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The Bryophyte Flora of Osmaneli (Bilecik/Turkey) District

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Abstract: The present study aimed to identify the moss flora of the Osmaneli (Bilecik) district. As a result of the identification of moss specimens collected from the research area between 2006 and 2009, a total of 90 taxa belonging to 17 families and 38 genera are defined. Of these, twenty-eight taxa are reported for the first time from A1 grid-square and nine taxa are reported for the first time from A2 grid-square in the system adopted by Henderson. *Grimmia lisae* De Not., *Schistidium pruinosum* (Wilson ex Schimp.) G.Roth, *Dialytrichia mucronata* (Brid.) Broth., *Tortula viridifolia* (Mitt.) Blockeel and A.J.E.Sm., *Leskea polycarpa* Hedw., *Pseudoleskeella rupestris* (Berggr.) Hedenas and L. Soderstr. and *Neckera pumila* Hedw. are recorded for the second time from Turkey.

Key words: Bryophyte, flora, Osmaneli (Bilecik), southern Marmara region, Turkey

INTRODUCTION

The study area, Osmaneli is a district of Bilecik in the southern Marmara region, located in the grid-squares A1 and A2, according to the system adopted by Henderson (1961). The area is located at the intersection of the Central Anatolia and the Mediterranean, Marmara and western Black Sea regions and also has some floristic elements belonging to different phytogeographical regions. No study had previously been done on the moss flora of the Osmaneli (Bilecik) district, the area chosen for this study.

The main vegetation types found in the research area are forest, shrub, grass and stream. *Pinus brutia* Ten., *Juniperus excelsa* Bieb., *J. oxycedrus* L., *Quercus pubescens* Willd., *Q. cocciferae* L., *Cistus creticus* L., *Pistacia terebinthus* L., *Crataegus monogyna* Jacq., *Arbutus andrachne* L., *Salix alba* L., *Platanus orientalis* L., *Cornus sanguinea* L., *Rosa canina* L., *Hedera helix* L., *Rubus sanctus* Schreber, *Populus nigra* L., *Juncus* sp., *Carex* sp., *Triticum* sp., *Bromus* sp., *Phleum* sp., *Poa* sp., *Phragmites* sp. and *Typha* sp. are commonly distributed in the vegetation types (Ocak and Tokur, 2000).

Despite a number of studies on vascular plants, with particular reference to Turkey's mosses, recently being initiated, neither the number of researches nor an analogous level of improvement in the research area has been demonstrated. While the investigations of Pteridophyta and Spermatophyta in Turkey have been thoroughly researched in 11 volumes, studies on Bryophyta are still ongoing. Although there has been a

rapid increase in studies carried out in the last 10 years (Tonguc, 2000; Keceli and Cetin, 2000; Ozdemir, 2001; Savaroglu *et al.*, 2001; Uyar and Cetin, 2001; Cetin *et al.*, 2002; Erdag, 2002; Abay and Cetin, 2003; Uyar, 2003; Abay and Ursavaş, 2005; Ezer, 2006; Savaroglu and Tokur, 2006; Uyar and Cetin, 2006; Oren *et al.*, 2007; Uyar *et al.*, 2007; Batan and Ozdemir, 2008; Ezer *et al.*, 2008; Ozdemir and Batan, 2008; Abay and Ursavaş, 2009; Kirmaci and Agcagil, 2009; Kirmaci and Erdag, 2009, 2010; Ozdemir, 2009; Cangul and Ezer, 2010), to date, these studies have only covered a very small percentage of the total surface area of our country.

The aim of this study was to explore the bryophyte flora of Osmaneli (Bilecik). We hope that this study will serve as a valuable contribution to the knowledge of the bryoflora of Turkey and gives a base for future biodiversity and nature conservation surveys.

MATERIALS AND METHODS

Osmaneli is situated between 40° 35' 84" latitude and 30° 01' 34" longitude (Fig. 1). The study area is restricted to Vezirhan in the south (Bilecik), Pamukova and Geyve in the north (Sakarya), Iznik in the west (Bursa), Golpazari in the south-east (Bilecik) and Tarakli in the east (Sakarya).

The climate of the research area was examined using data from the meteorology station in Bilecik. The average rainfall in the area is 436.4 mm a year and the regime type is W. Sp. A.S. The hottest and most arid and hottest month is August, with an average temperature of

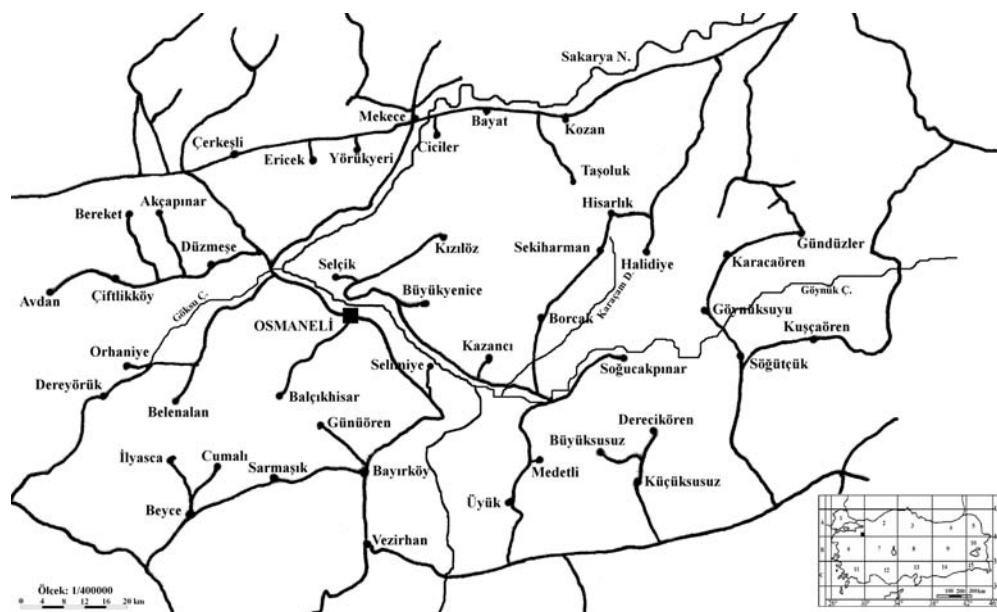


Fig. 1: Map of the study area and the grid system adopted by Henderson for Turkey

21.60°C. The average temperature for the year is 12.30°C. When the climate data was inserted into Emberger's Formula (Akman, 1999) of rain and temperature factors ($Q = 55.9$), the area was determined to be a Mediterranean semi dry climate (Ocak and Tokur, 2000).

The moss samples were collected in different seasons between 2006 and 2009 in the Osmaniye (Bilecik) district. The plant specimens were collected from their habitats using a special spatula. After cleaning, the specimens were preserved in standard collecting envelopes including information of their collection number, substratum, the date of collecting, etc. They were identified with the relevant floras and monographs (Smith, 1980; Crum and Anderson, 1981; Nyholm, 1981; Watson, 1981; Hallingback and Holmasen, 1985; Greven 1995, 2003; Smith, 2004; Kurschner, 2006, 2007).

The latest status of taxa for Turkey was determined by reviewing the relevant literature (Cetin, 1988; Uyar and Cetin, 2004; Kurschner and Erdag, 2005).

Arrangement of taxa in the list follows the system proposed by Hill *et al.* (2006). Information concerning taxa new to the A1 and A2 squares was determined by investigating previous studies of the A1 and A2 square grids (Henderson, 1969; Cetin and Yurdakulol, 1985, 1988; Ozalp, 1995; Cetin, 1999; Keceli and Cetin, 2000; Ozdemir, 2001; Uyar and Cetin, 2001; Cetin *et al.*, 2002; Abay and Cetin, 2003; Uyar, 2003; Abay, 2005; Uyar and Cetin, 2006; Oren *et al.*, 2007; Uyar *et al.*, 2007; Abay and

Ursavaş, 2009; Cangul and Ezer, 2010). Asterisks indicate new records for square A1 (*) and for square A2 (**). Vouchers are deposited in the herbarium of Eskişehir Osmangazi University, Faculty of Science and Arts, Department of Biology.

RESULTS

Bryopsida:

- Encalyptaceae Schimp.
- Encalypta Hedw.

***E. streptocarpa* Hedw.:** A2 Osmaniye (Bilecik): Kazanç village, in the valley, canyon, 218 m, N 40° 20' 08.6", E 030° 12' 46.1", 26.05.2006, on rock, Savaroglu 1090.

Distribution: Turkey (A1, A2, A3, B6, B7, C12, C13), Europe, North America, Northwest Asia.

****E. alpina* Sm.:** A1 Osmaniye (Bilecik): From Egerce-Orhaniye, Ataturk's path, 422 m, N 40° 20' 31.5", E 029° 51' 39.1", 18.05.2006, on rock, Savaroglu 1044.

Distribution: Turkey (A2, A3, A4, B9, C14), Middle Europe, Caucasus, North and Middle Asia, China, North Africa, North America.

E. rhaptocarpa Schwagr.: A2 Osmaneli (Bilecik): Balcikhisar road, 299 m, N 40° 20' 58.0", E 030° 00' 03.1", 04.04.2007, on rock, Savaroglu 1246.

Distribution: Turkey (A1, A2, C11), Europe, Caucasus, Asia, China, North Africa, North America, Iceland.

E. vulgaris Hedw.: A2 Osmaneli (Bilecik): Kozan village, highland, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 189 m, N 40° 26' 45.4", E 030° 07' 48.4", 10.04.2006, on soil, Savaroglu 872; A2: Osmaneli-Kazanci road, in forest, 156 m, N 40° 20' 42.4", E 030° 03' 58.0", 10.04.2006, on soil, Savaroglu 888; A2: Sogucakpinar-Sogutcuik road, canyon, 238 m, N 40° 20' 04.1", E 030° 12' 57.9", 24.04.2006, on rock, Savaroglu 979.

Distribution: Turkey, Cosmopolitan.

- Funariaceae Schwagr.
- Funaria Hedw.

F. hygrometrica Hedw.: A2 Osmaneli (Bilecik): Ciciler village roadside, , 92 m, N 40° 26' 31.5", E 030° 03' 30.3", 10.04.2006, on soil, Savaroglu 863; A2: Mecece-Osmaneli road, in forest, *Pinus nigra*, 160 m, N 40° 25' 13.5", E 030° 01' 25.2", 01.05.2006, on soil, Savaroglu 1001; A1: From Dereyoruk-Orhaniye, 335 m, N 40° 19' 41.9", E 029° 51' 35.7", 26.05.2006, on soil, Savaroglu 1047; A2: Sogucakpinar out village, canyon environment, *Pinus nigra*, 217 m, N 40° 20' 08.3", E 030° 12' 46.0", 11.04.2007, on rock, Savaroglu 1273.

Distribution: Turkey, Cosmopolitan.

- Grimmiaceae Arn.
- Grimmia Hedw.

G. dissimulata E. Maier: A1 Osmaneli (Bilecik): Balcikhisar rural village, 584 m, N 40° 20' 43.4", E 029° 58' 09.0", 01.05.2008, on rock, Savaroglu 1346.

Distribution: Turkey (A1, A2, A4), Europe.

**G. funalis* (Schwagr.) Bruch and Schimp. (*Dryptodon funalis* (Schwagr.) Brid., *G. funalis* var. *calandscens* (Kindb.) H.Möller: A1 Osmaneli (Bilecik): Belenalan village, rocky area, 713 m, N 40° 19' 02.7", E 029° 53' 57.5", 28.02.2007, on rock, Savaroglu 1184.

Distribution: Turkey (A4, A5), Iceland, Caucasus, Himalayas, Japan, China, Algeria, Morocco.

***G. hartmanii* Schimp. (*Dryptodon hartmanii* (Schimp.)

Limpr.: A2 Osmaneli (Bilecik): Kozan village, highland, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 189 m, N 40° 26' 45.4", E 030° 07' 48.4", 10.04.2006, on rock, Savaroglu 870; A1: Belenalan road, forest road, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 161 m, N 40° 21' 09.4", E 029° 55' 46.8", 28.02.2007, on rock, Savaroglu 1178; A1: Vezirhan-Sarmaşik road, forest road, rocks, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 366 m, N 40° 14' 43.3", E 029° 58' 44.1", 15.05.2008, on rock, Savaroglu 1370.

Distribution: Turkey (A4, B6, C11, C12, C13), Europe, Caucasus, North Africa, North America.

**G. lisae* De Not. (*G. retracta* Stirt.): A1 Osmaneli (Bilecik): Vezirhan-Sarmaşik road, marble quarries, forest road, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 378 m, N 40° 14' 37.8", E 029° 59' 35.8", 15.05.2008, on rock, Savaroglu 1352.

Distribution: Turkey (C11), South and Middle Europe, Cyprus, Northwest America, Mexico.

***G. orbicularis* Bruch ex Wilson (*Dryptodon orbicularis* (Bruch ex Wilson) Ochyra and Zarnowiec): A2 Osmaneli (Bilecik): Kayabeli-Cemetery, 101 m, N 40° 15' 33.8", E 030° 05' 06.2", 28.11.2006, on rock, Savaroglu 1154.

Distribution: Turkey (A1, B6, B7, B9, C11, C13, C14), Germany, Poland, Pakistan, ABD, Mexico, Caucasus, Cyprus.

G. pulvinata (Hedw.) Sm. (*D. pulvinatus* (Hedw.) Brid.): A2 Osmaneli (Bilecik): Ciciler village roadside, , 92 m, N 40° 26' 31.5", E 030° 03' 30.3", 10.04.2006, on rock, Savaroglu 858; A1: From Dereyoruk-Belenalan, stream edge, rocks, 194 m, N 40° 17' 30.0", E 029° 50' 35.0", 17.10.2006, on rock, Savaroglu 1141.

Distribution: Turkey, Cosmopolitan.

G. trichophylla Grev. (*D. trichophyllus* (Grev.) Brid.): A2 Osmaneli (Bilecik): From Medetli-Kazanci village, edge of the cemetery, 101 m, N 40° 15' 33.8", E 030° 05' 06.2", 10.04.2006, on rock, Savaroglu 893; A2: Buyukyenic out village, *Pinus nigra*, *Juniperus oxycedrus*, 177 m, N 40° 21' 52.9", E 030° 03' 36.2", 04.04.2007, on rock, Savaroglu 1227; A2: Balcikhisar road, 299 m, N 40° 20' 58.0", E 030° 00' 03.1", 04.04.2007, on soil, Savaroglu 1241.

Distribution: Turkey, Cosmopolitan.

- Schistidium Bruch and Schimp.

***S. confertum (Funck) Bruch and Schimp. (S. apocarpum var. confertum (Funck) H. Möller):** A1 Osmaneli (Bilecik): Belenalan village, rocky area, 713 m, N 40° 19' 02.7", E 029° 53' 57.5", 28.02.2007, on rock, Savaroglu 1183; A2: Buyuksusuz village, 581 m, N 40° 16' 54.6", E 030° 10' 06.9", 21.03.2007, on rock, Savaroglu 1204.

Distribution: Turkey (A2, A4, B6, B8, B9, C13, C14), North Europe, Caucasus, China, North America.

***S. pruinatum (Wilson ex Schimp.) G. Road (Grimmia conferta var. pruinosa (Wilson) Braithw.):** A1 Osmaneli (Bilecik): Belenalan village road, *Pinus nigra*, *P. brutia*, *Arbutus unedo*, *Juniperus oxycedrus* forest area, 138 m, N 40° 21' 41.1", E 029° 55' 22.2", 17.10.2006, on rock, Savaroglu 1120.

Distribution: Turkey (C11), Europe, Iceland, Caucasus.

***S. trichodon (Brid.) Poelt:** A1 Osmaneli (Bilecik): From Duzmeşe-Orhaniye, Goksu river (Avdan), waterfall, rocky, 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.04.2006, on rock, Savaroglu 911; A2: Mekece village road, against the side of Kartalkayasi, edge of the ring road, rocks, 100 m, N 40° 24' 36.5", E 030° 01' 34.5", 10.04.2006, on rock, Savaroglu 851.

Distribution: Turkey (A2, A3, A4), Europe, Sweden, Norway.

- Seligeriaceae Schimp.
- Seligeria Bruch and Schimp.

***S. recurvata (Hedw.) Bruch and Schimp.:** A1 Osmaneli (Bilecik): Belenalan village, rocky area, 713 m, N 40° 19' 02.7", E 029° 53' 57.5", 28.02.2007, on rock, Savaroglu 1190.

Distribution: Turkey (A2, A4), Europe, North Scandinavia, Asia, North America.

- Ditrichaceae Limpr.
- Ditrichum Timm ex Hampe.

***D. cylindricum (Hedw.) Grout.:** A1 Osmaneli (Bilecik): Belenalan village road, *Pinus nigra*, *P. brutia*, *Arbutus unedo*, *Juniperus oxycedrus* forested land, 138 m, N 40° 21' 41.1", E 029° 55' 22.2", 17.10.2006, on rock, Savaroglu 1116.

Distribution: Turkey (A2, A4, B6, B8), Europe, Siberia, Japan, North America, New Zealand.

- Dicranaceae Schimp.
- Dicranum Hedw.

D. scoparium Hedw.: A2 Osmaneli (Bilecik): Kiziloz village future, *Pinus brutia* forest, 558 m, N 40° 24' 07.1", E 030° 06' 54.6", 26.09.2006, on soil, Savaroglu 1111; A1: Vezirhan-Sarmaşık road, forest road, rocks, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 366 m, N 40° 14' 43.3", E 029° 58' 44.1", 15.05.2008, on rock, Savaroglu 1364.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C12), Europe, America, New Zealand, Iceland, Caucasus, North Asia, Japan, North Africa.

- Pottiaceae Schimp.
- Tortella (Lindb.) Limpr.

T. tortuosa (Hedw.) Limpr.: A1 Osmaneli (Bilecik): Belenalan village, forest fire way to, *Pinus nigra*, *P. brutia*, *Quercus* sp., *Juniperus oxycedrus*, 147 m, N 40° 22' 15.2", E 029° 57' 21.7", 27.03.2006, on soil, Savaroglu 818.

Distribution: Turkey, Cosmopolitan.

- Barbula Hedw.

B. convoluta Hedw. (Streblotrichum convolutum (Hedw.) P. Beauv): A1 Osmaneli (Bilecik): Sarmaşık village, edge of the fountain, 480 m, N 40° 16' 39.4", E 029° 57' 51.4", 01.05.2008, in water, on rock, Savaroglu 1337.

Distribution: Turkey (A1, B6, C11, C12, C13), Europe, Caucasus, Siberia, China, Japan, Tunisia, Algeria, North America, Mexico, Australia.

- Diallytrichia (Schimp.) Limpr.

****D. mucronata (Brid.) Broad. (Cinclidotus mucronatus (Brid.) Guim.):** A2 Osmaneli (Bilecik): Kazanci village, in the valley, canyon, water edge, 218 m, N 40° 20' 08.6", E 030° 12' 46.1", 26.05.2006, on soil, Savaroglu 1086; A1: From Duzmeşe-Ciftlikkoy, forest road, stream edge, 156 m, N 40° 22' 22.8", E 029° 54' 32.4", 17.04.2006, in water, on rock, Savaroglu 907; A1: From Duzmeşe-Orhaniye, Goksu river, rocks, 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.10.2006, on rock, Savaroglu 1128.

Distribution: Turkey (B6), Europe, Asia, Algeria.

- Didymodon Hedw.

***D. fallax* (Hedw.) R.H. Zander (*Barbula adriatica* Baumgartner, *Barbula fallax* Hedw.):** A1 Osmaneli (Bilecik): Belenalan village road, *Pinus nigra*, *P. brutia*, *Arbutus unedo*, *Juniperus oxycedrus* forest area, 138 m, N 40° 21' 41.1", E 029° 55' 22.2", 17.10.2006, on tree and on soil, Savaroglu 1118.

Distribution: Turkey (A1, A2, A3, B6, B8, B9, B10, C11, C13), Europe, Iceland, Caucasus, Asia, North Africa, North America.

****D. spadiceus* (Mitt.) Limpr. (*Barbula insidiosa* Jur. and Milde, *Barbula spadicea* (Mitt.) Braithw.):** A1 Osmaneli (Bilecik): Duzmeşe road, agricultural areas, *Pinus nigra*, 128 m, N 40° 23' 10.4", E 029° 56' 46.4", 15.05.2008, on rock, Savaroglu 1385.

Distribution: Turkey (A2, A3, B9, C14), Europe, Caucasus, North Asia, North America.

***D. tophaceus* (Brid.) Lisa (*Barbula tophacea* (Brid.) Mitt.):** A1 Osmaneli (Bilecik): Belenalan village road, forest fire way to, *Pinus nigra*, *P. brutia*, *Quercus* sp., *Juniperus oxycedrus* 147 m, N 40° 22' 15.2", E 029° 57' 21.7", 27.03.2006, on soil, Savaroglu 828; A2: Kucuksusuz village, 589 m, N 40° 16' 40.6", E 030° 11' 19.4", 21.03.2007, on rock, Savaroglu 1206.

Distribution: Turkey (A1, A2, B6, C11, C13), Europe, Iceland, Asia, Africa, America.

- *Syntrichia* Brid.

***S. calcicola* J.J. Amann (*S. densa* (Andlen.) J.P. Frahm, *Tortula calcicolens* W.A.Kramer):** A1 Osmaneli (Bilecik): Vezirhan-Sarmaşık road, marble quarries, forest road, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 378 m, N 40° 14' 37.8", E 029° 59' 35.8", 15.05.2008, on rock, Savaroglu 1356.

Distribution: Turkey (A1, A2, B6), Europe, Africa, Asia, America.

***S. intermedia* Brid. (*Tortula crinita* (De Not.) De Not., *T. intermedia* (Brid.) De Not.):** A1 Osmaneli (Bilecik): Balcikhisar rural village, 584 m, N 40° 20' 43.4", E 029° 58' 09.0", 01.05.2008, on rock, Savaroglu 1343.

Distribution: Turkey (A1, A2, A5, B6, B7, B8, B9, B10, C11, C12, C13, C14), Europe, Asia, Africa, America.

***S. montana* Nees (*S. intermedia* Brid.):** A2 Osmaneli (Bilecik): Kozan village, highland, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 189 m, N 40° 26' 45.4", E 030° 07' 48.4", 10.04.2006, on rock, Savaroglu 875.

Distribution: Turkey (A1, A2, A5, B6, B7, B8, B9, B10, C11, C12, C13, C14), Europe, West Asia, South Africa, North America.

***S. princeps* (De Not.) Mitt. (*Tortula princeps* De Not.):** A2 Osmaneli (Bilecik): Kazanci village, in the valley, canyon, 218 m, N 40° 20' 08.6", E 030° 12' 46.1", 26.05.2006, on rock, Savaroglu 1082; A2: Medetli out village, forest road, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 291 m, N 40° 17' 41.3", E 030° 06' 33.6", 28.11.2006, on rock, Savaroglu 1160.

Distribution: Turkey (A1, A2, B6, B7, C11, C12, C13, C14), Europe, Asia, North and South America, New Zealand.

***S. ruralis* (Hedw.) F. Weber and D. Mohr (*Tortula ruralis* (Hedw.) P. Gaertn., B. Mey. and Scherb.):** A2 Osmaneli (Bilecik): Mekece village road, Against the side of Kartalkayasi, edge of the ring road, rocks, 100 m, N 40° 24' 36.5", E 030° 01' 34.5", 10.04.2006, on rock, Savaroglu 855.

Distribution: Turkey, Cosmopolitan.

- *Tortula* Hedw.

****T. atrovirens* (Sm.) Lindb.:** A1 Osmaneli (Bilecik): From Duzmeşe-Orhaniye, Goksu river, rocks, 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.10.2006, on rock, Savaroglu 1129.

Distribution: Turkey (A4, C11), Cosmopolitan.

*****T. canescens* Mont.:** A2 Osmaneli (Bilecik): Osmaneli-Kazanci road, 156 m, N 40° 20' 42.4", E 030° 03' 58.0", 10.04.2006, on soil, Savaroglu 886.

Distribution: Turkey (A4, C11), Europe, Algeria, Caucasus.

*****T. inermis* (Brid.) Mont. (*S. inermis* (Brid.) Bruch):** A2 Osmaneli (Bilecik): Sogucakpinar-Sogutcuk road, canyon, 238 m, N 40° 20' 04.1", E 030° 12' 57.9", 24.04.2006, on the soil over rock, Savaroglu 978; A2: Buyuksusuz village, 581 m, N 40° 16' 54.6", E 030° 10' 06.9", 21.03.2007, on rock, Savaroglu 1203.

Distribution: Turkey (A1, A3, A4, B6, B7, B8, B9, C11, C12, C13, C14), South-West Asia, Europe, Algeria, North Africa, North and Middle America.

****T. lanceola R.H. Zander (Pottia lanceolata (Hedw.) Müll.Hal.):** A2 Osmaneli (Bilecik): Sogucakpinar-Sogutcu road, canyon, 238 m, N 40° 20' 04.1", E 030° 12' 57.9", 24.04.2006, on soil, Savaroglu 981; A1: Belenalan village road, forest fire way to, *Pinus nigra*, *P. brutia*, *Quercus* sp., *Juniperus oxycedrus* 147 m, N 40° 22' 15.2", E 029° 57' 21.7", 27.03.2006, on soil, Savaroglu 835.

Distribution: Turkey (A1, C11, C14), Europe, North Africa, North America

****T. modica R.H. Zander (Pottia intermedia (Turner) Fürnr.):** A2 Osmaneli (Bilecik): Kozan village, highland, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 189 m, N 40° 26' 45.4", E 030° 07' 48.4", 10.04.2006, on soil, Savaroglu 881; A2: Medetli village forest road, *Pinus nigra*, 193 m, N 40° 20' 33.6", E 030° 04' 28.0", 10.04.2008, on soil, Savaroglu 1334.

Distribution: Turkey (A1, C11), Middle Europe, East Asia, Australia.

T. muralis Hedw.: A2 Osmaneli (Bilecik): Mekece village road, against the side of Kartalkayasi, edge of the ring road, rocks, 100 m, N 40° 24' 36.5", E 030° 01' 34.5", 10.04.2006, on rock, Savaroglu 854.

Distribution: Turkey, Cosmopolitan.

***T. subulata Hedw. var. subinermis (Bruch and Schimp.) Wilson:** A1 Osmaneli (Bilecik): Cerkeşli village, upper part, forest area, *P. sylvestris*, 381 m, N 40° 25' 53.5", E 029° 56' 44.8", 18.05.2006, on soil, Savaroglu 1025.

Distribution: Turkey (A2, C11, C13), Europe, China, Algeria, North America.

T. subulata Hedw. var. subulata: A2 Osmaneli (Bilecik): Osmaneli-ICmeler road, 309 m, N 40° 24' 40.1", E 030° 03' 38.7", 21.03.2007, on soil, Savaroglu 1219; A1: Vezirhan-Sarmaşık road, forest road, 361 m, N 40° 14' 43.4", E 029° 58' 44.6", 02.04.2009, on rock, Savaroglu 1404.

Distribution: Turkey, Cosmopolitan.

T. truncata (Hedw.) Mitt. (Pottia truncata (Hedw.) Bruch and Schimp.): A1 Osmaneli (Bilecik): Vezirhan-Sarmaşık road, forest road, 361 m, N 40° 14' 43.4", E 029° 58' 44.6", 02.04.2009, on soil, Savaroglu 1401.

Distribution: Turkey (A1, C11), Europe, Asia, Algeria, Morocco, North and Middle America, New Zealand.

T. viridifolia (Mitt.) Blockeel and A.J.E. Sm. (Pottia crinita Wilson ex Bruch and Schimp., P. viridifolia Mitt.): A1 Osmaneli (Bilecik): Duzmeşe village, mountainous, 219 m, N 40° 22' 49.8", E 029° 55' 27.1", 17.04.2006, on rock, Savaroglu 900.

Distribution: Turkey (A1), Europe, Israel, Southwest Asia, Algeria, Morocco.

- Orthotrichaceae Arn.
- Orthotrichum Hedw.

O. anomalum Hedw.: A2 Osmaneli (Bilecik): From Uyük-Medetli, 167 m, N 40° 16' 14.4", E 030° 06' 00.9", 01.05.2006, on rock, Savaroglu 982; A1: Belenalan village, rocky area, 713 m, N 40° 19' 02.7", E 029° 53' 57.5", 28.02.2007, on rock, Savaroglu 1194; A2: Sogucakpinar out village, canyon environment, *Pinus nigra*, 217 m, N 40° 20' 08.3", E 030° 12' 46.0", 11.04.2007, on rock, Savaroglu 1257.

Distribution: Turkey (A1, A2, A3, A4, B6, B8, C11, C13), Asia, Middle Europe, North Africa, North and Middle America.

O. cupulatum Hoffm. ex Brid.: A2 Osmaneli (Bilecik): Buyuksusuz village, 581 m, N 40° 16' 54.6", E 030° 10' 06.9", 21.03.2007, on rock, Savaroglu 1205; A1: Duzmeşe cemetery, 204 m, N 40° 23' 05.5", E 029° 56' 09.0", 09.05.2007, on rock, Savaroglu 1304.

Distribution: Turkey (A1, A2, B6, B7, B8, B9, C11, C12, C13, C14, C15), Europe, Iceland, North Asia, North America, North Africa, Australia, New Zealand.

O. rupestre Schleich. ex Schwagr.: A1 Osmaneli (Bilecik): Vezirhan-Sarmaşık road, right side, forest road, 366 m, N 40° 14' 43.3", E 029° 58' 44.1", 15.05.2008, water edge, on rock, Savaroglu 1373.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, B8, C13), Europe, Asia, Northwest America, North and West Africa.

O. affine Schrad. ex Brid. (O. Moroccotigiatum Bruch ex Brid.): A2 Osmaneli (Bilecik): Mekece, highland, 370 m, N 40° 25' 52.2", E 030° 01' 26.7", 01.05.2007, on *Quercus* sp., Savaroglu 1277; A1: Cumali-BalCikhisar road, right side, *Quercus* sp., 753 m, N 40° 17' 26.9", E 029° 55' 59.2", 15.05.2008, on *Quercus* sp., Savaroglu 1382.

Distribution: Turkey (A1, A2, A3, A4, B6, C11), North Europe, Caucasus, Siberia, Middle Asia, North America.

***O. speciosum* Nees (*O. elegans* Auct. Eur. non Schwagr.):** A2 Osmaneli (Bilecik): Mekece-Osmaneli road, *Pinus nigra*, 250 m, N 40° 21' 12.8", E 030° 06' 19.9", 01.05.2007, on *Quercus* sp., Savaroglu 1285.

Distribution: Turkey (A1, A2, B6, C11, C13), Europe, North and Middle Asia, Northwest America.

- Bartramiaceae Schwagr.
- Bartramia Hedw.

***B. pomiformis* Hedw.:** A1 Osmaneli (Bilecik): Vezirhan-Sarmaşık road, right side, forest road, rocks, 366 m, N 40° 14' 43.3", E 029° 58' 44.1", 15.05.2008, on rock and on soil, Savaroglu 1367.

Distribution: Turkey (A1, A4, A5, B6, C11, C14), Europe, Asia, North America, New Zealand, Japan.

- Bryaceae Schwagr.
- Bryum Hedw.

***B. caespiticium* Hedw. (*B. badium* (Brid.) Schimp., *B. comense* Schimp.):** A1 Osmaneli (Bilecik): Vezirhan-Sarmaşık road, marble quarries, forest road, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 378 m, N 40° 14' 37.8", E 029° 59' 35.8", 15.05.2008, on rock, Savaroglu 1355.

Distribution: Turkey Cosmopolitan.

***B. capillare* Hedw. (*B. platyloma* Schwagr.):** A2 Osmaneli (Bilecik): From Buyukyeniye-Kazanci village, forest road, 223 m, N 40° 20' 35.3", E 030° 04' 34.9", 26.05.2006, on soil, Savaroglu 1062; A2: Osmaneli-ICmeler road, 309 m, N 40° 24' 40.1", E 030° 03' 38.7", 21.03.2007, on soil, Savaroglu 1216; A2: Buyukyeniye village environment, 253 m, N 40° 22' 14.0", E 030° 05' 00.2", 04.04.2007, on soil, Savaroglu 1232; A1: Cumali-BalCikhisar road, right side, *Quercus* sp., 753 m, N 40° 17' 26.9", E 029° 55' 59.2", 15.05.2008, on rock, Savaroglu 1378.

Distribution: Turkey, Cosmopolitan.

****B. creberrimum* Taylor (*B. affine* F.W. Schultz non J.F.Gmel. ex Broad., *B. cuspidatum* (Bruch and Schimp.) Schimp., *B. lisae* De Not.):** A1 Osmaneli (Bilecik): Duzmeşe road, agricultural areas, *Pinus nigra*, 128 m, N 40° 23' 10.4", E 029° 56' 46.4", 15.05.2008, on soil, Savaroglu 1388.

Distribution: Turkey (A2, A4, B6, B8, B9, C11, C13), Europe, North Asia, North America, Australia, New Zealand.

***B. imbricatum* (Schwagr.) Bruch and Schimp. (*B. amblyodon* Müll. Hal., *B. inclinatum* (Brid.) Blandow, *B. stenotrichum* Müll. Hal.):** A2 Osmaneli (Bilecik): Vezirhan-Golpazari road, Kayabeli village, *Pinus nigra* forest, 211 m, N 40° 14' 31.4", E 030° 02' 25.4", 24.04.2006, on soil, Savaroglu 948.

Distribution: Turkey (A2, A4), Europe, Asia, North Africa, North America, Australia.

****B. intermedium* (Brid.) Blandow (*B. nitidulum* Lindb.):** A1 Osmaneli (Bilecik): From Duzmeşe-Orhaniye, Goksu river, Waterfall, rocky region, 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.04.2006, on rock, Savaroglu 916.

Distribution: Turkey (C11, C12), Europe, Asia, North Africa, North America, Australia.

***B. pallescens* Schleich. ex Schwagr. (*B. lonchocaulon* Müll. Hal., *B. obconicum* Hornsch. ex Bruch and Schimp.):** A2 Osmaneli (Bilecik): Sogucakpinar village Cikişi, canyon environment, *Pinus nigra*, 217 m, N 40° 20' 08.3", E 030° 12' 46.0", 11.04.2007, on rock, Savaroglu 1271.

Distribution: Turkey (A1, A2, A4, B6, B8, C11, C12), Europe, Iceland, Caucasus, Asia, America.

- Plagiomniaceae T.J. Kop
- Plagiomnium T.J. Kop

****P. cuspidatum* (Hedw.) T.J.Kop:** A1 Osmaneli (Bilecik): Duzmeşe road, agricultural areas, *Pinus nigra*, 128 m, N 40° 23' 10.4", E 029° 56' 46.4", 15.05.2008, on rock, Savaroglu 1384.

Distribution: Turkey (A2, A4, B6), Europe, Asia, North America.

***P. affine* (Blandow ex Funck) T.J.Kop:** A1 Osmaneli (Bilecik): From Duzmeşe-Orhaniye village, Goksuriverside, rocks, 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.10.2006, on rock, Savaroglu 1125; A1: Belenalan village road, forest road, *Pinus nigra*, *P. brutia*, *Quercus* sp., *Juniperus oxycedrus* 347 m, N 40° 20' 35.5", E 029° 55' 12.4", 10.04.2008, on rock, Savaroglu 1320.

Distribution: Turkey (A1, A2, A4, B6, B8), Europe, West Russia, Iran.

***P. elatum* (Bruch and Schimp.) T.J. Kop:** A2 Osmaneli (Bilecik): BalCikhisar village Cevresi, 363 m, N 40° 19' 52.6", E 030° 00' 35.8", 04.04.2007, on rock, Savaroglu 1250.

Distribution: Turkey (A2, A3, A4), Europe, Iceland, Asia.

***P. medium* (Bruch and Schimp.) T.J. Kop:** A2 Osmaneli (Bilecik): Kazanci village, in the valley, canyon, water edge, 218 m, N 40° 20' 08.6", E 030° 12' 46.1", 26.05.2006, on soil, Savaroglu 1089.

Distribution: Turkey (A2, B6), Europe, Iceland, Caucasus, Japan, Morocco, North America,

***P. undulatum* (Hedw.) T.J. Kop:** A1 Osmaneli (Bilecik): From Duzmeşe-Orhaniye village, Goksu riverside, rocks, *Populus* sp., *Pinus nigra*, *Platanus* sp., 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.10.2006, on rock, Savaroglu 1132.

Distribution: Turkey (A1, A2, A3, A4, B6, C11, C13), Asia, Northwest Africa, North Europe, Iceland, Caucasus, Japan, Southwest Asia.

- Amblystegiaceae Kindb.
- Amblystegium Schimp.

***A. serpens* (Hedw.) Schimp. (*A. juratzkanum* Schimp.):** A2 Osmaneli (Bilecik): Buyuksusuz village, 581 m, N 40° 16' 54.6", E 030° 10' 06.9", 21.03.2007, on *Quercus* sp., Savaroglu 1202.

Distribution: Turkey (A1, A2, A3, A4, B6, B7, B8, C11, C12), Europe, Iceland, Japan, North America, Middle Asia, Mexico, New Zealand.

- Hygroamblystegium Loeske

***H. tenax* (Hedw.) Jenn. (*Amblystegium tenax* (Hedw.) C.E.O.Jensen):** A1 Osmaneli (Bilecik): Sarmaşık village, edge of the fountain, 480 m, N 40° 16' 39.4", E 029° 57' 51.4", 01.05.2008, in water, on rock, Savaroglu 1338.

Distribution: Turkey (A1, A2, A4, B6, B8, B9, C11, C13), Iceland, Caucasus, Siberia, Algeria, Morocco, North America.

****H. varium* (Hedw.) Mönk. (*Amblystegium varium* (Hedw.) Lindb.):** A1 Osmaneli (Bilecik): Vezirhan-Sarmaşık road, right side, forest road, 366 m, N 40° 14' 43.3", E 029° 58' 44.1", 15.05.2008, water edge, on rock, OREN 66/08.

Distribution: Turkey (A2, A3, A4, B6, C11), Europe, Asia, Caucasus, Iran, Siberia, China, Morocco, North America, Mexico.

- Leskeaceae Schimp.
- Lescurea Schimp.

****L. saxicola* (Schimp.) Molendo:** A1 Osmaneli (Bilecik): Avdan village, 430 m, N 40° 22' 24.4", E 029° 45' 34.6", 17.04.2006, in water, on rock, Savaroglu 936.

Distribution: Turkey (A4, A5, C13), Europe, Caucasus, North and Middle Asia, North America.

- Leskea Hedw.

****L. polycarpa* Hedw.:** A1 Osmaneli (Bilecik): From Dereyörük-Belenalan, stream edge, rocks, 194 m, N 40° 17' 30.0", E 029° 50' 35.0", 17.10.2006, on tree, Savaroglu 1142.

Distribution: Turkey (A2), Middle Europe, Caucasus, Middle Asia, North America.

- Pseudoleskeella Kindb.

*****P. rupestris* (Berggr.) Hedenas and L. Soderstr. (*P. nervosa* var. *rupestris* (Berggr.) Nyholm, *P. sibirica* (Arnell) P.S.Wilson and D.H.Norris):** A2 Osmaneli (Bilecik): Medetli-Osmaneli road, Sakarya riverside, rocks, *Pinus nigra*, 106 m, N 40° 17' 25.3", E 030° 03' 15.2", 24.04.2006, on rock, Savaroglu 966.

Distribution: Turkey, Finland, France, Germany, Italy, Poland, Switzerland, Spain, North America.

- Brachytheciaceae Schimp.
- Pseudoscleropodium (Limpr.) M. Fleisch.

****P. purum* (Hedw.) M.Fleisch. (*S. purum* (Hedw.) Limpr.):** A1 Osmaneli (Bilecik): Cerkeşli village, upper part, forest area, *P. sylvestris*, 381 m, N 40° 25' 53.5", E 029° 56' 44.8", 18.05.2006, on rock, Savaroglu 1012; A1: Orhaniye village, Atatürk's path, 504 m, N 40° 20' 05.9", E 029° 51' 54.7", 17.10.2006, on soil, Savaroglu 1133; A2: Osmaneli-Medetli-İCmeler road, 96 m, N 40° 24' 13.3", E 030° 00' 19.8", 28.11.2006, on soil, Savaroglu 1166.

Distribution: Turkey (A2, A3, A4, B6), Middle Europe, Asia, North America.

- Eurhynchium Schimp.

***E. pulchellum* (Hedw.) Jenn.:** A1 Osmaneli (Bilecik): Belenalan, forest road, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 161 m, N 40° 21' 09.4", E 029° 55' 46.8", 28.02.2007, on soil, Savaroglu 1173.

Distribution: Turkey (A1, A2, A4, A5, B6, B8, B10), Europe, North and South America, Asia, Japan.

- Rhynchostegium Schimp.

R. megapolitanum (Blandow ex F.Weber and D.Mohr):

A2 Osmaneli (Bilecik): Medetli village forest road, *Pinus nigra*, 193 m, N 40° 20' 33.6", E 030° 04' 28.0", 10.04.2008, on soil, Savaroglu 1332.

Distribution: Turkey (A1, A2, B6, C11, C12), Europe, Iran, Syria, Lebanon, Algeria, Morocco, Asia, North Africa.

- Cirriphyllum Grout

***C. piliferum (Hedw.) Grout:** A1 Osmaneli (Bilecik):

Vezirhan-Sarmaşık road, right side, forest road, 366 m, N 40° 14' 43.3", E 029° 58' 44.1", 15.05.2008, water edge, on rock, Savaroglu 1377.

Distribution: Turkey (A2, A3, A4, C11), Europe, Iceland, Caucasus, Iran, North and Middle Asia, North Africa, Japan, Algeria, Morocco, North America.

- Oxyrrhynchium (Schimp.) Warnst.

O. hians (Hedw.) Loeske (Eurhynchium hians (Hedw.)

Sande Lac., O. swartzii (Turner) Warnst.): A2 Osmaneli (Bilecik): Sogucakpinar village, forest road, 290 m, N 40° 20' 52.3", E 030° 05' 56.4", 26.05.2006, on soil, Savaroglu 1066; A2: Medetli village forest road, *Pinus nigra*, 193 m, N 40° 20' 33.6", E 030° 04' 28.0", 10.04.2008, on tree, Savaroglu 1333.

Distribution: Turkey (A1, A2, A3, A4, B6, C11, C12, C13), Middle Europe, Iceland, Caucasus, Middle Asia, Japan, Algeria, North America.

O. schleicheri (R.Hedw.) Röhl (Eurhynchium schleicheri

(R.Hedw.) Milde): A2 Osmaneli (Bilecik): Ciciler village forest road, 116 m, N 40° 26' 15.4", E 030° 03' 20.6", 02.04.2009, on soil, Savaroglu 1410.

Distribution: Turkey (A1, A2, B6, C11), Europe, Asia, Africa.

- Kindbergia Ochyra

K. praelonga (Hedw.) Ochyra (Eurhynchium praelongum (Hedw.) Schimp.): A1 Osmaneli (Bilecik):

Osmaneli-Iznik turnoff, roadside, scrub, 108 m, N 40° 22' 29.5", E 029° 58' 24.5", 01.05.2006, on soil, Savaroglu 1009.

Distribution: Turkey (A1, A2, A3, A4, B6, B8, C11), Europe, North Asia, China, Japan, North Africa, North America.

- Sciuro-hypnum Hampe

S. populeum (Hedw.) Ignatov and Huttunen

(Brachythecium populeum (Hedw.) Schimp.): A2

Osmaneli (Bilecik): Medetli village forest road, *Pinus nigra*, 185 m, N 40° 18' 08.8", E 030° 06' 11.9", 24.04.2006, under the tree, on soil, Savaroglu 959; A1: Belenalan village, Goksu river, waterfall road, 170 m, N 40° 21' 09.1", E 029° 55' 47.1", 25.07.2006, on soil, Savaroglu 1103; A2: KuCukusuz village future, 117 m, N 40° 26' 16.0", E 030° 03' 19.4", 21.03.2007, on soil, Savaroglu 1214.

Distribution: Turkey (A1, A2, A4, B6, B7), Middle Europe, Iceland, Caucasus, Iran, North Asia, Japan, Algeria, Morocco, North America.

- Brachythecium Schimp.

****B. campestre (Müll.Hal.) Schimp. (B. ryanii Kaurin):**

A2 Osmaneli (Bilecik): Vezihran-Golpazari road, Kayabeli village, *Pinus nigra* forest, 211 m, N 40° 14' 31.4", E 030° 02' 25.4", 24.04.2006, under *Cedrus* sp., Savaroglu 954.

Distribution: Turkey (A1, B6, C11), Afghanistan, Iran.

***B. glareosum (Bruch ex Spruce) Schimp.:** A1 Osmaneli

(Bilecik): Vezihran-Sarmaşık road, marble quarries, forest road, *Pinus nigra*, *Quercus* sp., *Juniperus oxycedrus*, 378 m, N 40° 14' 37.8", E 029° 59' 35.8", 15.05.2008, on rock, Savaroglu 1358.

Distribution: Turkey (A2, A3, A4, B6, B8), Europe, North America, North Asia.

B. rutabulum (Hedw.) Schimp.: A2 Osmaneli (Bilecik):

Mekece-Osmaneli road, rocks, 93 m, N 40° 24' 58.7", E 030° 01' 51.5", 01.05.2007, on soil, Savaroglu 1281.

Distribution: Turkey (A1, A2, A3, A4, B6, B8, C11, C14), Europe, Asia, North America, Australia.

B. trachypodium (Brid.) Schimp.: A1 Osmaneli (Bilecik):

BalCikhisar rural village, 584 m, N 40° 20' 43.4", E 029° 58' 09.0", 01.05.2008, on rock, Savaroglu 1345.

Distribution: Turkey (A1, A2, B8, B10), Caucasus, Afghanistan, Siberia, Algeria, Canada.

- Scleropodium bruch and Schimp.

***S. cespitans (Wilson ex Müll.Hal.) L.F. Koch (Brachythecium appleyardiae McAdam and A.J.E.Sm.):**

A1 Osmaneli (Bilecik): Belenalan village, forest road, *Pinus nigra*, *P. brutia*, *Quercus* sp., *Juniperus oxycedrus* 347 m, N 40° 20' 35.5", E 029° 55' 12.4", 10.04.2008, on soil, Savaroglu 1325.

Distribution: Turkey (A2, B6, C11), Belgium, France, Italy, Netherlands, Portugal, Spain, North America.

- Homalothecium Schimp.

H. lutescens (Hedw.) H.Rob. (Camptothecium lutescens (Hedw.) Schimp.):

A2 Osmaneli (Bilecik): From Medetli-Kazanci village, edge of the cemetery, 101 m, N 40° 15' 33.8", E 030° 05' 06.2", 10.04.2006, on rock, Savaroglu 891; A1: From Duzmeşe-Ciftlikkoy, forest road, stream edge, 156 m, N 40° 22' 22.8", E 029° 54' 32.4", 17.04.2006, on *Fagus* sp., Savaroglu 904; A1: From Egerce-Orhaniye, Atatürk's path, 422 m, N 40° 20' 31.5", E 029° 51' 39.1", 18.05.2006, on *Quercus* sp., Savaroglu 1036.

Distribution: Turkey (A1, A2, A3, B6, B7, C11, C12, C13), Europe, Iceland, Caucasus, Iran, Morocco.

H. sericeum (Hedw.) Schimp.:

A1 Osmaneli (Bilecik): Avdan village, Egerce Castle, 280 m, N 40° 20' 17.7", E 029° 52' 17.9", 17.04.2006, on rock, Savaroglu 928; A1: Belenalan village road, *Pinus nigra*, *P. brutia*, in forest, 331 m, N 40° 20' 40.7", E 029° 55' 04.3", 25.07.2006, on rock, Savaroglu 1096; A2: Kayabeli-Cemetery, 101 m, N 40° 15' 33.8", E 030° 05' 06.2", 28.11.2006, on rock, Savaroglu 1157; A2: Buyukyeniçe village, 146 m, N 40° 21' 40.8", E 030° 03' 57.5", 04.04.2007, on tree, Savaroglu 1234.

Distribution: Turkey, Cosmopolitan.

- Hypnaceae Schimp.
- Platygirium Schimp.

***P. repens (Brid.) Schimp.:** A1 Osmaneli (Bilecik) From Avdan-Ciftlikkoy, *Pinus nigra*, *Juniperus oxycedrus*, 573 m, N 40° 22' 33.1", E 029° 50' 26.9", 17.04.2006, on *P. nigra*, Savaroglu 941.

Distribution: Turkey (A2, B6), Europe, Asia, North America.

- Hypnum Hedw.

H. cupressiforme Hedw. var. cupressiforme: A1 Osmaneli (Bilecik): Duzmeşe out village, 156 m, N 40° 22' 37.8", E 029° 54' 54.4", 24.04.2006, on *Platanus* sp., Savaroglu 974; A2: KuCukusuz village future, 117 m, N 40° 26' 16.0", E 030° 03' 19.4", 21.03.2007, on rock, Savaroglu 1212; A2: Medetli road, 108 m, N 40° 19' 32.8", E 030° 06' 10.9", 01.05.2008, on tree, Savaroglu 1348.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C13), Cosmopolitan.

H. cupressiforme Hedw. var. lacunosum Brid.

(H. cupressiforme subsp. lacunosum (Brid.) Bertsch, H. lacunosum (Brid.) Hoffm. Ex Brid.):

A2 Osmaneli (Bilecik): Osmaneli-Kazanci road, in forest, 156 m, N 40° 20' 42.4", E 030° 03' 58.0", 10.04.2006, on soil, Savaroglu 884; A1: From Avdan-Ciftlikkoy, *Pinus nigra*, *Juniperus oxycedrus*, 573 m, N 40° 22' 33.1", E 029° 50' 26.9", 17.04.2006, on *P. nigra*, Savaroglu 939.

Distribution: Turkey (A1, A2, A3, A4, B6, B7, C11, C12), Europe, North America, Caucasus, South Africa, Australia, New Zealand.

H. cupressiforme Hedw. var. resupinatum (Taylor) Schimp. (H. cupressiforme subsp. resupinatum (Taylor) Hartm., H. resupinatum Taylor):

A2 Osmaneli (Bilecik): Mekece-Osmaneli road, in forest, *Pinus nigra*, 160 m, N 40° 25' 13.5", E 030° 01' 25.2", 01.05.2006, on tree, Savaroglu 1003.

Distribution: Turkey (A1, A2, A4, B6, C11), Europe, North America, Cyprus.

***H. imponens Hedw.:** A1 Osmaneli (Bilecik): Belenalan village road, forest fire way to, *Pinus nigra*, *P. brutia*, *Quercus* sp., *Juniperus oxycedrus*, 147 m, N 40° 22' 15.2", E 029° 57' 21.7", 27.03.2006, on rock, Savaroglu 838; A1: From Dereyörük-Orhaniye, 335 m, N 40° 19' 41.9", E 029° 51' 35.7", 26.05.2006, on soil, Savaroglu 1056; A2: Sogucakpinar village, forest road, 290 m, N 40° 20' 52.3", E 030° 05' 56.4", 26.05.2006, on rock, Savaroglu 1068.

Distribution: Turkey (A2, A3), Europe, Middle Asia, Switzerland, Iceland, Japan, North America.

***H. jutlandicum Holmen and E. Warncke**

(H. cupressiforme var. ericetorum Schimp.):

A1 Osmaneli (Bilecik): Beyce entry, stream edge, *Populus* sp. 324 m, N 40° 13' 43.7", E 029° 56' 59.1", 16.10.2008, on tree, Savaroglu 1396; A2: Buyukyeniçe village environment,

253 m, N 40° 22' 14.0", E 030° 05' 00.2", 04.04.2007, on soil, Savaroglu 1233.

Distribution: Turkey (A2, A4, B7, C11), Middle Europe, Algeria, Iceland, North America, Asia, Caucasus.

***H. vaucheri Lesq. (Stereodon vaucheri (Lesq.) Lindb. ex Broad.):** A1 Osmaneli (Bilecik): From Avdan-Ciftlikkoy, *Pinus nigra*, *Juniperus oxycedrus*, 573 m, N 40° 22' 33.1", E 029° 50' 26.9", 17.04.2006, on tree, Savaroglu 937.

Distribution: Turkey (A2, A4, B8, B10, C15), Europe, Asia, North America.

- Leucodontaceae Schimp.
- Leucodon Schwagr.

L. sciuroides (Hedw.) Schwagr: A1 Osmaneli (Bilecik): Cumali-BalCikhisar road, right side, *Quercus* sp., 753 m, N 40° 17' 26.9", E 029° 55' 59.2", 15.05.2008, on rock, Savaroglu 1381.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C12, C13), Europe, Asia, Iceland.

- Pterogonium Sw.

P. gracile (Hedw.) Sm.: A1 Osmaneli (Bilecik): From Egerce-Orhaniye, Atatürk's path, 422 m, N 40° 20' 31.5", E 029° 51' 39.1", 18.05.2006, on rock, Savaroglu 1037; A1: Belenalan village road, *Pinus nigra*, *P. brutia*, in forest, 331 m, N 40° 20' 40.7", E 029° 55' 04.3", 25.07.2006, on rock, Savaroglu 1094; A1: From Duzmeşe-Orhaniye village, Goksu riverside, rocks, 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.10.2006, on rock, Savaroglu 1127.

Distribution: Turkey (A1, A4, B6, C11, C12, C13), Europe, Africa, North America.

- Neckeraceae Schimp.
- Neckera Hedw.

***N. besseri (Lobarz.) Jur. (Homalia besseri Lobarz.):** A1 Osmaneli (Bilecik): Duzmeşe waterfall, rocks, 122 m, N 40° 21' 28.4", E 029° 54' 44.9", 09.05.2007, on rock, Savaroglu 1309.

Distribution: Turkey (A2, C12), Europe, Caucasus.

N. complanata (Hedw.) Huebener (H. complanata (Hedw.) De Not.: A1 Osmaneli (Bilecik): From Duzmeşe-Orhaniye village, Goksu riverside, rocks, *Populus* sp.,

Pinus nigra, *Platanus* sp., 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.10.2006, on tree, Savaroglu 1124; A1: Duzmeşe road, agricultural areas, *Pinus nigra*, 128 m, N 40° 23' 10.4", E 029° 56' 46.4", 15.05.2008, on rock, Savaroglu 1386.

Distribution: Turkey (A1, A2, A3, A4, B6, C13), Middle Europe, Caucasus, Iran, Algeria, Middle Africa, North America.

***N. pumila Hedw. (N. fontinaloides Lindb.):** A1 Osmaneli (Bilecik): Belenalan village, Goksu river, waterfall road, 170 m, N 40° 21' 09.1", E 029° 55' 47.1", 25.07.2006, on *Platanus* sp., Savaroglu 1102.

Distribution: Turkey (A2), Middle Europe, Canary Islands.

- Leptodon D. Mohr

***L. smithii (Hedw.) F. Weber and D.Mohr:** A1 Osmaneli (Bilecik): From Duzmeşe-Orhaniye, Goksu river, Waterfall, rocky region, 96 m, N 40° 21' 07.2", E 029° 54' 08.4", 17.04.2006, on rock, Savaroglu 927; A1: Duzmeşe waterfall, rocks, 122 m, N 40° 21' 28.4", E 029° 54' 44.9", 09.05.2007, on rock, Savaroglu 1310.

Distribution: Turkey (B6, C11, C12, C13), Europe, Middle East, North Africa, South America, Australia, New Zealand.

DISCUSSION

As a result of the study, 90 moss taxa belonging to 17 families and 38 genera have been found in the area. Among them, 28 taxa (*Encalypta alpina*, *Grimmia funalis*, *G. lisae*, *Schistidium confertum*, *S. pruinosum*, *S. trichodon*, *Seligeria recurvata*, *Ditrichum cylindricum*, *Didymodon spadiceus*, *Tortula atrovirens*, *T. subulata* var. *subinermis*, *Bryum creberrimum*, *B. intermedium*, *Plagiomnium cuspidatum*, *Hygroamblystegium varium*, *Lescuraea saxicola*, *Leskea polycarpa*, *Pseudoscleropodium purum*, *Cirriphyllum piliferum*, *Brachythecium glareosum*, *Scleropodium cespitans*, *Platygyrium repens*, *Hypnum imponens*, *H. jutlandicum*, *H. vaucheri*, *Neckera besseri*, *N. pumila* and *Leptodon smithii*) represent new records for the A1 square and 9 taxa (*Grimmia hartmanii*, *G. orbicularis*, *Dialytrichia mucronata*, *Tortula canescens*, *T. inermis*, *T. lanceola*, *T. modica*, *Pseudoleskeella rupestris* and *Brachythecium campestre*) represent new records for the A2 square according to the Henderson (1961) grid system.

Table 1: The distribution and percentages of the taxa according to the families

Families	No. of taxa	Rate (%)
Pottiaceae (A)	21	23.33
Brachytheciaceae (P)	15	16.66
Grimmiaceae (A)	10	11.11
Hypnaceae (P)	7	7.77
Bryaceae (A)	6	6.66
Orthotrichaceae (A)	5	5.55
Plagiomniaceae (P)	5	5.55
Encalyptaceae (A)	4	4.44
Neckeraceae (P)	4	4.44
Amblystegiaceae (P)	3	3.33
Leskeaceae (P)	3	3.33
Leucodontaceae (P)	2	2.22
Funariaceae (A)	1	1.11
Ditrichaceae (A)	1	1.11
Dicranaceae (A)	1	1.11
Bartramiaceae (A)	1	1.11
Seligeriaceae (A)	1	1.11
Total: 17	90	0.100

A: Akrocarpous, P: Pleurocarpous

Table 2: The distribution and percentages of the taxa according to the genera

Genera	No. of taxa	Rate (%)
<i>Tortula</i>	10	11.11
<i>Grimmia</i>	7	7.77
<i>Bryum</i>	6	6.66
<i>Hypnum</i>	6	6.66
<i>Syntrichia</i>	5	5.55
<i>Orthotrichum</i>	5	5.55
<i>Plagiomnium</i>	5	5.55
<i>Encalypta</i>	4	4.44
<i>Brachythecium</i>	4	4.44
<i>Schistidium</i>	3	3.33
<i>Didymodon</i>	3	3.33
<i>Neckera</i>	3	3.33
<i>Hygroamblystegium</i>	2	2.22
<i>Oxyrrhynchium</i>	2	2.22
<i>Homalothecium</i>	2	2.22
<i>Funaria</i>	1	1.11
<i>Seligeria</i>	1	1.11
<i>Ditrichum</i>	1	1.11
<i>Dicranum</i>	1	1.11
<i>Tortella</i>	1	1.11
<i>Barbula</i>	1	1.11
<i>Dialytrichia</i>	1	1.11
<i>Bartramia</i>	1	1.11
<i>Amblystegium</i>	1	1.11
<i>Lescuræa</i>	1	1.11
<i>Leskea</i>	1	1.11
<i>Pseudoleskeella</i>	1	1.11
<i>Pseudoscleropodium</i>	1	1.11
<i>Eurhynchium</i>	1	1.11
<i>Rhynchostegium</i>	1	1.11
<i>Cirriophyllum</i>	1	1.11
<i>Kindbergia</i>	1	1.11
<i>Sciuro-hypnum</i>	1	1.11
<i>Scleropodium</i>	1	1.11
<i>Platygyrium</i>	1	1.11
<i>Leucodon</i>	1	1.11
<i>Pterogonium</i>	1	1.11
<i>Leptodon</i>	1	1.11
Total: 38	90	100.00

As a result of research in the territory of the study area, we can say that mosses made up an important portion of our flora, containing mainly taxa with a

Table 3: Comparison of taxa count and distribution percentage of families between the study area and the other studies in A1 square

Largest families	Osmaneli (Bilecik)		Uludağ (Bursa)		Erdek, Bandırma, Manyas (Balıkesir)	
	ts	%	ts	%	ts	%
Pottiaceae (A)	21	23.33	10	11.8	20	14.9
Brachytheciaceae (P)	15	16.66	10	11.8	23	17.2
Grimmiaceae (A)	10	11.11	11	12.9	8	6.0
Hypnaceae (P)	7	7.77	2	2.4	6	4.5
Bryaceae (A)	6	6.66	8	9.5	7	5.2
Orthotrichaceae (A)	5	5.55	5	5.9	7	5.2
Plagiomniaceae (P)	5	5.55	4	4.7	3	2.2

ts: No. of taxa, A: Acrocarpous, P: Pleurocarpous

water-wise character. For this reason, the dominant group of the arid areas, the acrocarpous Pottiaceae family, took first place with 21 taxa. The pleurocarpous Brachytheciaceae family followed with 15 taxa, Grimmiaceae with 10 taxa, Hypnaceae with 7 taxa, Bryaceae with 6 taxa, and finally the Orthotrichaceae and Plagiomniaceae families with 5 taxa each. The taxa of the Pottiaceae, Brachytheciaceae, Grimmiaceae, Hypnaceae, Bryaceae, Orthotrichaceae and Plagiomniaceae families found within the area of the study constituted 76.63% of the total taxa, and the remaining 10 families contained 23.37% (Table 1).

During the study, it was noted that acrocarpous mosses, despite living in arid habitats under the effect of continuous exposure to the sun, the drying effect of the wind and being situated during droughts, manage to survive. However, in habitats having plenty of water and where the air relative humidity is higher, pleurocarp is the dominant moss. In terms of all of the families found within the research area, 10 mosses belonged to the acrocarp group and 7 to the pleurocarp group. In terms of the taxa, 56.66% (51 taxa) of the total taxa in the rainy Osmaneli (Bilecik) region were from the arid and hot dominant acrocarp mosses group and 43.33% (39 taxa) were from the group possessing rainy climate characteristics, pleurocarp mosses. Given that the transitional features of the climate in the region show that the regional climate falls between the temperate climate of the Marmara Region and the continental climate of the Central Anatolia region, this type of Acrocarp/Pleurocarp ratio occurs (Table 1).

Since acrocarpous species have quill-edges leaves and grow in cushion form, they can endure longer periods of heat and dryness better than pleurocarpous species. Pleurocarpous bryophytes generally cover rocks or other substrata in more humid habitats. However *Syntrichia ruralis*, *Tortula subulata*, *Homalothecium lutescens* and *Hypnum cupressiforme* are common in all kinds of habitats because of their high tolerance to desiccation during the long dry season between May and October. Therefore, it is not surprising that Pottiaceae and Brachytheciaceae families have great moss species richness in the study area.

Table 4: Comparison of taxa count and distribution percentage of families between the study area and the other studies in A2 square

Largest families	Osmaneli (Bilecik)		Western Black Sea Region		Yenice (Karabük)		Çankiri		Kaplannede mountain (Düzce)	
	ts	%	ts	%	ts	%	ts	%	ts	%
Pottiaceae (A)	21	23.33	29	15.34	20	11.56	3	8.57	17	17.17
Brachytheciaceae (P)	15	16.66	31	16.40	26	15.02	5	14.29	19	19.19
Grimmiaceae (A)	10	11.11	11	5.82	9	5.20	6	17.14	2	2.02
Hypnaceae (P)	7	7.77	15	7.93	9	5.20	4	11.42	5	5.05
Bryaceae (A)	6	6.66	12	6.34	9	5.20	3	8.57	6	6.06
Orthotrichaceae (A)	5	5.55	12	6.34	8	4.62	3	8.57	6	6.06
Plagiomniaceae (P)	5	5.55	15	7.93	3	1.73	-	-	1	1.01

ts: No. of taxa, A: Acrocarpous, P: Pleurocarpous

The distribution of the mosses taxa identified by genus is given in Table 2. According to the distribution of the genus taxa, the genus occupying first place in the list of 10 taxa dominating areas of rocky and soil land is *Tortula*, with *Grimmia* taking second place with 7 taxa, being dominant, again, in rocky land. Third place was shared between the 6 taxa of the *Bryum* and *Hypnum* genus. Other genera with a low taxa count and percentage have been arranged accordingly (Table 2).

There were also some interesting taxa collected from the study area. Taxa found within the territory of this study, *Grimmia lisa* De Not., *Schistidium pruinatum* (Wilson ex Schimp.) G.Roth, *Dialytrichia mucronata* (Brid.) Broth., *Tortula viridifolia* (Mitt.) Blockeel and A.J.E.Sm., *Leskea polycarpa* Hedw., *Pseudoleskeella rupestris* (Berggr.) Hedenas and L.Soderstr. and *Neckera pumila* Hedw. are recorded for the second time from Turkey.

While *Bryum capillare* are prominent as colonizers of soil and soil banks, *Grimmia hartmanii*, *Schistidium trichodon*, *Orthotrichum anomalum*, *O. rupestre* and *Pterogonium gracile* are common taxa on rocks. *Bartramia pomiformis* and *Dicranum scoparium* can be found in both soil and rocks. *Dialytrichia mucronata*, *Hygroamblystegium tenax*, *H. varium* and *Cirriphyllum piliferum* are common taxa on rocks in streams and rivers. *Orthotrichum speciosum*, *O. affine* and *Hypnum cupressiforme* var. *cupressiforme* are the most common taxa as epiphytes. In addition, *Homalothecium sericeum* can live both on rocks and tree trunks.

Upon comparison of mosses recorded within the same squares (A1 and A2) in other studies, the bryological floristic diversity revealed in our study is remarkable. The floristic variety of the biggest family in our study area demonstrated a similarity to the other six studies conducted (Table 3, 4) (Cetin, 1999; Uyar and Cetin, 2006; Oren *et al.*, 2007; Uyar *et al.*, 2007; Abay and Ursavaş, 2009; Cangul and Ezer, 2010).

The present study focused on the bryophyte flora of the Osmaneli (Bilecik) district which is bryologically unknown. This is thought to be a valuable contribution for understanding the bryophyte flora of Turkey.

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