i>	<i>Medicago</i>
<i>Pleospora gigaspora</i>	<i>Acantholimon</i>	<i>Delphinium, Galium, Neurolooma, Pulsatilla, Senecio</i>
<i>Pleospora scrophulariae</i>	<i>Centaurea</i>	<i>Aconitum, Artemisia, Iris, Parnassia, Cardaminopsis, Delphinium, Gypsophila, Pedicularis, Pulsatilla, Ranunculus, Saussurea, Saxifraga, Valeriana</i>
<i>Strickeria anceps</i>	<i>Thesium</i>	<i>Alnus</i>
<i>S. woronowiana</i>	<i>Achillea, Euphorbia Scrophularia,</i>	<i>Kalidium</i>
<i>Trematosphaeria circinans</i>	<i>Onobrychis</i>	<i>Medicago</i>
<i>Hendersonia grossularia</i>	<i>Acantholimon</i>	<i>Grossularia</i>
<i>Phoma oleraceae</i> var. <i>solidaginis</i>	<i>Chondrilla</i>	<i>Erysimum, Ajania, Solidago Syrenia, Scrophularia</i>
<i>Bispora antennata</i>	<i>Centaurea</i>	<i>Atriplex</i>
<i>Coniosporium epiphillum</i>	<i>Pilosella</i>	<i>Ipomoea</i>
<i>Heterosporium echinulatum</i>	<i>Eryngium</i>	<i>Cerastium, Silene, Dianthus, Acanthophyllum</i>

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APPENDIX

The list of microfungi species established from Sivas province. The sequences of families, genera and species in the following list fits in alphabetical order. The taxa above order are given according to Far et al.(1995).

Kingdom: FUNGI

Div.: EUMYCOTA

Subdiv.: ASCOMYCOTINA

Class.: DISCOMYCETES

Order: HELOTIALES

Fam.: HELOTIACEAE

*1. 1. *Heterosphaeria patella* (Tode) Grev.

Achillea schischkini Sosn. (*Asteraceae*)

B6 Sivas: Celalli, Aktaş village, Gürlevik mountain, south slopes, 1700 m. 8 viii 1984, N. Çelik 2859, B. Yıldız.

Class.: LOCULOASCOMYCETES

Order: DOTHIDEALES

Fam.: MYCOSPHAERELLACEAE

*2. *Didymella hellebori* (Chaillat.) Sacc.

Vincetoxicum fuscum (Hornem.) Rchb. f. subsp. *fuscum* (*Asclepiadaceae*)

B6 Sivas: Demiryazı village, Yedigöz, meadows, 1300 m. 26 vi 1985, N. Çelik 3143.

*3. *D. proximella* (P. Karst.) Sacc.

Aethionema sp. (*Brassicaceae*)

B6 Sivas: Gürün, steppe, 1300 m, 6 vi 1997, ZB 1683.

*4. *D. superflua* (Fuckel) Sacc.

Sterigmostemum incanum M. Bieb. (*Brassicaceae*)

B6 Sivas: Kayseri road, Taşlıdere, gypsum, 4 vii 1985, Ş. Civelek 1980.

3. 5. *Mycosphaerella allicina* (Fr.) Vesterg.

Scorzonera eriophora DC. (*Asteraceae*)

B6 Sivas: north of Sivas, south slopes, steppe, 1300 m, 3 vi 1997, ZB 1543.

*6. *M. fusca* (Pass.) Tomilin.

Aethionema cordatum (Desf.) Boiss. (*Brassicaceae*)

B6 Sivas: around Hocabey village, deep soiled area, 1200 m, 18 v 1983, B. Yıldız 3528.

*7. *M. silenicola* Woron.

Silene swertiifolia Boiss. (*Caryophyllaceae*)

B6 Sivas: Gürün, Şugul valley, wet places in the valley, 1400 m, 6 vi 1997, ZB 1653.

Fam.: PLEOSPORACEAE

4. *8. *Clathrospora permunda* (Cooke.) Berl.

Artemisia austriaca Jacq. (*Asteraceae*)

B6 Sivas: Taşlıdere, south of Esenyurt, Şahinoğlu brook 1500 m, 21 ix 1984, Ş. Civelek 1131.

5. *9. *Didymosphaeria dryadis* (Fuckel) Berl. & Voglino

Polygala anatolica Boiss & Heldr. (*Polygalaceae*)

B6 Sivas: Ulaş, above Ovacık village, Tecer mountain, 1700 m, 28 v 1985. B. Yıldız 4856.

*10. *D. matthiolae* (Fuckel) Berl. & Voglino

Fibigia clypeata (L.) Medik. (*Brassicaceae*)

B6 Sivas: Şerefiye, Armutçayırı village, Abdiaga fountain, open forest, 1600 m, 25 vi 1985, B. Yıldız 5557.

6. 11. *Pleospora coloradensis* Ellis & Everh.

Centaurea virgata Lam. (*Asteraceae*)

B6 Sivas: 33 km from Gürün to Pınarbaşı, calcareous slopes, 1700 m, 19 vii 1998, ZB 2150.

*12. *P. gigaspora* P. Karst.

Acantholimon venustum Boiss. var. *venustum* (*Plumbaginaceae*)

B6 Sivas: Celalli, Gürlevik mountain, north slopes, 1700 m, 17 vii 1984, B. Yıldız 4545.

13. *P. herbarum* P. Karst.

Helichrysum plicatum DC. (*Asteraceae*)

B6 Sivas: 3 km west of Yıldızeli, steppe, 1300 m, 13 vii 1996, ZB 901, B. Yıldız.

Acroptilon repens (L.) DC. (*Asteraceae*)

A6 Sivas: 10 km from Suşehri to Değirmentaş, roadside, 1250 m, 14 viii 1996, ZB 1208.

Carlina sp. (*Asteraceae*)

B6 Sivas: between Gürün and Gökpınar, marly places 1500 m, 18 vii 1998, ZB 2013.

Linum tenuifolium L. (*Linaceae*)

B6 Sivas: C.U. Campus, 1300 m, steppe, 25 vi 1983, B. Yıldız 3721.

*14. *P. platyspora* Sacc.

Onobrychis cornuta (L.) Desv. (*Fabaceae*)

B6 Sivas: Celalli, Aktaş village, Gürlevik mountain, north faces, calcareous area, 2200 m, 17 vii 1984, B. Yıldız 4620, N. Çelik.

*15. *P. scrophulariae* (Desm.) Hoehn.

Thesium procumbens C.A.Mey. (*Santalaceae*)

B6 Sivas: Celalli, Aktaş village, Gürlevik mountain, north slopes, 2200 m, 8 viii 1984, N. Çelik 2888, B. Yıldız.

Centaurea drabifolia Sm. subsp. *cappadocica* (DC.) Wagenitz (*Asteraceae*)

B6 Sivas: Celalli, Aktaş village, Gürlevik mountain, south slopes 2250-2400 m, 8 viii 1984, N. Çelik 2855, B. Yıldız.

Centaurea mucronifera DC. (*Asteraceae*)

B6 Sivas: 13 km west of İmranlı, gypsaceous area, 1900 m, 14 viii 1996, ZB 1045, B. Yıldız.

Scrophularia libanotica Boiss. subsp. *libanotica* (*Scrophulariaceae*)

B6 Sivas: C.U. campus, steppe, 1200-1400 m, 7 v 1983, N. Çelik 2143, B. Yıldız.

*16. *P. vulgaris* Niessl

Acantholimon venustum Boiss. (*Plumbaginaceae*)

B6 Sivas: Celalli, Aktaş village, Gürlevik mountain, north slopes, 1500-1700 m, 17 vii 1984, B. Yıldız 4545, N. Çelik.

Eryngium campestre L. (*Apiaceae*)

B6 Sivas: 3 km west of Yıldızeli, steppe, 1300 m, 13 vii 1996, ZB 897, B. Yıldız.

7. *17 *Strickeria anceps* (Sacc.) Cooke

Thesium procumbens C.A.Mey. (*Santalaceae*)

B6 Sivas: Tecer Da., Beşgözler, calcareous south slopes, 1700 m, 6 vi 1985, N. Çelik 3605.

*18. *S. dura* (Fuekel) G.Winter

Helichrysum noeanum Boiss. (Asteraceae)

B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1130.

*19. *S. obducens* (Fr.) G.Winter

Astragalus sp. (Fabaceae)

B6 Sivas: C.U. campus, steppe, 1200-1550 m, steppe, 22 vii 1983, N. Çelik 2515, B. Yıldız.

*20. *S. woronowiana* (Rehm) Bezuch.

Achillea gonioccephala Boiss. & Bal. (Asteraceae)

B6 Sivas: C.U. campus, steppe, 1300 m, 16 vi 1983, B.Yıldız 3772.

Scrophularia libanotica Boiss. var. *libanotica* (Scrophulariaceae)

B6 Sivas: Demiryazı village, Yedigöz, mixed scrub, 1600 m, 17 vii 1985, B. Yıldız 6366.

Euphorbia cheiradenia Boiss. & Hohen. (Euphorbiaceae)

B6 Sivas: Zara, 15 km from Bolucan to Sincan, Quercus scrub, 1700 m, 10 viii 1986, N. Çelik, 4661.

8. *21. *Trematosphaeria circinans* (Fuekel) G.Winter

Onobrychis argyrea Boiss subsp. *argyrea* (Fabaceae)

B6 Sivas: Sincan, Allıkçay village, 1400 m, 12.vi 1995, N. Çelik 4948, B. Yıldız.

Class: PLECTOMYCETES

Order: ERYSIPTHALES

Fam.: ERYSIPTHACEAE

9. 22. *Blumeria graminis* (DC.) Speer

Hordeum bulbosum L. (Poaceae)

B6 Sivas: 40 km from Sivas to Yıldızeli, garden edge, 1300m, 13 viii 1996, ZB 1100.

Elymus elongatus (Host) Runemark subsp. *turcicus* (Mc.Güine) Melderis (Poaceae)

B6 Sivas: 20 km from Gürün to Darende, steppe, 1300-1400 m, 1 x 1996, ZB 1370, B. Yıldız.

Elymus hispidus (Opiz) Melderis subsp. *hispidus* (Poaceae)

B6 Sivas: Gürün, Şugul valley, rocky slopes, 1400 m, 2 x 1996, ZB 1430, B. Yıldız.

Poa bulbosa L. (Poaceae)

B6 Sivas: 18 km from Kangal to Gürün, steppe, 1300 m, 3 vi 1997, ZB 1507, B. Yıldız.

10. 23. *Erysiphe aquilegiae* DC. var. *ranunculii* (Grev.) R.Y.Zheng & G.Q.Chen

Ranunculus sp. (Ranunculaceae)

B6 Sivas: Ulaş, Tecer brook, streamside, 1350 m, 23 ix 1996, ZB 1343, B. Yıldız; B6 Sivas: Gürün, Şugul valley, wet places in the valley, 1400 m, 2 x 1996, ZB 1415, B. Yıldız.

Delphinium dasystachyum Boiss. & Bal. (Ranunculaceae)

B6 Sivas: 15 km from Bolucan to Sincan, open forest, 1700 m, 10 viii 1986, N. Çelik 4626.

24. *E. aquilegiae* DC. var. *aquilegiae*

Caltha polypetala Hochst. ex Laurent (Ranunculaceae)

B7 Sivas: Divriği, Höbek village, Tülü valley, streamside, 1300 m, 4 viii 1997, ZB 1839.

25. *E. betae* (Vanha) Weltzien

Beta vulgaris L. (Chenopodiaceae)

B6 Sivas: Gürün, Gökpinar, calcareous rocks, north face, 1500 m, 18 vii 1998, ZB 2562.

*26. *E. biocellata* Ehrenb.

Ajuga salicifolia (L.) Schreb. (Lamiaceae)

A6 Sivas: 10 km from Suşehri to Degirmentaş, meadows, 1250 m, 14 viii 1996, ZB 1199.

Teucrium chamaedrys L. (Lamiaceae)

B6 Sivas: 8 km west of Gürün, steppe, 1400 m, 3 viii 1997, ZB 1752, B. Yıldız.

Nepeta nuda L. (Lamiaceae)

B6 Sivas: between Gürün and Kangal, west of Böğrüdelik village, calcareous rocks, 2000-2200 m, 4 viii 1997, ZB 1791, B. Yıldız.

Thymus sipyleus Boiss. (Lamiaceae)

B6 Sivas: Gürün, Gökpinar, eroded south slopes, marly hills, 1500 m, 18 vii 1998, ZB 2043.

*27. *E. buhrii* U.Braun

Silene discolor Sibth. & Sm. (Caryophyllaceae)

B6 Sivas: Gürün, Gökpinar, calcareous rocks, 1400 m, 3 viii 1997, ZB 1713, B. Yıldız.

*28. *E. caulicola* (Petr.) U.Braun

Astragalus sp. (Fabaceae)

B6 Sivas: Taşlıdere, around Karayolları fountain, serpentine, 1400 m, 20 vii 1998, ZB 2313.

29. *E. cichoracearum* DC. var. *cichoracearum*

Anthemis kotschyana Boiss. (Asteraceae)

A6 Sivas: Suşehri, around Ekinözü village, mixed scrub, 1100 m, 15 viii 1996, ZB 1221.

Senecio pseudo-orientalis Schischk. (Asteraceae)

B6 Sivas: 13 km.west of İmranlı, 1600 m, 12 vii 1996, ZB 832, B. Yıldız.

Senecio vernalis Waldst. & Kit. (Asteraceae)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2380, B.Yıldız.

Cirsium arvense (L.) Scop. (Asteraceae)

B6 Sivas: Gürün, Gökpinar, wet places, 1500 m, 2 x 1996, ZB 1439.

Centaurea virgata Lam. (Asteraceae)

B6 Sivas: Gürün, Şuğul valley, rocky slopes, 1400 m, 2 x 1996, ZB 1435, B. Yıldız.

Centaurea pergamacea DC. (Asteraceae)

B6 Sivas: Taşlıdere, Domuzlukıçı, 1200-1300 m, 12 vii 1986, ZB 2572.

Sonchus asper (L.) Hill (Asteraceae)

A6 Sivas: 10 km from Suşehri to Degirmentaş, edge of field, 1250 m, 14 viii 1996, ZB 1321.

Lactuca serriola L. (Asteraceae)

B6 Sivas: bank of Kızılırmak river, around Eğri bridge, 1300 m, 22 ix 1996, ZB 1274.

Chondrilla juncea L. (Asteraceae)

B6 Sivas: 20 km from Gürün to Darende, 1300-1400 m, 1 x 1996, ZB 1375.

Asperula xylarrbiza Nabbelek (*Rubiaceae*)

B6 Sivas: 13 km from Sivas to Karaçayır, steep slopes, 1400 m, 5 viii 1997, ZB 1886.

30. *E. convolvuli* DC. var. *convolvuli*

Convolvulus arvensis L. (*Convolvulaceae*)

B6 Sivas: Ulaş, east of Tecer village, field edge, 1300 m, 10 ix 1998, ZB 2577.

31. *E. cruciferarum* Opiz ex L. Junell

Isatis tinctoria L. (*Brassicaceae*)

B6 Sivas: Gürün, around Suçatı village, 1500 m, 1 x 1996, ZB 1382.

Descuriana sophia (L.) Webb ex Prantl (*Brassicaceae*)

B6 Sivas: 33 km from Gürün to Pınarbaşı, south slopes, 1700 m, 19 vii 1998, ZB 2165.

*32. *E. cynoglossi* (Wallr.) U.Braun

Cerintho minor L. (*Boraginaceae*)

A6 Sivas: Suşehri, around Ekinözü village, fallow fields, 1100 m, 15 viii 1996, ZB 1216.

Nonea sp. (*Boraginaceae*)

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous rocks, 2000 m, 5 vi 1997, ZB 1606, B. Yıldız.

33. *E. depressa* (Wallr.) Schldl.

Centaurea depressa M. Bieb. (*Asteraceae*)

B6 Sivas: C. U. Campus, steppe, 1300 m, 25 viii 1996, N. Çelik 2988,

Arctium minus (Hill) Bernh. (*Asteraceae*)

B6 Sivas: Gürün, Gökpinar, streamside, 1500 m, 18 viii 1998, ZB 2100.

34. *E. galeopsidis* DC.

Sideritis libanotica Labill. (*Lamiaceae*)

B6 Sivas: 33 km from Gürün to Pınarbaşı, calcareous area, 1600 m, 11 viii 1996, ZB 1006.

Lamium garganicum L. (*Lamiaceae*)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998 ZB 2382.

35. *E. heraclei* DC.

Anthriscus nemorosa (M.Bieb.) Spreng. (*Apiaceae*)

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous rocks, 1700-2000 m, 14 vii 1996, ZB 943, B. Yıldız.

Heracleum sp. (*Apiaceae*)

B6 Sivas: 40 km from Sivas to Yıldızeli, edge of orchard, 1300 m, 13 viii 1996, ZB 1095.

*36. *E. limonii* L. Junell

Limonium gmelini (Willd.) Kuntze (*Plumbaginaceae*)

B6 Sivas: Bingöl village, halophytic vegetation, 1350 m, 22 ix 1996, ZB 1279, B. Yıldız.

37. *E. lycopsidis* R.Y.Zheng & G.Q.Chen

Anchusa leptophylla Roem. & Schult. (*Boraginaceae*)

B6 Sivas: Kangal, Alacahan, 2 km east. of Yeşildere, steppe, 1550 m, 10 vii 1996, ZB 735. B7 Sivas: Divriği, Höbek village, Tülü valley, steppe, 1300 m, 4 viii 1997, ZB 1835.

Anchusa sp. L. (*Boraginaceae*)

B6 Sivas: 5 km west of Gürün, orchard edge, 1400 m, 3 viii 1997, ZB 1758.

*38. *E. mayorii* S.Blumer var. *mayorii*

Cirsium sp. (*Asteraceae*)

B6 Sivas: Taşlıdere, wet places in the valley, 1300-1350 m, 22 ix 1996, ZB 1300, B.Yıldız.

39. *E. pisi* DC. var. *pisi*

Lathyrus sp. (*Fabaceae*)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2391, B. Yıldız.

40. *E. pisi* DC. var. *cruchetiana* (S.Blumer) U.Braun

Ononis spinosa L. (*Fabaceae*)

B6 Sivas: Kızıldağ pass, mountain meadows, 2100 m, 14 viii 1996, ZB 1041.

Trifolium pratense L. (*Fabaceae*)

A6 Sivas: 10 km from Suşehri to Degirmentaş, fallow fields, 1250 m, 14 viii 1996, ZB 1205.

Trifolium ochroleucum Huds. (*Fabaceae*)

A6 Sivas: 2 km north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1910 b.

41. *E. polygona* DC.

Polygonum sp. (*Polygonaceae*)

A6 Sivas: Suşehri, Kelkit valley, steppe, 700-800 m, 14 viii 1996, ZB 1171.

Rumex patientia L. (*Polygonaceae*)

B6 Sivas: Ulaş, east of Tecer village, edge of fields, 1300 m, 10 ix 1998, ZB 2575; B6 Sivas: Yıldızeli, 2 km east of Karakaya village, steppe, 1300 m, 6 viii 1997, ZB 1947.

Rumex tuberosus L. (*Polygonaceae*)

B6 Sivas: Kangal, Gürün line crossing, 1300 m, 3 vi 1997, ZB 1508.

42. *E. sordida* L.Junell

Plantago major L. (*Plantaginaceae*)

A6 Sivas: 10 km from Suşehri to Degirmentaş, fallow field, 1250 m, 14 viii 1996, ZB 1206.

*43. *E. viciae-urjugae* (Homma) U.Braun

Lathyrus roseus Stev. (*Fabaceae*)

A6 Sivas: 2 km north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1934.

11. 44. *Leveillula duriaei* (Lev.) U.Braun

Phlomis tuberosa L. (*Lamiaceae*)

B6 Sivas: between Zara and İmranlı, 13 km west of İmranlı, 1600 m, 12 vii 1996, ZB 833.

Phlomis sieheana Rech. (*Lamiaceae*)

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous area, 1700 m, 12 viii 1996, ZB 1047.

Phlomis pungens Willd. (*Lamiaceae*)

B6 Sivas: 65 km from Şarkışla to Pınarbaşı, edge of cultivated place, 1550 m, 19 vii 1998, ZB 2249; B7 Sivas: Divriği, around Yalnızsöğüt village, edge of cultivated place, 1300 m, 4 viii 1997, ZB 1822.

45. *L. taurica* (Lev.) G. Arnaud

Silene sp. (*Caryophyllaceae*)

B6 Sivas: between Gürün and Darende, marly places, 1100 m, 11 viii 1996, ZB 982.

Gundelia tournefortii L. (*Asteraceae*)

B6 Sivas: between Gürün and Darende, marly places, 1100 m, 11 viii 1996, ZB 977.

Onopordum turcicum Danin (*Asteraceae*)

B6 Sivas: Sivas, Gürün, Gökpinar, wet places, 1500 m, 2 x 1996, ZB 1447, B. Yıldız.

Picris sp. (*Asteraceae*)

B6 Sivas: 20 km from Gürün to Darende, 1300-1400 m, 1 x 1996, ZB 1366, B. Yıldız.

- Chondrilla juncea* L. (Asteraceae)
B6 Sivas: Gürün, around Suçatı village, 1500 m, 1 x 1996, ZB 1386, B. Yıldız.
- Echinops pungens* Trautv. (Asteraceae)
B6 Sivas: Gürün, Gökpinar, wet places, 1500 m, 2 x 1996, ZB 1448.
- Eryngium campestre* L. (Apiaceae)
B6 Sivas: 15 km from Ulaş to Yagdonduran pass, steppe, 1400 m, 14 vii 1996, ZB 924.
- Echinophora tenuifolia* L. (Apiaceae)
B6 Sivas: 20 km from Gürün to Darende, 1300-1400 m, 1 x 1996, ZB 1378.
- Scabiosa argentea* L. (Dipsacaceae)
B6 Sivas: 16 km from Kangal to Gürün, steppe, 1450 m, 12 viii 1996, ZB 1068.
- Verbascum* sp. (Scrophulariaceae)
B6 Sivas: 10 km from Kangal to Gürün, steppe, 1300 m, 3 vi 1997, ZB 1515.
- Verbascum cheiranthifolium* Boiss. (Scrophulariaceae)
B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous rocks, 2000-2200 m, 4 viii 1997, ZB 1794.
- Linaria* sp. (Scrophulariaceae)
B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1117.
- Medicago x varia* Martyn (Fabaceae)
A6 Sivas: 10 km from Suşehri to Degirmentaş, fallow fields, 1250 m, 14 viii 1996, ZB 1211.
- Medicago falcata* L. (Fabaceae)
B6 Sivas: 8 km west of Gürün, marly places, 1500 m, 12 viii 1996, ZB 1013.
- Onobrychis cappadocica* Boiss. (Fabaceae)
B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1128.
- Onobrychis argyrea* Boiss. (Fabaceae)
B6 Sivas: Between Gürün and Darende, 1100 m, 11 viii 1996, ZB 970, B. Yıldız.
- Onobrychis vicifolia* Scop. (Fabaceae)
A6 Sivas: 10 km from Suşehri to Degirmentaş, fallow fields, 1250 m, 14 viii 1996, ZB 1204.
- Hedysarum varium* Willd. (Fabaceae)
A6 Sivas: Suşehri, Kelkit valley, steppe, 700-800 m, 14 viii 1996, ZB 1178.
- Coronilla varia* L. (Fabaceae)
B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1032.
- Vicia* sp. (Fabaceae)
A6 Sivas: Suşehri, Ekinözü vantage, edge of cultivated area, 1100 m, 15 viii 1996, ZB 1218.
- Andrachne telephioides* L. (Euphorbiaceae)
A6 Sivas: Suşehri, Kelkit valley, steppe, 700-800 m, 14 viii 1996, ZB 1169.
- Helianthemum canum* (L.) Baumg. (Cistaceae)
A6 Sivas: 10 km north of Sivas, stony slopes, 1600 m, 21 vii 1998, ZB 2445, B. Yıldız.
- Helianthemum* sp. (Cistaceae)
B6 Sivas: 4-5 km west of Gürün, steppe, 1450 m, 12 viii 1996, ZB 1030.
- Glaucium acutideutatum* Hausskn. & Bornm. (Papaveraceae)
B7 Sivas: 13 km west of İmranlı, deep soiled area, 1600 m, 12 vii 1996, ZB 833.
- Glaucium leiocarpum* Boiss. (Papaveraceae)
B6 Sivas: Zara, shore of Tödürge lake, 1300 m, 14 viii 1996, ZB 1186, B. Yıldız.
- Glaucium flavum* Crantz (Papaveraceae)
B6 Sivas: Taşlıdere, gypsaceous slopes, 1300-1350 m, 22 ix 1996, ZB 1323.
- Hyoscyamus* sp. (Solanaceae)
B6 Sivas: Taşlıdere, wet places in the valley, 1300-1350 m, 22 ix 1996, ZB 1315.
- Peganum harmula* L. (Zygophyllaceae)
B6 Sivas: 3 km from Gürün to Gökpinar, steppe, 1300 m, 3 viii 1997, ZB 1744.
- 12. *46. *Microsphaera crispula*** U.Braun
Astragalus odoratus Lam. (Fabaceae)
A6 Sivas: 10 km north of Sivas, meadows, 1600 m, 21 vii 1998, ZB 2435.
- Astragalus sprunerii* Boiss. (Fabaceae)
A6 Sivas: 3 km north of Karaçayır, mixed forest, 1600 m, 21 vii 1998, ZB 2486.
- Astragalus* sp. L. (Fabaceae)
B6 Sivas: Suşehri, east of Akıncılar village, south slopes, 1100 m, 12 vii 1996, ZB 860.
- 47. *M. euonymi*** (DC.) Sacc.
Euonymus europaeus L. (Celastraceae)
A6 Sivas: 10 km north of Sivas, stony slopes, 1600 m, 21 vii 1998, ZB 2460.
- *48. *M. trifolii*** (Grev.) U.Braun var. *trifolii*
Onobrychis sp. (Fabaceae)
A6 Sivas: 10 km from Suşehri to Degirmentaş, road side, 1250 m, 14 viii 1996, ZB 1202. *Trifolium pratense* L. (Fabaceae)
B6 Sivas: 6 km west of Zara, edge of cultivated area, 1300 m, 12 vii 1996, ZB 819.
- 13. 49. *Phyllactinia guttata*** (Wallr.) Lev.
Pyrus elaeagnifolia Pallas subsp. *elaegnifolia* (Rosaceae)
B6 Sivas: Taşlıdere, Karayolları fountain, serpentine, 1350 m, 22 ix 1996, ZB 1319.
- Crataegus szovitsii* Pojark. (Rosaceae)
B6 Sivas: Gürün, Şugul valley, wet places in the valley, 1400 m, 2 x 1996, ZB 1397.
- Cerasus* sp. (Rosaceae)
B6 Sivas: Gürün, Şugul valley, wet places in the valley, 1400 m, 2 x 1996, ZB 1406.
- 14. *50. *Podosphaera tridactyla*** (Wallr.) de Bary var. *tridactyla*
Cerasus incana (Pallas) Spach var. *incana* (Rosaceae)
B6 Sivas: Gürün, Gökpinar, wet places, 1500 m, 2 x 1996, ZB 1438.
- 15. 51. *Sphaerotheca aphanis*** (Wallr.) U.Braun var. *aphanis*
Alchemilla lithophila Juz. (Rosaceae)
B7 Sivas: Divriği, Höbek village, Tülüce valley, streamside, 1300 m, 4 viii 1997, ZB 1840.
- 52. *S. dipsacacearum*** (Tul. & C.Tul.) L. Junell
Cephalaria syriaca (L.) Schrad. (Dipsacaceae)

B7 Sivas: 13 km west of İmranlı, steppe, 1200 m, 14 viii 1996, ZB 1149.

Cephalaria speciosa Boiss. & Kotschy (*Dipsacaceae*)

B6 Sivas: Ulaş, east of Tecer village, fallow fields, 1300 m. 10 ix 1998, ZB 2258.

Dipsacus laciniatus L. (*Dipsacaceae*)

B6 Sivas: Gürün, Gökpinar, wet places, 1500 m 2 x 1996, ZB 1449.

53. S. euphorbiae (Castagne) E.S.Salman

Euphorbia sp. (*Euphorbiaceae*)

A6 Sivas: Suşehri, Kelkit valley, steppe, 700-800 m, 14 viii 1996, ZB 1172.

***54. S. ferruginea** (Schldtl.) L.Junell

Sanguisorba minor Scop. (*Rosaceae*)

B6 Sivas: Gürün, Gökpinar, calcareous rocks, 1400 m, 3 viii 1997, ZB 1720.

55. S. fusca (Fr.) S.Blumer

Senecio vernalis Waldst. & Kit. (*Asteraceae*)

B6 Sivas: 33 km from Gürün to Pınarbaşı, calcareous area, 1600 m, 11 viii 1996, ZB 1007.

Taraxacum sp. (*Asteraceae*)

B7 Sivas: İmranlı, Kızıldağ pass, 2100 m, alpine meadows, 14 viii 1996, ZB 1138.

Rhinanthus angustifolius C.C.Gmel. (*Scrophulariaceae*)

A6 Sivas: 10 km from Suşehri to Degirmentaş village, fallow fields, 1250 m, 13 viii 1996. ZB 1200, B. Yıldız.

Hieracium lasiochaetum (Bornm. & Zahn) Sell & West (*Asteraceae*)

A6 Sivas: 10 km from Suşehri to Degirmentaş, fallow fields, 1250 m, 4 viii 1996, ZB 1207.

Bidens tripartita L. (*Asteraceae*)

B6 Sivas: bank of Kızılırmak, around Eğri bridge, 1300 m, 22 ix 1996, ZB 1267.

Xanthium strumarium L. (*Asteraceae*)

B6 Sivas: edge of Kızılırmak, around Eğri bridge, 1300 m, 22 ix 1996, ZB 1271.

Pedicularis comosa L. (*Scrophulariaceae*)

B6 Sivas 10 km from Kangal to Alacahan, meadows, 1400 m, 4 viii 1997, ZB 1846.

56. S. plantaginis (Castagne) L. Junell

Plantago lanceolata L. (*Plantaginaceae*)

B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1119.

B6 Sivas: Gürün, around Suçatı village, 1500 m, 1 x 1996, ZB 1390.

***57. S. thalictri** L. Junell

Thalictrum minus L. (*Ranunculaceae*)

B6 Sivas: Taşlıdere, Karayolları fountain, streamside, 1300 m, 20 vii 1998, ZB 2276.

Class.: PYRENOMYCETES

Order: CLAVICIPITALES

Fam.: CLAVICIPITACEAE

16. 58. Claviceps purpurea (Fr.) Tul.

Secale montanum Guss. (*Poaceae*)

B6 Sivas: 33 km from Gürün to Pınarbaşı, calcareous slopes, 1700 m, 19 vii 1998, ZB 2161.

Carex hirta L. (*Cyperaceae*)

B6 Sivas: Ulaş, Tecer brook, streamside, 1350 m, 23 ix 1996, ZB 1336.

Bromus sp. (*Poaceae*)

B6 Sivas: 60 km from Sivas to Şarkışla, gypsaceous area, 20 vii 1998, ZB 2365.

Subdiv.: BASIDIOMYCOTINA

Class.: HETEROBASIDIOMYCETES

Order: UREDINALES

Fam.: COLEOSPORIACEAE

17. 59. Coleosporium campanulae (Pers.) Lev.

Campanula olympica Boiss. (*Campanulaceae*)

A6 Sivas: 2 km north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1929.

60. C. tussilaginis (Pers.) Kleb.

Tussilago farfara L. (*Asteraceae*)

B6 Sivas: Gürün, Gökpinar, wet places, 1500 m, 2 x 1996, ZB 1444.

Fam.: MELAMPORACEAE

18. 61. Melampsora salicis albae Kleb.

Salix cinerea L. (*Salicaceae*)

B6 Sivas: bank of Kızılırmak, Eğri bridge, 1300 m, 22 ix 1996, ZB 1270.

Salix alba L. (*Salicaceae*)

B6 Sivas: Gürün, Gökpinar, streamside, 1400 m, 3 viii 1997, ZB 1724.

Populus nigra L. (*Salicaceae*)

B6 Sivas: Gürün, Şugul valley, wet places in the valley, 1400 m, 2 x 1996, ZB 1400.

62. M. euphorbiae (Schwein) Castagne

Euphorbia cardiophylla Boiss. & Heldr. (*Euphorbiaceae*)

B6 Sivas: 15 km from Sivas to Karaçayır, Tavla brook, 1600 m, 4 vi 1997, ZB 1566.

Euphorbia virgata Waldst. & Kit. ex Willd. (*Euphorbiaceae*)

B6 Sivas: Zara, around Tödürge lake, gypsum, 1300 m, 14 viii 1996, ZB 1182; **B6 Sivas:** Bingöl village, halophytic vegetation, 1350 m, 22 ix 1996, ZB 1295.

Euphorbia macroclada Boiss. (*Euphorbiaceae*)

B6 Sivas: Zara, around Bolucan, 1500 m, 22 vii 1999, ZB 2507.

Fam.: PUCCINIACEAE

19. *63. Aecidium otitis Schldtl.

Silene italica (L.) Pers. (*Caryophyllaceae*)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2402.

20. *64. Gymnosporangium amelanchieris E.Fisch. ex F.Kern

Amelanchier rotundifolia (Lam.) Dum.-Cours. (*Rosaceae*)

B6 Sivas: Taşlıdere, Karayolları fountain, 1300-1400 m, 20 vii 1998, ZB 2311.

65. G. clavariiforme (Jacq.) DC.

Crataegus sp. L. (*Rosaceae*)

A6 Sivas: 10 km north of Sivas, stony slopes, 1600 m, 21 vii 1998, ZB 2430.

66. G. confusum Plowr.

Crataegus monogyna Jacq. subsp. *monogyna* (*Rosaceae*)

A6 Sivas: 8. km from Suşehri to Tokat, orchard edge, 700-800 m, 13 vii 1996, ZB 875.

Crataegus sp. L. (*Rosaceae*)

B6 Sivas: Gürün, Şugul valley, rocky south slopes, 1500 m, 18 vii 1998, ZB 2115.

Crataegus tanacetifolia (Lam.) Pers. (*Rosaceae*)

B6 Sivas: 17 km from Pınarbaşı to Şarkışla, fallow fields, 1600 m, 19 vii 1998, ZB 2222.

Crataegus pentagyna Waldst. & Kit. ex Wild. (*Rosaceae*)

B6 Sivas: Taşlıdere, serpentine, 1300-1400 m, 20 vii 1998, ZB 2327.

Crataegus szowitsii Pojark (*Rosaceae*)

B6 Sivas: Zara, around Bolucan, Quercus scrub, 1500 m, 22 vii 1999, ZB 2517.

21. *67. Phragmidium bulbosum (Fr.) Schtdl.

Rubus sanctus Schreb. (*Rosaceae*)

A6 Sivas: Yıldızeli, Çamlıbel pass, Pinus forest, 1600-1700 m, 13 viii 1996, ZB 1077.

68. Ph. mucronatum (Pers.) Schtdl.

Rosa canina L. (*Rosaceae*)

A7 Sivas: 20 km from Akıncılar village to Suşehri, 2100 m, 14 viii 1996, ZB 1166.

Rosa dumalis Bechst. (*Rosaceae*)

B6 Sivas: Gürün, Gökpinar, calcareous rocks, 1400 m, 3 viii 1997, ZB 1734.

Rosa pimpinellifolia L. (*Rosaceae*)

B7 Sivas: İmranlı, around Saruhan village, 1900 m, 14 viii 1996, ZB 1157.

69. Ph. potentillae (Pers.) P.Karst.

Potentilla recta L. (*Rosaceae*)

A6 Sivas: Yıldızeli, Çamlıbel pass, 1600-1700 m, 13 viii 1996, ZB 1086, B. Yıldız.

70. Ph. rubi-saxatilis Liro

Rubus canescens DC. var. *canescens* (*Rosaceae*)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2417.

71. Ph. sanguisorbae (DC.) Schröt.

Sanguisorba minor Scop. subsp. *minor* (*Rosaceae*)

B7 Sivas: 13 km west. of İmranlı, gypsaceous area, 1900 m, 14 viii 1996, ZB 1143. ZB 1193.

72. Ph. tuberculatum Jul. Müll

Rosa dumalis Bechst. (*Rosaceae*)

A6 Sivas: 8 km from Suşehri to Tokat, garden edge, 700-800 m, 13 vii 1996, ZB 874.

Rosa villosa L. subsp. *villosa* (*Rosaceae*)

B6 Sivas: west of Böğrüdelik village, rocky slopes, 1700-2000 m, 14 vii 1996, ZB 937.

Rosa pulverulenta M.Bieb. (*Rosaceae*)

B6 Sivas: between Gürün and Kangal, west of Böğrüdelik village, calcareous rocks, 2000-2200 m, 4 viii 1997, ZB 1773.

22. *73. Puccinia absinthii DC.

Artemisia austriaca Jacq. (*Asteraceae*)

B6 Sivas: Zara, around Tödürge lake, gypsum, 1300 m, 12 vii 1996, ZB 809.

Artemisia absinthium L. (*Asteraceae*)

A6 Sivas: 8 km from Suşehri to Tokat, garden edge, 700-800 m, 13 vii 1996, ZB 781.

Artemisia taurica Willd. (*Asteraceae*)

B6 Sivas: Bingöl village, salt mine, halophytic vegetation 1350 m, 22 ix 1996, ZB 1281.

Tanacetum balsamita L. (*Asteraceae*)

A6 Sivas: Suşehri, Ekinözü village, fallow field, 1100 m, 15 viii 1996, ZB 1215.

74. P. acarnae P.Syd. & Syd.

Picnoman acarna (L.) Cass. (*Asteraceae*)

B6 Sivas: Bingöl village, salt mine, halophytic vegetation, 1350 m, 22 ix 1996, ZB 1290; **B6** Sivas: Şugul valley, rocky slopes, 1400 m, 2 x 1996, ZB 1431.

75. P. acetosae (Schum.) Korn.

Rumex tuberosus L. (*Polygonaceae*)

A/B6 Sivas: Yıldızeli, Çamlıbel pass, 1650 m, 11 vii 1996, ZB 786.

Rumex acetosella L. (*Polygonaceae*)

A6 Sivas: Şerefiye, Karabayır pass, steppe, 1925 m, 15 viii 1996, ZB 1223.

76. P. achilleae Cooke

Achillea sipikorensis Hausskn. & Bornm. (*Asteraceae*)

B6 Sivas: 16 km from Kangal to Gürün, marly, 1450 m, 10 vii 1996, ZB 751.

Achillea phrygia Boiss. & Bal. (*Asteraceae*)

A6 Sivas: Yıldızeli, Çamlıbel pass, 1600-1700 m, 13 viii 1996, ZB 1087, B. Yıldız.

Achillea millefolium L. (*Asteraceae*)

B6 Sivas: 10 km from Suşehri to Degirmentaş village, 1000 m, 12 vii 1996, ZB 869.

Achillea cucullata (Hausskn.) Bornm. (*Asteraceae*)

B6 Sivas: between Gürün and Darende, marl, 1100 m, 11 viii 1996, ZB 966, B. Yıldız.

Achillea wilhelmsii C.Koch (*Asteraceae*)

B6 Sivas: Bingöl village, banks of salt lake, 1350 m, 22 ix 1996, ZB 1280, B. Yıldız.

Achillea sintenisii Hub.-Mor. (*Asteraceae*)

B6 Sivas: 22 km from Hafik to Zara, gypsum, 1300 m, 14 viii 1996, ZB 1195, B. Yıldız.

Achillea teretifolia Willd. (*Asteraceae*)

B6 Sivas: Divriği, Höbek village, Tülü valley, steppe, 2 vi 1997, ZB 1470, B. Yıldız.

77. P. annularis (F.Strawss) G.Winter

Teucrium polium L. (*Lamiaceae*)

A6 Sivas: Yıldızeli, Çamlıbel pass, 1600-1700 m, 13 viii 1996, ZB 1084, B. Yıldız.

78. P. arenariae (Schumach.) J.Schröt.

Silene italica (L.) Pers (*Caryophyllaceae*)

A6 Sivas: 2 km north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1933.

79. P. asparagi DC.

Asparagus verticillatus L. (*Liliaceae*)

B6 Sivas: Gürün, Şugul valley, wet places in the valley, 1400 m, 2 x 1996, ZB 1404.

Asparagus officinalis L. (*Liliaceae*)

B6 Sivas: Taşlıdere, gypsum hills, 1300-1400 m, 20 vii 1998, ZB 2285, B. Yıldız.

80. P. asperulae-aporines Picbauer

Asperula pestalozzae Boiss. (*Rubiaceae*)

B6 Sivas: Yıldızeli, around Karakaya village, steppe, 1300 m, 6 viii 1997, ZB 1946.

Asperula sp. (*Rubiaceae*)

B6 Sivas: between Gürün and Darende, steppe, 1100 m, 11 viii 1996, ZB 981, B. Yıldız.

81. *P. betonicae* (Alb. & Schwein.) DC.
Stachys iberica M.Bieb. (*Lamiaceae*)

A/B6 Sivas: Yıldızeli, Çamlıbel pass, 1550 m, 11 vii 1996, ZB 773, B. Yıldız.

Stachys citrina Boiss. & Heldr. (*Lamiaceae*)

B6 Sivas: Gürün, Gökpinar, calcareous rocks, 1400 m, 3 viii 1997, ZB 1711, B. Yıldız.

*82. *P. bromina* Erikss.

Bromus japonicus Thunb. (*Poaceae*)

B7 Sivas: Suşehri, 18 km from Akıncılar to Refahiye, steppe 1100 m, 12 vii 1996, ZB 856.

Bromus sterilis L. (*Poaceae*)

B7 Sivas: Suşehri, 18 km from Akıncılar to Refahiye, steppe, 1100 m, 12 vii 1996, ZB 1506.

83. *P. bulbocastani* (Cumina) Fucckel

Bunium sp. (*Apiaceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, cultivated area, 1500 m, 5 viii 1997, ZB 1904.

84. *P. bupleuri* (Opiz) Rudolphi

Bupleurum croseum Fenzl (*Apiaceae*)

B6 Sivas: 6 km west of Zara, fallow fields, 1300 m, 12 vii 1996, ZB 825.

Bupleurum falcatum L. (*Apiaceae*)

A6 Sivas: 10 km from Sivas to Karaçayır, steppe, 1300 m, 5 viii 1997, ZB 1876.

Bupleurum rotundifolium L. (*Apiaceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, cultivated area, 1500 m, 5 viii 1997, ZB 1894.

85. *P. calcitrapae* DC.

Centaurea solstitialis L. (*Asteraceae*)

B6 Sivas: Ulaş, spring of Tecer river, streamside, 1350 m, 23 ix 1996, ZB 1349, B. Yıldız.

Centaurea kotschy (Boiss. & Heldr.) Hayek (*Asteraceae*)

B6 Sivas: 15 km from Ulaş to Yagdonduran pass, steppe, 1400 m, 14 vii 1996, ZB 929.

Centaurea glastifolia L. (*Asteraceae*)

B6 Sivas: 13 km from Sivas to Karaçayır, steep slopes, 1400 m, 5 viii 1997, ZB 1877.

Centaurea virgata Lam. (*Asteraceae*)

B6 Sivas: between Gürün and Kangal steppe, 1300 m, 4 viii 1997, ZB 1809, B. Yıldız.

Echinops ritro L. (*Asteraceae*)

B6 Sivas: Gürün, Gökpinar, calcareous rocks, north slopes, 1500 m, 18 vii 1998, ZB 2060.

Echinops galaticus Freyn (*Asteraceae*)

B7 Sivas: İmranlı, around Saruhan village, 1900 m, 14 viii 1996, ZB 1152, B. Yıldız.

Echinops melitenensis Hedge & Hub.-Mor. (*Asteraceae*)

B6 Sivas: Gürün, Gökpinar, calcareous area, 1400 m, 3 viii 1997, ZB 1726, B. Yıldız.

86. *P. carduorum* Jacky

Carduus nutans L. (*Asteraceae*)

B6 Sivas: Kangal, Alacahan, 2 km east of Yeşildere, steppe, 1550 m, 10 vii 1996, ZB731.

Carduus acanthoides L. (*Asteraceae*)

B6 Sivas: 3 km west of Yıldızeli, steppe, 1300 m, 13 vii 1996, ZB 898; B6 Sivas: around Halep bridge, streamside, 1300 m, 23 ix 1996, ZB 1355.

Carduus pycnocephalus L. (*Asteraceae*)

B6 Sivas: around Paşabağçe, gypsum, 1300 m, 5 viii 1997, ZB 1854, B. Yıldız.

87. *P. caricicola* Fucckel

Carex hirta L. (*Cyperaceae*)

B6 Sivas: Ulaş, spring of Tecer river, streamside, 1350 m, 23 ix 1996, ZB 1336, B. Yıldız.

Carex riparia Curtis (*Cyperaceae*)

B6 Sivas: Gürün, Şugul valley, wet places, 1400 m, 2 x 1996, ZB 1396, B. Yıldız.

Carex hordeistishos Vill (*Cyperaceae*)

A6 Sivas: 10 km from Suşehri to Degirmentaş, pasture, 1250 m, 14 viii 1996, ZB 1197.

Carex nigra (L.) Reichard (*Cyperaceae*)

B6 Sivas: 10 km from Kangal to Alacahan, meadows, 1400 m, 4 viii 1997, ZB 1845a.

Carex atrata L. (*Cyperaceae*)

B6 Sivas: Gürün, Gökpinar, meadows, 1500 m, 18 viii 1998, ZB 2099, B. Yıldız.

88. *P. celakovakya* Bub.

Cruciata taurica (Willd.) Ehrend. (*Rubiaceae*)

A/B6 Sivas: Yıldızeli, Çamlıbel pass, 1550 m, 11 vii 1996, ZB 766; B6 Sivas: 14 km from Zara to Bolucan, 1400 m, 22 vii 1998, ZB 2544, B. Yıldız.

Cruciata laevipes Opiz (*Rubiaceae*)

A6 Sivas: Şerefiye, Karabayır pass, steppe, 1925 m, 15 viii 1996, ZB 1226, B. Yıldız.

89. *P. centaurea* DC.

Centaurea sivasica Wagenitz (*Asteraceae*)

B6 Sivas: 16 km from Kangal to Gürün, steppe, 1450 m, 12 viii 1996, ZB 1072, B. Yıldız.

Centaurea iberica Trev. ex Spreng. (*Asteraceae*)

B6 Sivas: 6 km west of Zara, field edge, 1300 m, 12 vii 1996, ZB 824, B. Yıldız.

Centaurea glastifolia L. (*Asteraceae*)

A6 Sivas: Suşehri, around Ekinözü village, field edge, 1100 m, 15 viii 1996 ZB 1222.

Centaurea virgata Lam. (*Asteraceae*)

B6 Sivas: 20 km from Gürün to Darende, 1300-1400 m, 1 x 1996, ZB 1376, B. Yıldız.

Centaurea agregata DC. (*Asteraceae*)

B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1113.

Centaurea consanguinea DC. (*Asteraceae*)

B6 Sivas: between Gürün and Darende, marl, 1100 m, 11 viii 1996, ZB 986, B. Yıldız.

Centaurea polypodiifolia Boiss. (*Asteraceae*)

B6 Sivas: Şarkışla, border of Sivas and Kayseri, steppe, 1750 m, 19 vii 1998, ZB 2200.

90. *P. chondrillina* Bubak

Chondrilla juncea L. (*Asteraceae*)

A6 Sivas: 16 km from Suşehri to Koyulhisar, steppe, 700 m, 13 vii 1996, ZB 885; B6 Sivas: Gürün, Gökpinar, calcareous area, 1400 m, 3 viii 1997, ZB 1731.

91. *P. cichorii* (DC.) Belynnck
Cichorium intybus L. (Asteraceae)
B6 Sivas: Kangal, Alacahan, 2 km east of Yeşildere, steppe, 1550 m, 10 vii 1996, ZB 728.
92. *P. cirsii* Lasch.
Cirsium arvense (L.) Scop. (Asteraceae)
B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 12 vii 1996, ZB 797. *Cirsium lappacearum* (M.Bieb.) M.Bieb. (Asteraceae)
A6 Sivas: 2 km north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1926; B6 Sivas: Kangal road, around Halep bridge, streamside, 1300 m, 23 ix 1996, ZB 1359, B. Yıldız.
Cirsium vulgare (Savi) Ten. (Asteraceae)
B6 Sivas: Zara, shore of Tödürge lake, pasture, 1300 m, 14 viii 1996, ZB 1181, B. Yıldız. *Cirsium macrobotris* (C. Koch) Boiss. (Asteraceae)
B6 Sivas: İmranlı, Kızıldağ pass, alpine meadows, 2100 m, 14 viii 1996, ZB 1142, B. Yıldız.
93. *P. cnici* G.Martin
Cirsium lappaceum (M.Bieb.) Fischer (Asteraceae)
B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, rocky slopes, 2000 m, 4 viii 1997, ZB 1769, B. Yıldız.
Cirsium pubigerum (Desf.) DC. (Asteraceae)
B6 Sivas: Gürün, Gökpinar, streamside, 1500 m, 18 viii 1998, ZB 2101, B. Yıldız.
94. *P. coronillae* Woron.
Coronilla orientalis Miller (Fabaceae)
A6 Sivas: Suşehri, east of Akıncılar village, south slopes, 1100 m, 12 vii 1996, ZB 862.
95. *P. crepidis* J. Schröt.
Crepis foetida L. (Asteraceae)
B6 Sivas: 16 km from Kangal to Gürün, marl, 1450 m, 10 vii 1996, ZB 750, B. Yıldız.
Crepis alpina L. (Asteraceae)
A7 Sivas: Suşehri, 18 km from Akıncılar to Refahiye, steppe 1100 m, 12 vii 1996, ZB 853.
96. *P. cyanii* Pass.
Centaurea polypodiifolia Boiss. (Asteraceae)
B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gybsum, 1400 m, jips 12 vii 1996, ZB 800.
Centaurea virgata Lam. (Asteraceae)
B6 Sivas: 3 km west of Yıldızeli, steppe-1300 m, 13 vii 1996, ZB 899, B. Yıldız.
Centaurea triumfettii All. (Asteraceae)
B7 Sivas: Divriği, Höbek village, Tülü valley, steppe, 2 vi 1997, ZB 1469, B. Yıldız.
Centaurea iberica Trev. ex Spreng. (Asteraceae)
B6 Sivas: Bingöl village, salt lake, halophytic vegetation, 1350 m, 22 ix 1996, ZB 1287.
Centaurea pichleri Boiss. (Asteraceae)
B6 Sivas: 15 km from Sivas to Karaçayır, Tavla valley, steppe, 1600 m, 4 vi 1997, ZB 1568.
Centaurea urvillei DC. (Asteraceae)
B6 Sivas: 15 km from Sivas to Karaçayır, Tavla valley, steppe, 1600 m, 4 vi 1997, ZB 1689.
97. *P. cynodontis* Lacroix ex Desm
Cynodon dactylon (L.) Pers. var. *villosus* Regel (Poaceae)
B6 Sivas: 15 km from Ulaş to Yagdonduran pass, steppe, 1400 m, 14 vii 1996, ZB 924; B6 Sivas: Bingöl village, salt lake, halophytic vegetation, 1300 m, 4 vi 1997, ZB 1589, B. Yıldız.
98. *P. cyperi* Arthur
Cyperus sp. (Cyperaceae)
B7 Sivas: Divriği, Höbek village, Tülü valley, streamside, 1300 m, 4 viii 1997, ZB 1837.
- *99. *P. dioicae* Magnus
Carex atrata L. (Cyperaceae)
B6 Sivas: Gürün, Gökpinar, meadows, 1500 m, 18 viii 1998, ZB 2096, B. Yıldız.
- *100. *P. divergens* Bubak
Carlina oligocephala Boiss. & Kotschy (Asteraceae)
B6 Sivas: Gürün, Gökpinar, calcareous rocks, north slopes, 1500 m, 18 vii 1998, ZB 2064.
101. *P. eryngii* DC.
Eryngium campestre L. (Apiaceae)
B6 Sivas: 15 km from Ulaş to Yagdonduran pass, steppe, 1400 m, 14 vii 1996, ZB 924.
102. *P. falcariae* (Pers.) Fockel
Falcaria vulgaris Bernh. (Apiaceae)
B6 Sivas: 33 km from Gürün to Pınarbaşı, calcareous area, 1600 m, 11 viii 1996, ZB 1003.
103. *P. fockelii* P.Syd. & Syd
Jurinea pontica Hausskn. & Freyn ex Hausskn. (Asteraceae)
B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1114.
104. *P. graminis* Pers.
Secale cereale L. var. *cereale* (Poaceae)
B6 Sivas: 16 km from Sivas to Karaçayır, field edge, 1500 m, 5 viii 1997, ZB 1892, B. Yıldız.
Secale montanum Guss. (Poaceae)
B6 Sivas: 16 km from Kangal to Gürün, marl, 1450 m, 10 vii 1996, ZB 748, B. Yıldız.
Secale cereale L. var. *voronovii* (Grossh.) Mayss. (Poaceae)
A6 Sivas: 10 km north of Sivas, screes, 1600 m, 21 vii 1998, ZB 2437, B. Yıldız.
Elymus hispidus (Opiz) Melderis ssp. *hispidus* (Poaceae)
B6 Sivas: 16 km from Kangal to Gürün, marl, 1450 m, 10 vii 1996, ZB 743, B. Yıldız.
Elymus elongatus (Host) Runemark subsp. *turcicus* (McGüire) Melderis (Poaceae)
B6 Sivas: around Paşabahçe, gypsum, 1300 m, 5 viii 1997, ZB 1851, B. Yıldız.
Elymus lazicus (Boiss.) Melderis subsp. *lazicus* (Poaceae)
B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous area, 1900-2000 m, 12 viii 1996, ZB 1051, B. Yıldız.
Elymus lazicus (Boiss.) Melderis subsp. *divaricatus* (Boiss. & Bal.) Melderis (Poaceae)
B6 Sivas: Gürün, Gökpinar, rocky slopes, 1500 m, 2 x 1996, ZB 1457, B. Yıldız.

Elymus nodosus (Nevski) Melderis subsp. *gypsicolus* Melderis (*Poaceae*)

B6 Sivas: Taşlıdere, around Karayolları fountain, serpentine, 1400 m, 20 vii 1998, ZB 2305.

Elymus repens (L.) Gould subsp. *repens* (*Poaceae*)

B6 Sivas: Kangal road, around Halep Bridge, streamside, 1300 m, 23 ix 1996, ZB 1361.

Bromus lanceolatus Roth (*Poaceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, fallow fields, 1500 m, 5 viii 1997, ZB 1906.

Poa longifolia Trin. (*Poaceae*)

B6 Sivas: Gürün, Şugul valley, 1400 m, 2 x 1996, ZB 1414.

Avena sativa L. (*Poaceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, field edge, 1500 m, 5 viii 1997, ZB 1896.

Eremopoa persica (Trin.) Roshev. (*Poaceae*)

A6 Sivas: 10 km north of Sivas, stony slopes, 1600 m, 21 vii 1998, ZB 2433.

Aegilops speltoides Tausch (*Poaceae*)

B6 Sivas: 65 km from Şarkışla to Pınarbaşı, edge of cultivated area, 1550 m, 19 vii 1998, ZB 2261; **B6** Sivas: Zara, around Bolucan, steppe, 1500 m, 22 vii 1999, ZB 2510.

Aegilops umbellulata Zhuk. (*Poaceae*)

A6 Sivas: Suşehri, Kelkit valley, steppe, 700-800 m, 14 viii 1996, ZB 1177.

Melica ciliata L. subsp. *ciliata* (*Poaceae*)

B6 Sivas: 3 km from Gürün to Suçatı village, marly slopes, 1400 m, 5 vi 1997, ZB 1648.

Alopecurus myosuroides Hudson var. *myosuroides* (*Poaceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, field edge, 1500 m, 5 viii 1997, ZB 1892.

Alopecurus arundinaceus Poir. (*Poaceae*)

B6 Sivas: 40 km from Sivas to Şarkışla, field edge, 1400 m, 20 vii 1998, ZB 2334.

Calamagrostis pseudophragmites (Haller f.) Koeler (*Poaceae*)

B6 Sivas: Gürün, Gökpinar, 1500 m, 18 vii 1998, ZB 2068.

Hordeum distichon L. (*Poaceae*)

B6 Sivas: 65 km from Şarkışla to Pınarbaşı, 1550 m, 19 vii 1998, ZB 2254.

Dactylis glomerata L. (*Poaceae*)

B6 Sivas: Yıldızeli, around Karakaya village, steppe, 1300 m, 6 viii 1997, ZB 1941.

Triticum sp. (*Poaceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, field edge, 1500 m, 5 viii 1997, ZB 1901.

Berberis vulgaris (*Berberidaceae*)

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous area, 2000-2200 m, 4 viii 1997, ZB 1782.

Berberis cratagina L. (*Berberidaceae*)

B6 Sivas: 16 km from Kangal to Gürün, steppe, 1450 m, 10 vii 1996, ZB 745.

105. P. gundeliae Cooke.

Gundelia tournefortii L. subsp. *tenuisecta* Willd. (*Asteraceae*)

B6 Sivas: 3 km west of Yıldızeli, steppe, 1300 m, 13 vii 1996, ZB 903; **B6** Sivas: Gürün, Ziyaret pass, calcareous area, 2000-2200 m, 19 vii 1998, ZB 2195.

106. P. hieracii H.Mart. var. *hieracii*

Taraxacum serotinum (Waldst. & Kit.) Poir. (*Asteraceae*)

A6 Sivas: Suşehri, around Ekinözü village, fallow fields, 1100 m, 15 viii 1996, ZB 1217.

Taraxacum montanum (C.A.Mey.) DC. (*Asteraceae*)

A6 Sivas: Şerefiye, Karabayır pass, steppe, 1925 m, 15 viii 1996, ZB 1232.

Taraxacum syriacum Boiss. (*Asteraceae*)

B6 Sivas: Bingöl village, Halophytic vegetation, 1350 m, 22 ix 1996, ZB 1277.

Hieracium pannosum Boiss. (*Asteraceae*)

B6 Sivas: Gürün, Ziyaret pass, stony slopes, 2000-2200 m, 19 vii 1998, ZB 2179.

107. P. hordei G.H.Otth

Hordeum distichon L. (*Poaceae*)

B6 Sivas: Şarkışla, Hinzır Da, steppe, 1600 m, 19 vii 1998, ZB 2209.

108. P. iridis Wallr.

İris sp. (*Iridaceae*)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2394.

109. P. lapsanae Focke.

Lapsana communis L. var. *communis* (*Asteraceae*)

A6 Sivas: 10 km north of Sivas, stony slopes, 1600 m, 21 vii 1998, ZB 2428; **B7** Sivas: 13 km west of Imranlı, 1600 m, 12 vii 1996, ZB 834.

***110. P. leontodontis** Jacky.

Leontodon crispus Vill. (*Asteraceae*)

B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1115.

Leontodon asperrimus (Willd.) J.Ball. (*Asteraceae*)

B6 Sivas: Gürün, around Suçatı village, steppe, 1500 m, 1 x 1996, ZB 1394.

111. Puccinia libani Magnus

Prangos pabularia Lindley (*Apiaceae*)

B6 Sivas: 13 km from Gürün to Pınarbaşı, calcareous area, 1700 m, 11 viii 1996, ZB 992.

112. P. liliacearum Duby

Ornithogalum sp. (*Liliaceae*)

B6 Sivas: 15 km from Sivas to Karaçayır, Tavla brook, Corylus scrub, 1500-1600 m, 4 vi 1997, ZB 1560.

113. P. malvacearum Bertero ex Mont.

Malva neglecta Wallr. (*Malvaceae*)

B6 Sivas: Gürün, Şugul valley, wet places in the valley, 1400 m, 6 vi 1997, ZB 1663.

114. P. menthae Pers.

Mentha spicata L. subsp. *spicata* (*Lamiaceae*)

A6 Sivas: 10 km from Suşehri to Degirmentaş village, streamside, 1250 m, 14 viii 1996, ZB 1207; **B6** Sivas: Ulaş, spring of Tecer river, streamside, 1350 m, 23 ix 1996, ZB 1344.

115. P. montana Focke

Centaurea mucronifera DC. (*Asteraceae*)

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, rocky slopes, 1900-2000 m, 12 viii 1996, ZB 1045.

Centaurea carduiformis DC. (*Asteraceae*)

B7 Sivas: 13 km west of İmranlı, gypsaceous area, 1900 m, 14 viii 1996, ZB1147.

Centaurea kotschyi (Boiss. & Heldr.) Hayek (*Asteraceae*)

B6 Sivas: 60 km from Sivas to Şarkışla, gypsum, 20 vii 1998, ZB 2345.

Centaurea rhizantha C.A.Mey. (*Asteraceae*)

B6 Sivas: Zara, around Bolucan, 1500 m, 22 vii 1999, ZB 2516.

*116. *P. mulgedii* (Westend.) P.Syd. & Syd.

Cicerbita mulgedioides (Sch.Bip. ex Vis. & Panc.) Beauvred (*Asteraceae*)

B6 Sivas: Şerefiye, Armutçayırı village, Abdiaga fountain, 1500 m, 15 viii 1996, ZB 1244 a.

117. *P. nigrescens* Kirchn.

Salvia verticillata L. (*Lamiaceae*)

B6 Sivas: Ulaş, spring of Tecer river, streamside, 1350 m, 23 ix 1996, ZB 1350.

Salvia multicaulus Vahl (*Lamiaceae*)

B6 Sivas: Gürün, Şugul valley, calcareous slopes, 1400 m, 6 vi 1997, ZB 1651.

*118. *P. nishidana* Henn

Cirsium lappaceum (M.Bieb.) Fischer (*Asteraceae*)

B6 Sivas: Bingöl village, steppe, 1350 m, 22 ix 1996, ZB 1291, B. Yıldız.

119. *P. persistens* Plowr. subsp. *persistens*

Elymus repens (L.) Gould subsp. *repens* (*Poaceae*)

B6 Sivas: Ulaş, spring of Tecer brook, streamside, 1350 m, 23 ix 1996, ZB 1335.

Elymus longearistatus (Boiss.) Tzvelev (*poaceae*)

B6 Sivas: Between Gürün and Kangal, west of Böğrüdelik village, calcareous rocks, 2000 m, 5 vi 1997, ZB 1618.

Elymus elongatus (Host) Runemark subsp. *turcicus* (McGuire) Melderis (*Poaceae*)

B6 Sivas: 13 km south of Şarkışla, edge of cultivated area, 1550 m, 19 vii 1998, ZB 2272.

Elymus lazicus (Boiss.) Melderis subsp. *lazicus* (*Poaceae*)

B6 Sivas: 33 km from Gürün to Pınarbaşı, stony south slopes, 1700 m, 19 vii 1998, ZB 2157.

Elymus nodosus (Nevski) Melderis subsp. *gypsicolus* Melderis (*Poaceae*)

B6 Sivas: 65 km from Şarkışla to Pınarbaşı, fallow fields, 1550 m, 19 vii 1998, ZB 2266.

Agrostis stolonifera L. (*Poaceae*)

A6 Sivas: between Şerefiye and Karabayır pass, 6. km, steppe, 1750 m, 15 viii 1996, ZB 1234.

120. *P. phlomidis* Thum

Phlomis pungens Willd. (*Lamiaceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, fallow fields, 1500 m, 5 viii 1997, ZB 1905.

121. *P. phragmitis* (Schumach) Körn.

Phragmites australis (Cav.) Trin. ex Steudel (*Poaceae*)

B6 Sivas: Ulaş, spring of Tecer brook, stream side, 1350 m, 23 ix 1996, ZB 1333.

*122. *P. picridis* Hazsl.

Picris hieracioides L. (*Asteraceae*)

A/B6 Sivas: Yıldızeli, Çamlıbel pass, 1650 m, 11 vii 1996, ZB 783, B. Yıldız.

Picris strigosa M.Bieb. (*Asteraceae*)

A/B6 Sivas: 2 km from Çamlıbel pass to Yıldızeli, 1550 m, 11 vii 1996, ZB 769. **B6** Sivas: 4-5 km west of Gürün, steppe, 1450 m, 12 viii 1996, ZB 1029.

Picris hieracioides L. (*Asteraceae*)

B6 Sivas: Taşlıdere, serpentine, 1300-1400 m, 20 vii 1998, ZB 2303. , B. Yıldız.

Picris pauciflora Willd. (*Asteraceae*)

B6 Sivas: 16 km from Sivas to Karaçayır, edge of fields, 1500 m, 5 viii 1997, ZB 1900.

123. *P. pimpinellae* (F.Strauss) Link

Pimpinella aurea DC. (*Apiaceae*)

B6 Sivas: Between Gürün and Kangal, west of Böğrüdelik village, calcareous rocks, 2000-2200 m, 4 viii 1997, ZB 1796.

Pimpinella tragium Vill. subsp. *lythophyta* (Schischk.) Tutin (*Apiaceae*)

B6 Sivas: Gürün, Gökpinar, calcareous rocks, north slopes, 1500 m, 18 vii 1998, ZB 2083. *Pimpinella corymbosa* Boiss. (*Apiaceae*)

B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 12 vii 1996, ZB 806.

Pimpinella olivierioides Boiss. & Hausskn. (*Apiaceae*)

B6 Sivas: 60 km from Sivas to Şarkışla, gypsum, 20 vii 1998, ZB 2367.

124. *P. poarum* E.Nielsen

Poa nemoralis L. (*Poaceae*)

B6 Sivas: West of Sivas, Zübeyde Hanım forest, gypsaceous area, 1300-1400 m, 13 viii 1996, ZB 1103.

125. *P. podospermi* DC.

Scorzonera cinerea Boiss. (*Asteraceae*)

A6 Sivas: Şerefiye, Karabayır pass, steppe, 1925 m, 15 viii 1996, ZB 1230, B. Yıldız.

126. *P. polygoni* Alb. & Schwein

Polygonum lapathifolium L. (*Polygonaceae*)

B6 Sivas: 33 km from Gürün to Pınarbaşı, wetlands, 1700 m, 19 vii 1998, ZB 2131.

127. *P. punctata* Link

Galium humifusum M.Bieb. (*Rubiaceae*)

A6 Sivas: 16 km from Suşehri to Koyulhisar, steppe, 700 m, 13 vii 1996, ZB 884.

Galium verum L. subsp. *verum* (*Rubiaceae*)

B7: Sivas: Divriği, Höbek village, Tülü valley, steppe, 1300 m, 4 viii 1997, ZB 1834.

Galium verum L. subsp. *glabrescens* Ehrend. (*Rubiaceae*)

B6 Sivas: 2 km from, Karakaya village to Yıldızeli, steppe, 1300 m, 6 viii 1997, ZB 1951.

Galium margaceum Ehrend. & Schonb.Tem. (*Rubiaceae*)

B7 Sivas: 13 km west of İmranlı, deep soiled area, 1600 m, 12 vii 1996, ZB 831.

Galium psilophyllum Ehrend. & Schonb.Tem. (*Rubiaceae*)

B6 Sivas: west of Böğrüdelik village, calcareous rocks, 2000m, 14 vii 1996, ZB 935.

*128. *P. schemahensis* Uljan.

Blysmus copressus (L.) Panzer
(Cyperaceae)

B6 Sivas: 10 km from Kangal to Alacahan, meadows, 1400 m, 4 viii 1997, ZB 1845b.

129. *P. scorzonerae* (Schumach) Jacky.

Scorzonera mollis M.Bieb. subsp. *mollis*
(Asteraceae)

B7 Sivas: Divriği, Höbek village, Tülü valley, steppe, 2 vi 1997, ZB 1473.

Scorzonera eriophora DC. (Asteraceae)

B6 Sivas: 33 km from Gürün to Pınarbaşı, south slopes, 1700 m, 19 vii 1998, ZB 2160.

130. *P. silvatica* J. Schröt.

Senecio vernalis Waldst. & Kit.
(Asteraceae)

B6 Sivas: 17 km from Şarkışla to Pınarbaşı, fallow fields, 1600 m, 19 vii 1998, ZB 2224.

131. *P. stipae* Arthur

Salvia euphratica Montbret & Aucher ex Benth
(Lamiaceae)

A6 Sivas: 8 km from Suşehri to Tokat, orchard edge, 700-800 m, 13 vii 1996, ZB 881.

Salvia cryptantha Montbret & Aucher ex Benth
(Lamiaceae)

B6 Sivas: between Gürün and Darende, marl, 1100 m, 11 viii 1996, ZB 967.

Salvia multicaulis Vahl (Lamiaceae)

B6 Sivas: 15 km from Ulaş to Yagdonduran pass, steppe, 1400 m, 14 vii 1996, ZB 928.

Salvia cadmica Boiss. (Lamiaceae)

B7 Sivas: Divriği, 1 km east of Davutoğlu village, steppe 1400-1500 m, 2 vi 1997, ZB 1496.

132. *P. striiformis* Westend var. *dactylidis* Manners.

Dactylis glomerata L. (Poaceae)

A6 Sivas: 10 km north of Sivas, stony slopes, 1600 m, 21 vii 1998, ZB 2443.

133. *P. tanacetii* DC.

Tanacetum argenteum L. subsp. *argenteum* (Asteraceae)

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous rocks, 2000 m, 14 vii 1996, ZB 941.

Tanacetum densum (Lab.) Sch.Bip
(Asteraceae)

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous rocks, 2000 m, 14 vii 1996, ZB 934.

Tanacetum vulgare L. (Asteraceae)

A6 Sivas: 2 km north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1922.

134. *P. taraxaci* (Rebent) Plowr.

Taraxacum bessarabicum (Hornem.)
Hand.Mazz. (Asteraceae)

A6 Sivas: Yıldızeli, Çamlıbel pass, alpine steppe, 1600-1700 m, 13 viii 1996, ZB 1090.

Taraxacum montanum (C.A.May.) DC.
(Asteraceae)

B6 Sivas: Gürün, Gökpınar, steppe, 1500 m, 18 viii 1998, ZB 2089.

135. *P. thesii* (Desv.) Chaillet

Thesium stelleroides Jaub. & Spach
(Santalaceae)

B6 Sivas: west of Sivas, Zübeyde Hanım forest, gypsum, 1400 m, 13 viii 1996, ZB 1102.

Thesium procumbens C.A.Mey.
(Santalaceae)

B6 Sivas: 8 km west of Gürün, marl, 1500 m, 12 viii 1996, ZB 1019; A6 Sivas: Suşehri, Kelkit valley, steppe, 700-800 m, 14 viii 1996, ZB 1170.

Thesium tauricum Boiss. & Hausskn.
(Santalaceae)

B6 Sivas: Divriği, around Yalnızsöğüt village, 1300 m, 4 viii 1997, ZB 1823.

136. *P. tragopogi* (Pers.) G.Winter

Tragopogon aureus Boiss. (Asteraceae)

B6 Sivas: 13 km west of İmranlı, deep soiled area, 1600 m, 12 vii 1996, ZB 837.

137. *P. ziziphorae* P.Syd. & Syd.

Ziziphora clinopodioides Lam.
(Lamiaceae)

B6 Sivas: 13 km west of İmranlı, steppe, 1600 m, 12 vii 1996, ZB 829.

23. 138. *Trachyspora intrusa* (Grev.) Arthur.

Alchemilla holocycla Rothm. (Rosaceae)

A/B6 Sivas: 2 km from Çamlıbel pass to Yıldızeli, 1550 m, 11 vii 1996, ZB 778.

24. *139. *Uromyces aeluropodis-repentis* Natrass

Aeluropus littoralis (Gouan) Parl.
(Poaceae)

B6 Sivas: Bingöl village, halophytic vegetation, 1350 m, 22 ix 1996.

140. *U. anthyllidis* (Grev.) J.Schröz

Dorycnium graecum (L.) Ser. (Fabaceae)

By Sivas: 10 km east of İmranlı, steppe, 1700 m, 12 vii 1996, ZB 840.

Lotus corniculatus L. (Fabaceae)

A6 Sivas: Suşehri, around Ekinözü village, mixed scrub, 1100 m, 15 viii 1996, ZB 1212.

Anthyllis vulneraria L. (Fabaceae)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2410.

141. *U. behenis* (DC.) Unger

Silene vulgaris (Moench) Garcke
(Caryophyllaceae)

A6 Sivas: 6 km from Şerefiye to Karabayır pass, steppe, 1750 m, 15 viii 1996, ZB 1240.

Silene italica (L.) Pers (Caryophyllaceae)

A6 Sivas: north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1933.

*142. *U. cytisi* J. Schröt.

Genista aucheri Boiss. (Fabaceae)

A6 Sivas: Suşehri, 18 km from Akıncılar to Refahiye, steppe 1100 m, 12 vii 1996, ZB 857.

143. *U. dianthi* (Pers.) Niessl

Dianthus strictus Banks & Sol.
(Caryophyllaceae)

B6 Sivas: Gürün, Şugul valley, stony slopes, 1400 m, 2 x 1996, ZB 1432.

Dianthus orientalis Adams
(Caryophyllaceae)

B6 Sivas: around Paşabahçe, gypsum, 1300 m, 5 viii 1997, ZB 1856.

Dianthus floribundus Boiss.
(Caryophyllaceae)

A6 Sivas: 3 km north of Karaçayır, mixed forest, 1600 m, 21 vii 1998, ZB 2466.

144. *U. fabae* (Pers.) de Bary

Vicia cracca L. (*Fabaceae*)

B6 Sivas: 65 km from Şarkışla to Pınarbaşı, 1550 m, 19 vii 1998, ZB 2259.

*145. *U. fischeri-eduardi* Magnus

Vicia cracca L. (*Fabaceae*)

B6 Sivas: 5 km east of Yıldızeli, steppe, 1300-1400 m, 11 vii 1996, ZB 761.

*146. *U. galegicola* Woron.

Galega officinalis L. (*Fabaceae*)

A6 Sivas: Suşehri, 20 km from Akıncılar to Refahiye, 2100 m, 14 viii 1996, ZB 1160.

147. *U. geranii* (DC.) G.H.Ott & Wartm.

Geranium rotundifolium L. (*Geraniaceae*)

B6 Sivas: 10 km north of Sivas, meadows, 4 vi 1997, ZB 1554.

148. *U. glycyrrhizae* (Rabenh) Magnus

Glycyrrhiza echinata L. (*Fabaceae*)

B6 Sivas: Gürün, around Bahçeçi village, garden edge, 1100 m, 14 vii 1996, ZB 919.

149. *U. gypsophilae* Cooke

Gypsophila perfoliata L. (*Caryophyllaceae*)

B6 Sivas: Zara, shore of Tödürge lake, steppe, 1300 m, 14 viii 1996, ZB 1188.

Vaccaria pyramidata Medik. (*Caryophyllaceae*)

B6 Sivas: 60 km from Sivas to Şarkışla, gypsum, 20 vii 1998, ZB 2207.

*150. *U. hedysari-obscuri* (DC.) Carestina & Picc.

Hedysarum pestalozzae Boiss. (*Fabaceae*)

B6 Sivas: Taşlıdere, gypsaceous hills, 1350 m, 22 ix 1996, ZB 1328.

Hedysarum varium Willd. (*Fabaceae*)

B6 Sivas: Taşlıdere, serpentine, 1300-1400 m, 20 vii 1998, ZB 2301.

151. *U. limonii* (DC.) Lev.

Limonium gmelini (Willd.) Kuntze (*Plumbaginaceae*)

A6 Sivas: Suşehri, Tokat road 8 km, garden edge, 700-800 m, 13 vii 1996, ZB 877.

Limonium sp. (*Plumbaginaceae*)

B6 Sivas: Bingöl village, salt marshes, 1300 m, 4 vi 1997, ZB 1582.

152. *U. muscari* Lev.

Hyacinthus orientalis L. (*Liliaceae*)

B7 Sivas: Divriği, Höbek village, Tülü valley, steppe, 2 vi 1997, ZB 1467.

Muscari sp. (*Liliaceae*).

B6 Sivas: between Gürün and Kangal, west of Böğürdelik village, calcareous area, 2000 m, 5 vi 1997, ZB 1601.

153. *U. onobrychidis* (Desm.) Lev.

Onobrychis cappadocica Boiss. (*Fabaceae*)

B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1128.

Onobrychis radiata (Desf.) M.Bieb. (*Fabaceae*)

B6 Sivas: 14 km from Zara to Bolucan, 1400 m, 22 vii 1998, ZB 2539.

154. *U. ononidis* Pass.

Ononis spinosa L. (*Fabaceae*)

B7 Sivas: 10 km east of İmranlı, steppe, 1700 m, 12 vii 1996, ZB 841.

155. *U. polygoni* (Pers.) Focke

Polygonum bellardii All. (*Polygonaceae*)

B6 Sivas: 18 km from Gürün to Kangal, steppe, 1500 m, 4 viii 1997, ZB 1763.

Polygonum arenastrum Bor. (*Polygonaceae*)

A6 Sivas: Şerefiye, Karabayır pass, 1925 m, 15 viii 1996, ZB 1225

156. *U. pisi* (DC.) G.H.Ott

Euphorbia virgata Waldst. & Kit. ex Willd. (*Euphorbiaceae*)

B6 Sivas: Kangal, Alacahan, 2 km east of Yeşildere, steppe, 1550 m, 10 vii 1996, ZB 733.

157. *U. rumicis* (Schumach.) G. Winter

Rumex sp. (*Polygonaceae*)

A6 Sivas: 10 km north of Sivas, stony slopes, 1600 m, 21 vii 1998, ZB 2423.

158. *U. salsolae* Reichardt.

Noaea mucronata (Forssk.) Aschers. & Schweinf. subsp. *mucronata* (*Chenopodiaceae*)

B6 Sivas: Yıldızeli, 2 km east of Karakaya village, steppe, 1300 m, 6 viii 1997, ZB 1944.

*159. *U. scleranthi* Rostr.

Minuartia meyeri (Boiss.) Bornm. (*Caryophyllaceae*)

B6 Sivas: between Gürün and Gökpinar, marl, 1500 m, 18 vii 1998, ZB 2018.

Minuartia hamata (Hausskn.) Mattf. (*Caryophyllaceae*)

B6 Sivas: between Gürün and Gökpinar, marl, 1500 m, 18 vii 1998, ZB 2020

160. *U. striatus* S. Schröt.

Medicago falcata L. (*Fabaceae*)

A6 Sivas: Suşehri, 20 km from Akıncılar to Refahiye, 2100 m, 14 viii 1996, ZB 1162; B6 Sivas: 16 km from Sivas to Karaçayır, fallow fields, 1500 m, 5 viii 1997, ZB 1908.

Medicago x varia Martyn (*Fabaceae*)

B6 Sivas: 13 km from Sivas to Hafik, Seyfebeli, gypsum, 1400 m, 13 viii 1996, ZB 1120.

161. *U. trifolii* (DC.) Lev.

Trifolium alpestre L. (*Fabaceae*)

A/B6 Sivas: 2 km from Çamlıbel pass to Yıldızeli, 1550 m, 11 vii 1996, ZB 771.

Trifolium pratense L. (*Fabaceae*)

A6 Sivas: 10 km from Suşehri to Degirmentaş, meadows, 1250 m, 14 viii 1996, ZB 1205.

Trifolium pannonicum Jacq. subsp. *elongata* (Willd.) Zoh. (*Fabaceae*)

A6 Sivas: 2 km north of Karaçayır, deciduous forest, 1500 m, 5 viii 1997, ZB 1910.

162. *U. tinctoriicola* Magnus.

Euphorbia virgata Waldst. & Kit. ex Willd. (*Euphorbiaceae*)

A6 Sivas: Suşehri, Tokat road, 8 km, garden edge, 700-800 m, 13 vii 1996, ZB 878; B6 Sivas: 8 km west of Gürün, marl, 1500 m, 14 vii 1996, ZB 909.

Euphorbia cardiophylla Boiss. & Heldr. (*Euphorbiaceae*)

B7 Sivas: Divriği, Höbek village, Tülü valley, meadows, 2 vi 1997, ZB 1480.

163. *U. trigonellae* Pass.

Trigonella monantha C.A.Mey.
(*Fabaceae*)

B6 Sivas: 13 km south of Şarkışla, fallow fields, 1550 m, 19 vii 1998, ZB 2269.

*164. *U. verruculosus* J. Schröt.

Silene alba (Miller) Krause
(*Caryophyllaceae*)

B6 Sivas: 3 km west of Yıldızeli, steppe, 1300 m, 13 vii 1996, ZB 890.

Silene italica (L.) Pers (*Caryophyllaceae*)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2416.

*165. *U. viciae-craccae* Const.

Vicia cracca L. (*Fabaceae*)

B6 Sivas: 10 km east of İmranlı, steppe, 1700 m, 12 vii 1996, ZB 839.

Order: USTILAGINALES

Fam.: TILLATIACEAE

25. *166. *Melanotaenium ari* (Cooke) Magnus

Arum euxinum R.Mill (*Araceae*)

B6 Sivas: between Gürün and Kangal, west of Böğrüdelik village, rocky slopes, 2000 m, 5 vi 1997, ZB 1610.

26. 167. *Tilletia controversa* J.G.Kühn

Triticum sp. (*Poaceae*)

B6 Sivas: between Gürün and Gökçınar, marl, 1500 m, 18 vii 1998, ZB 2007.

168. *T. laevia* J.Kuhn

Triticum sp. (*Poaceae*)

B6 Sivas: Suşehri, 18 km Akıncılar to Refahiye, steppe, 1100 m, 12 vii 1996, ZB 855.

Fam.: USTILAGINACEAE

27. 169. *Ustilago avenae* (Pers.) Rostr.

Avena sativa L. (*Poaceae*)

B6 Sivas: around Paşabahçe, gypsum, 1300 m, 5 viii 1997, ZB 1860.

170. *U. hypodytes* (Schldtl) Fr.

Bromus tomentellus Boiss. (*Poaceae*)

B6 Sivas: 3 km from Gürün to Suçatı village, marly hills, 1400 m, 5 vi 1997, ZB 1647.

171. *U. striiformis* (Westend) Niessl

Bromus danthoniae Trin. (*Poaceae*)

B6 Sivas: between Gürün and Darende, steppe, 1100 m, 11 viii 1996, ZB 969.

172. *U. tritici* C.Bauhin

Triticum vulgare Vill. (*Poaceae*)

B6 Sivas: 10 km from Suşehri to Degirmentaş village, fields, 1000 m, 12 vii 1996, ZB 867.

Stipa ehrenbergiana Trin. & Rupr.
(*Poaceae*)

B6 Sivas: 3 km from Gürün to Suçatı village, marly hills, 1400 m, 5 vi 1997, ZB 1650.

Stipa pulcherrima C.Koch (*Poaceae*)

B6 Sivas: 16 km from Kangal to Gürün, steppe, 1450 m, 12 viii 1996, ZB 1059.

*173. *U. williamsii* (Griffiths) Lavrov

Stipa ehrenbergiana Trin. & Rupr.
(*Poaceae*)

B6 Sivas: 3 km from Gürün to Suçatı village, marly hills, 1400 m, 5 vi 1997, ZB 1650.

Stipa pulcherrima C.Koch (*Poaceae*)

B6 Sivas: 16 km from Kangal to Gürün, steppe, 1450 m, 12 viii 1996, ZB 1059.

Subdiv.: DEUTEROMYCOTINA

Class.: COELOMYCETES

Order: MELANCONIALES

Fam.: MELANCONIACEAE

28. 174. *Entemosporium maculatum* Lev.

Cotoneaster nummularia Fisch. & Mey.
(*Rosaceae*)

B6 Sivas: Taşlıdere, Karayolları fountain, serpentine, 1300-1400 m, 20 vii 1998, ZB 2288.

29. *175. *Marssonina delastrei* (Lacroix.) Magnus

Silene vulgaris (Moench) Garcke
(*Caryophyllaceae*)

B7 Sivas: 13 km west of İmranlı, deep soiled area, 1600 m, 12 vii 1996, ZB 830.

Silene swertiifolia Boiss.
(*Caryophyllaceae*)

B6 Sivas: Gürün, Şugul valley, wet places, 1400 m, 6 vi 1997, ZB 1653.

Order: SPHAEROPSIDALES

Fam.: SPHAEROPSIDACEAE

30. *176. *Ascochyta lini* Rostr.

Linum bienne Miller (*Linaceae*)

A/ B6 Sivas: Yıldızeli, Çamlıbel pass, 1700 m, 6 vi 1993, N. Çelik 2316.

31. *177. *Camarosporium vetustum* Ellis & Everh.

Centaurea sp. (*Asteraceae*)

B6 Sivas: Taşlıdere, Karayolları fountain, serpentine, 1300 m, 3 vi 1997, ZB 1538.

32. *178. *Coniothyrium korovinii* Golovin

Lycium anatolicum A.Baytop & R.Mill
(*Solanaceae*)

B6 Sivas: C.U. Campus, steppe, 1200 m, 26 vii 1983, B. Yıldız 3938.

*179. *C. olivaceum* Bonord

Helychirium plicatum DC. (*Asteraceae*)

B6 Sivas: Gürün, Ziyaret pass, calcareous area, 2000-2200 m, 19 vii 1998, ZB 2173.

33. *180. *Diplodia herbarum* (Corda) Lev.

Helychirium plicatum DC. (*Asteraceae*)

B6 Sivas: Gürün, Ziyaret pass, calcareous area, 2000-2200 m, 19 vii 1998, ZB 2173.

34. *181. *Hendersonia grossulariae* Oudem.

Acantholimon venustum Boiss.
(*Plumbaginaceae*)

B6 Sivas: Celalli, Aktaş village, Gürlevik mountain, north slopes, 1500-1700 m. 17 vii 1984, B. Yıldız 4545.

35. *182. *Phoma astragalicola* Hollos

Astragalus sp. (*Fabaceae*)

B6 Sivas: C.U. campus, 1300-1550 m, steppe, 22 vii 1983, N. Çelik 2515.

*183. *P. oleraceae* Sacc. var. *solidaginis*

Chondrilla juncea L. (*Asteraceae*)

B7 Sivas: Divriği, Höbek village, Tülü valley, meadows, 2 vi 1997, ZB 1491.

36. *184. *Phyllosticta punctiformis* Sacc.

Silene italica (L.) Pers (*Caryophyllaceae*)

A6 Sivas: north of Karaçayır village, mixed forest, 1650 m, 21 vii 1998, ZB 2402.

- *185. *Ph. serratulae* Kalymb.
Serratula sp. (*Asteraceae*)
B6 Sivas: Kangal, 2 km west of Çetinkaya, steppe, 1400 m, 4 viii 1997, ZB 1821.
37. 186. *Polystigmia rubra* (Desm.) Sacc.
Prunus divaricata Ledeb. (*Rosaceae*)
B7 Sivas: İmranlı, around Saruhan village, 1900 m, 14 viii 1996, ZB 1155.
Prunus domestica L. (*Rosaceae*)
B6 Sivas: Zara, around Bolucan, steppe, 1500 m, 22 vii 1999, ZB 2514.
38. *187. *Rhabdospora pleosporoides* (Sacc.) Sacc.
Picris sp. (*Asteraceae*)
B6 Sivas: 8 km west of Gürün, marly hills, 6 vi 1997, ZB 1698.
39. *188. *Selenophoma centaurea* Pisareva & Philimonova
Centaurea sp. (*Asteraceae*)
B6 Sivas: Taşlıdere, 1300 m, 3 vi 1997, ZB 1538.
40. *189. *Septoria alliicola* Baumler
Allium scordoprasum (L.) Stearn subsp. *rotundum* (L.) Stearn (*Liliaceae*)
B6 Sivas: Celalli, Aktaş village, above Çağlayan, scree, 1700 m, 7 viii 1983, N. Çelik 2742.
190. *S. digitalidis* Pass.
Digitalis ferruginea L. subsp. *ferruginea* (*Scrophulariaceae*)
B6 Sivas: Ulaş, Şakırağılı village, Quercus scrub, 1700-1800 m, 10 x 1986, N. Çelik 4763.
41. 191. *Tuberculina persicina* (Oitmar) Sacc.
Cirsium arvense (L.) Scop. (*Asteraceae*)
B6 Sivas: between Sivas and Gürün, Sakaltutan, steppe, 1800 m, 5 vi 1997, ZB 1621.
- Class: HYPHOMYCETES
Order: HYPHOMYCETALES
Fam.: MONILIACEAE
42. *192. *Ramularia alatarni* Thum.
- Rhamnus catharticus* L. (*Rhamnaceae*)
A6 Sivas: Yıldız mountain, around Yusufoglan village, 1650 m, 16 vii 1988, Ş. Civelek
193. *R. brunnea* Peck.
Tussilago farfara L. (*Asteraceae*)
B6 Sivas: Ulaş, spring of Tecer brook, water edge, 1350 m, 23 ix 1996, ZB 1338.
- Fam.: DEMATIACEAE
43. 194. *Bispora antennata* (Pers.) E. W. Mason
Centaurea drabifolia Sm. subsp. *cappadica* (DC.) Wagenitz (*Asteraceae*)
B6 Sivas: Celalli, Aktaş, Gürlevik Mountain, south slopes, 2300 m, 8 viii 1984, N. Çelik 2855.
44. 195. *Cladosporium herbarum* (Pers.) Link: S.F. Gray
Picris sp. (*Asteraceae*)
B6 Sivas: 8 km west of Gürün, marly hills, 6 vi 1997, ZB 1698.
Gagea sp. (*Liliaceae*)
B6 Sivas: 18 km from Sivas to Karaçayır, fallow fields 1700 m, 4 vi 1997, ZB 1571.
Sonchus asper (L.) Hill (*Asteraceae*)
A6 Sivas: 10 km from Suşehri to Degirmentaş, fallow fields, 1250 m, 14 viii 1996, ZB 1213.
Gypsophila sp. (*Caryophyllaceae*)
B6 Sivas: 24 km from Sivas to Ulaş, gypsum, 1300 m, 3 vi 1997, ZB 1527
Aethionema cordatum (Desf.) Boiss. (*Brassicaceae*)
B6 Sivas: Hocabay village, Domuzluküçü, 1200 m, 18 v 1983, B. Yıldız 3528.
- *196. *C. macrocarpum* Preuss.
Onopordum turcicum Danin (*Asteraceae*)
B6 Sivas: Gürün, Gökpinar, wet places, 1500 m, 2 x 1996, ZB 1447.
45. *197. *Coniosporium epiphillum* Sacc.
Pilosella piloselloides (Vill.) Sojak (*Asteraceae*)
B6 Sivas: 33 km from Gürün to Pınarbaşı, calcareous slopes, 1600 m, 11 viii 1996, ZB 998
46. *198. *Coniothecium phyllophilum* Desm.
Atraphaxis billardieri Jaub. & Spach var. *billardieri* (*Polygonaceae*)
B6 Sivas: Karasar village, Tecer Da., south slopes, 1800-2000 m, 20 viii 1985, B.Yıldız 6448.
47. *199. *Fusicladium orbiculatum* (Desm.) Thum.
Sorbus torminalis (L.) Crantz (*Rosaceae*)
B6 Sivas: Taşlıdere, Domuzluküçü, mixed scrub, 1300 m, 12 vii 1984, B. Yıldız 4353.
48. 200. *Heterosporium echinulatum* (Berk.) Cooke
Eryngium campestre L. (*Apiaceae*)
B6 Sivas: Bingöl village, steppe, 1350 m, 22 ix 1996, ZB 1292.
49. *201. *Hormiscium antiquum* Sacc.
Polygala anatolica Boiss. & Heldr. (*Polygalaceae*)
B6 Sivas: C.U. campus, 1300-1400 m, steppe, 8 vi 1983, B. Yıldız 3681.
- Subdiv.: ASCOMYCOTINA
Class.: DISCOMYCETES
Order: HELOTIALES
Fam.: DERMEACEAE
50. *Mollisia* (Fr.) P.Karsz.
Picris strigosa M.Bieb. (*Asteraceae*)
A6/B6 Sivas: Yıldızeli: Çamlıbel pass, 1300-1400 m, 11 vii 1996, ZB 774, B. Yıldız.
- Class.: LOCULOASCOMYCETES
Order: DOTHIDEALES
Fam.: DOTHIDEACEAE
51. *Guignardia Viala & Ravaz*
Aethionema armenum Boiss. (*Brassicaceae*)
B6 Sivas: Tecer Mountain Beşgözler, 1700-1900 6 vi 1995, N. Çelik 3606, B. Yıldız.
- Fam.: MELANOMMATAACEAE
52. *Melanomma Nitschke ex Fuckel*
Linum bienne Miller (*Linaceae*)

A6/B6 Sivas: Yıldızeli, Çamlıbel pass,
1700 m, 6 vi 1993, N. Çelik, 2326 B. Yıldız.

Order: PLEOSPORALES

Fam.: PLEOSPORACEAE

53. Leptophaeria Ces. & DeNat.

Aethionema armenum Boiss.
(*Brassicaceae*)

B6 Sivas: Tecer Mountain Beşgözler,
1700-1900, 6 vi 1995, N. Çelik 3606, B.
Yıldız.

Subdiv.: DEOTEROMYCOTINA

Class.: COELOMYCETES

Order: SPHAEROPSIDALES

Fam.: SPHAEROPSIDACEAE

54. Microdiplodia Allesch.

Achillea sp (*Asteraceae*)

B6 Sivas: 18 km from Gürün to Kangal,
steppe, 1500 m. 4 viii 1994, ZB 1765.