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Research article/Araştırma makalesi

Bryophyte flora of Gevne and Dimçayı Valleys (Antalya-Konya/Turkey)

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Abstract

In this study, bryophyte flora of Gevne and Dimçayı Valleys was investigated. After examination of plant specimens collected from 71 different sites, 143 taxa belonging to 40 families were determined. Among them, 17 taxa recorded for the first time from C12 square. Moreover, *Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl. which reported only Western Black Sea Region (A2 grid square) up to now, was recorded for the first time from different part of Turkey.

Key words: bryophyte, flora, biodiversity, Antalya, Konya

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Gevne ve Dimçayı Vadileri Briyofit florası

Özet

Bu çalışmada Gevne ve Dimçayı Vadileri'nin briyofit florası araştırılmıştır. 71 farklı istasyondan toplanan bitki örneklerinin teşhis edilmesi sonucunda, 40 familyaya ait 143 takson belirlenmiştir. Bunlardan 17 tanesi C12 karesi için yenidir. Ayrıca, daha önce sadece Batı Karadeniz Bölgesi'nden (A2 karesi) bildirilen *Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl., Türkiye'nin farklı bir noktasından ilk defa kaydedilmiştir.

Anahtar kelimeler: briyofit, flora, biyoçeşitlilik, Antalya, Konya

1. Introduction

In terms of biodiversity, Turkey is one of the richest countries in the temperate zone (Kahraman et al., 2012). This richness is mainly because of distinct geographic, edaphic and climatic features of the country. Because of these, Turkey divided into three different phytogeographic regions (Euro-Siberian, Mediterranean and Irano-Turanian) and each of these regions have important ecosystems, such as wetlands, agricultural areas, grasslands and meadows, deciduous, coniferous and mixed forests, steppes etc. This diversification in ecosystems and habitats causes a high endemism rate; approximately 34% of Turkish vascular plant species are endemic to Turkey (Bulut and Yılmaz, 2010).

Although vascular plant flora is well-known for long years, bryofloristic studies are not sufficient enough for understanding bryodiversity of Turkey completely. Some important bryological studies and additional records published in recent years (Uyar et al., 2007; Keçeli et al., 2011; Ören et al., 2010, 2012; Ursavaş and Çetin, 2012; Kırmacı et al., 2012; Batan and Özdemir, 2013; Batan et al., 2013a, b, c; Kara et al., 2014; Özenoğlu Kiremit et al., 2014; Batan et al., 2015; Ören et al., 2015); however, for the complete "Turkish Bryophyte Flora", more bryofloristical studies should be conducted.

1.1 Study Area

Gevne and Dimçayı valleys are located in the southern part of Turkey and in C12 square according to Henderson's grid system (1961) (Figure-1). Despite locating in the same geographical region (Mediterranean) of Turkey, these two valleys have different geographic, climatic and vegetational features.

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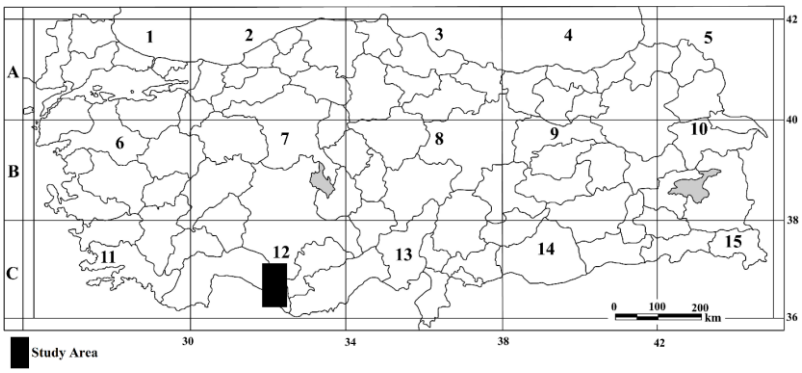

Figure 1. Position of the study area according to Henderson's grid system (1961)

Gevne Valley is mainly located in the boundaries of Konya province, Hadim County. This valley situated in mostly mountainous area, the altitude range is between 1000 m (in Taşkent County) and 2200 m (in Tosmur plateu) approximately. According to data obtained from Bozkır meteorological station, this area shows the characteristics of Mediterranean climate (Emberger's drought index (1955) is 1.5). According to De Martonne-Gottmann index (1942) that calculated as 11.3, climate type of the area is step/semi-humid. As can be seen on ombrothermic climatic diagram, there is a dry season between June and September (Figure-2). Steppes and alpine meadows are the dominant vegetations in Gevne Valley. However, there are sparse forests (mixed or pure) formed by Taurus cedar (*Cedrus libani* A. Rich.), juniper (*Juniperus* sp.), Cilician fir (*Abies cilicica* (Antoine & Kotschy) Carrière), black pine (*Pinus nigra* J.F. Arnold) and Scots pine (*Pinus sylvestris* L.) at the lower parts of the valley.

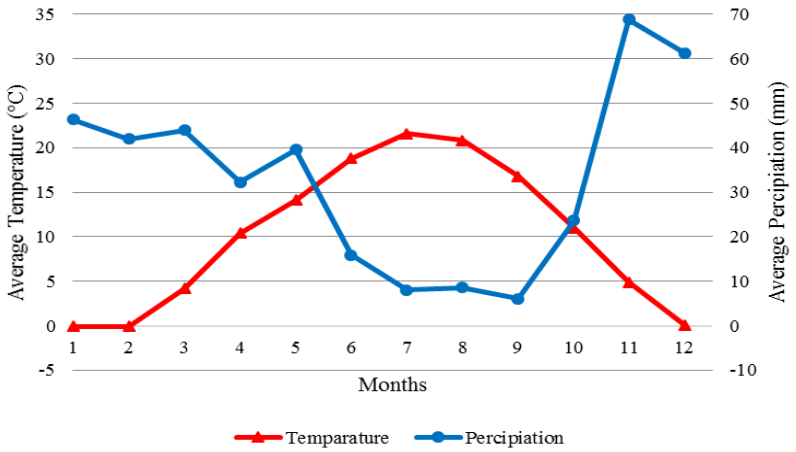

Figure 2. Ombrothermic climatic diagram for Bozkır meteorological station

Dimçayı Valley is located in Alanya county of Antalya province. This area is nearby Mediterranean coast and the altitude range is between 60 m. (in Dimçayı Dam) and 1250 m. (in Dimçayı Wildlife Improvement Area) approximately. According to Alanya meteorological station, Dimçayı Valley should be classified in Mediterranean climate (Emberger's drought index (1955) is 0.5). De Martonne- Gottmann index (1942) calculated for Alanya meteorological station as 23.1 which means climate of this area is semi-humid. According to ombrothermic climatic diagram, there is a dry season at June, July and August (Figure-3). Evergreen sclerophyllous shrublands (maquis) are dominant at this valley. Also, Cilician fir (*Abies cilicica* (Antoine & Kotschy) Carrière), black pine (*Pinus nigra* J.F. Arnold), Turkish pine (*Pinus brutia* Ten.), Juniper (*Juniperus* sp.) and Taurus cedar (*Cedrus libani* A. Rich.) formations are common at high altitudes. In addition, there is riparian vegetation consisting of oriental plane (*Platanus orientalis* L.), oriental alder (*Alnus oriantalis* Decne.) and white willow (*Salix alba* L.) in Dimçayı valley.

Both of Dimçayı and Gevne (including Gökbel Plateau) Valleys are listed as Key Biodiversity Areas (KBAs). Gevne Valley hosts 115 endemic seed plant taxa and among them, 8 are local endemic (Duman et al., 2000). Also, according to the IUCN criteria, 12 Vulnerable (VU), 9 Endangered (EN) and 5 Critically Endangered (CR) seed plant taxa distributes at Gevne Valley. Dimçayı Valley is important area for invertebrates; 3 vulnerable (VU), 1 Endangered (EN) butterfly and 1 Vulnerable (VU) dragonfly taxa inhabit at this area (Eken et al., 2006). In addition, target species of Dimçayı Wildlife Improvement Area is wild goat (*Capra aegagrus*), which also listed as Vulnerable (VU) (Weinberg et al., 2008). There aren't any bryological studies concerning about Gevne and Dimçayı valleys. However, there are some studies take place at C12 grid square in recent decade (Abay et al., 2006; Özenoğlu Kiremit et al., 2007; Kırmacı and Özçelik, 2010; Batan and Özdemir, 2011; Ursavaş and Çetin, 2013).

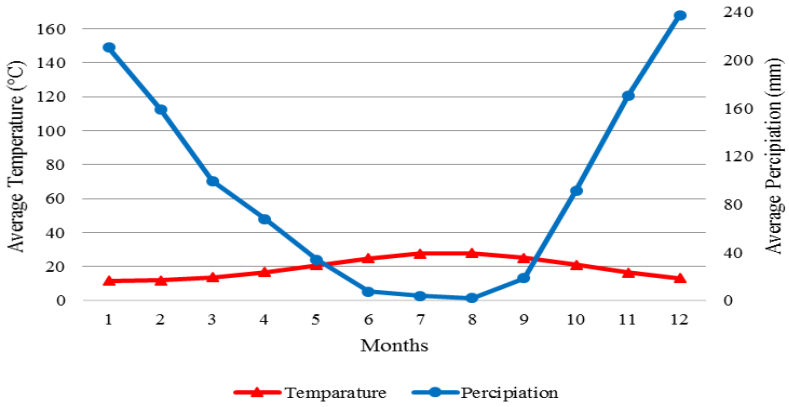

Figure 3. Ombrothermic climatic diagram for Alanya meteorological station

2. Materials and methods

Field trips conducted to Gevne and Dimçayı valleys between 2012 and 2013. Due to their vegetational and geographical characteristics, 71 collecting sites were determined (Table-1). Specimens were identified using related literature (Zander, 1993; Frey et al., 1995; Greven, 1995; Smith, 1996, Paton, 1999; Cortini Pedrotti, 2001; Greven, 2003; Heyn and Herrnstadt, 2004; Smith, 2004; Cortini Pedrotti, 2006; Guerra et al., 2006; Brugués et al., 2007; Casas et al., 2009). The status of taxa were checked with current check-lists (Uyar and Çetin, 2004; Kürschner and Erdağ, 2005; Ros et al., 2007; Özenoğlu Kiremit and Keçeli, 2009; Ros et al., 2013). After identification process, specimens were deposited at Bülent Ecevit University Bryophyte Herbarium (ZNG).

Table 1. Detailed information about collecting sites

Site Number	Location	Coordinates	Altitude (m a.s.l)	Vegetation
1	Taşkent; Pirlerkondu	36°55'15.1"N-32°29'27.9"E	1062	Salix alba, Juglans regia, Cerasus avium
2	Vicinity of Çayarası village	36°39'11.5"N-32°24'22.6"E	1138	Juniperus sp., Platanus orientalis, Quercus cerris, Acer sp.
3	Between Çayarası-Cirlasun	36°41'02.4"N-032°26'49.7"E	1138	Platanus orientalis, Quercus cerris, Pinus nigra
4	Çukuryurt gullet	36°50'36.4"N-032°30'01.3"E	1931	Steppe
5	Kocaalan plateu, vicinity of Mıhlıoluk	36°54'28.6"N-032°18'40.1"E	2062	Steppe
6	Tosmur Plateu	36°53'52.2"N-032°18'04.9"E	2200	Steppe
7	Çekiç Mountain	36°54'20.3"N-032°18'25.3"E	2150	Steppe
8	Vicinity of Dörtlütaş	36°54'29.3"N-032°19'12.2"E	2065	Steppe
9	Kocaalan Plateu, vicinity of Deliktaş	36°54'03.7"N-032°19'51.8"E	2048	Steppe
10	Kocaalan Plateu, vicinity of Zirnap	36°53'33.2"N-032°21'04.5"E	2067	Steppe
11	Vicinity of Datlısu	36°52'42.3"N-032°22'20.4"E	2012	Steppe
12	Topuzlu Plateu	36°51'21.0"N-032°21'56.9"E	2040	Juniperus sp., Salix sp., Malus domestica, Prunus sp.
13	Gevne Valley	36°49'17.5"N-032°27'24.4"E	1833	Steppe
14A	İshaklı Village, stream side	36°50'05.2"N-032°32'38.2"E	1577	Salix alba
14B	İshaklı Village, hillside	36°50'05.2"N-032°32'38.2"E	1577	Cedrus libani, Abies cilicica, Pinus nigra
15	İshaklı Village	36°49'09.9"N-032°22'51.8"E	1791	Near stream bed
16	İshaklı Plateu (Başyayla)	36°47'53.0"N-032°22'55.5"E	2035	Steppe
17	Between Başyayla-İshaklı Village	36°48'34.3"N-032°22'58.0"E	1935	Pinus nigra
18	Beyreli Village	36°50'40.1"N-032°22'22.8"E	1606	Pinus nigra, Abies cilicica, Salix alba
19	Between Beyreli-İspatlı	36°49'45.8"N-032°25'09.6"E	1535	Abies cilicica, Cedrus libani, Quercus sp., Juniperus sp.
20	Between Cirlasun-Çayarası	36°43'15.3'N-032°27'57.1"E	1308	Pinus nigra, Platanus orientalis, Carpinus orientalis, Juniperus sp., Acer campestre, Berberis sp., Erica sp.
21	Gökbel Plateu road	36°38'17.7"N-032°23'34.1"E	1265	Quercus sp.
22	Mahmutlar-Cindi Plateu	36°41'13.5"N-032°21'12.5"E	1861	Steppe
23A	Gökbel Plateu	36°41'09.9"N-032°19'04.7"E	1715	Meadow
23B	Gökbel Plateu	36°41'09.9"N-032°19'04.7"E	1715	Steppe
24	Vicinity of Kumbucağı Village	36°39'50.1"N-032°22'16.5"E	1672	Cedrus libani, Juniperus sp.
25	Tırlar Village	36°38'29.8"N-032°24'16.4"E	1220	Quercus cerris, Carpinus orientalis
26	Vicinity of Fakırcalı village	36°40'17.3"N-032°26'09.9"E	1263	Pinus sylvestris, Juniperus sp.
27	Alanya-Taşkent road, 2 km to Fakırcalı Village	36°42'21.7"N-032°27'00.4"E	1257	Cedrus libani, Juniperus sp.
28A	Cirlasun	36°45'07.6"N-032°27'39.9"E	1225	Pinus nigra, Erica sp., Platanus orientalis, Juniperus sp.
28B	Cirlasun	36°45'07.6"N-032°27'39.9"E	1225	Near stream bed
29	Hadim	36°59'11.9"N*-032°27'54.7"E	1417	Shrub formation
30	Taşkent-Alanya road, vicinity of Belpınarı	36°45'07.6"N-032°27'39.9"E	1733	Steppe, stream side
31	Between Çukuryurt-Beyreli	36°49'47.5"N-032°27'00.5"E	1754	Juniperus sp.
32	Vicinity of Beyreli village	36°52'06.1"N-032°25'29.1"E	1956	Steppe
33	Vicinity of Beyreli village	36°53'31.2"N-032°24'14.1"E	1931	Meadow, steppe
34	Vicinity of Beyreli village	36°55'11.1"N-032°24'14.4"E	1856	Steppe
35	Vicinity of Beyreli village	36°56'14.9"N-032°23'37.2"E	1880	Steppe

Table 1. devam ediyor

36	Vicinity of Beyreli village	36˚49'01.0"N-032˚26'38.1"E	1515	Pinus nigra, Juniperus sp.,Quercus sp., Cedrus libani, Abies cilicica
37	Cicikli Plateu	36˚47'32.0"N-032˚26'21.1"E	1332	Quercus sp., Juniperus sp., Pinus nigra
38	Deliabatlı Plateu	36˚47'42.8"N-032˚25'53.0"E	1503	Juniperus sp., Pinus nigra
39	Sarıveliler road, vicinity of Göksu	36˚41'28.3"N-032˚27'35.6"E	1353	Pinus nigra, Abies cilicica
40	Alanya road, construction site of hydroelectric plant	36˚40'31.8"N-032˚26'53.6"E	1175	Pinus nigra, Abies cilicica
41	Alanya road, construction site of hydroelectric plant	36˚42'49.8"N-032˚26'48.1"E	1383	Juniperus sp., Quercus cerris, Pinus nigra
42	Alanya-Hadim road	36˚43'41.6"N-032˚26'03.3"E	1740	Steppe
43	Alanya-Hadim road	36˚41'35.3"N-032˚26'59.2"E	1205	Pinus nigra, Pinus sylvestris, Platanus orientalis, Salix sp., Abies cilicica
44	Alanya-Hadim road	36˚40'57.7"N-032˚23'23.2"E	1325	Pinus nigra, Abies cilicica, Cedrus libani, Juniperus sp.
45	Alanya-Hadim road	36˚41'26.4"N-032˚23'15.3"E	1351	Pinus nigra, Abies cilicica, Cedrus libani, Juniperus sp.
46A	Dimçayı Wildlife Improvement Area	36˚36'35.4"N-032˚24'32.6"E	1227	Quercus cerris, Juniperus sp.
46B	Dimçayı Wildlife Improvement Area	36˚36'35.4"N-032˚24'32.6"E	1227	Near stream bed, Populus sp.
47	Gökbel Plateu road	36˚36'29.5"N-032˚20'41.8"E	1196	Pinus nigra, Abies cilicica
48	Gökbel Plateu road	36˚39'59.3"NE-032˚19'21.5"N	1595	Near stream bed
49	Between Dimçayı-Gökbel Plateu	1612		Abies cilicica, Cedrus libani, Pinus nigra, Juniperus sp.
50	Dimçayı Wildlife Improvement Area, Kuşkayası District	36˚33'10.0"N-032˚19'49.9"E	1280	Pinus nigra, Juniperus sp.
51	Alanya road	986		Pinus brutia, Juniperus sp., Crateagus sp., Quercus sp.
52	Alanya road, vicinity of Yalcı Village	36˚32'57.2"N-032˚16'17.4"E	704	Pinus brutia, Juniperus sp., Platanus orientalis, Quercus sp.
53	Alanya road	36˚32'55.1"N-032˚15'18.0"E	610	Pinus brutia, Arbutus sp., Platanus orientalis, Ostrya carpinifolia
54	Alanya road, vicinity of Yalcı Village	36˚32'59.1"N-032˚15'35.7"E	983	Pinus brutia, Arbutus sp., Quercus sp.
55	Uzunöz Village, vicinity of Pürenlik	36˚33'19.0"N-032˚13'46.0"E	290	Pinus brutia, Arbutus sp., Platanus orientalis, Ostrya carpinifolia
56	Dimçayı Dam	36˚32'55.1"N-032˚11'53.9"E	225	Pinus brutia, Arbutus sp., Platanus orientalis, Ostrya carpinifolia
57	Dim Cave	36˚32'24.4"N-032˚06'32.4"E	225	Pinus brutia, Cistus sp.
58	Dimçayı, stream side	36˚32'49.9"N-032˚07'17.6"E	70	Pinus brutia, Platanus orientalis, Pistachia terebintus
59	Dimçayı Dam	36˚32'37.8"N-032˚08'22.5"E	65	Pinus brutia, Platanus orieantalis
60	Dimçayı Dam	36˚32'51.7"N-032˚09'44.1"E	250	Pinus brutia, Arbutus sp., Platanus orientalis, Quercus sp.
61	Alanya-Hadim road, upper part of Dimçayı	36˚34'23.9"N-032˚14'31.4"E	360	Pinus brutia, Arbutus sp., Platanus orientalis
62	Alanya-Hadim road, upper part of Dimçayı	36˚33'10.7"N-032˚16'55.4"E	635	Pinus brutia, Pistachia terebintus
63	Alanya-Hadim road, upper part of Dimçayı	36˚32'44.2"N-032˚16'55.4"E	835	Pinus brutia, Pinus sylvestris, Pistachia terebantus, Cystus sp.
64	Gökbel Plateu road	36˚34'46.3"N-032˚21'14.9"E	1365	Pinus nigra, Abies cilicica
65	Gökbel Plateu	36˚30'05.7"N-032˚10'02.2"E	600	Quercus sp., Cystus sp., Pistachia terebentus, Daphnea sp.
66	Dimçayı Valley	36˚31'36.4"N-032˚13'28.5"E	1065	Pinus brutia, Quercus sp., Arbutus sp., Pistachia terebintus-67
	Dimçayı Valley	36˚36'23.3"N-032˚23'56.4"E	1140	Quercus sp., Platanus orientalis, Abies cilicica, Pinus nigra, Juniperus sp
68	Dimçayı Valley	36˚37'43.7"N-032˚23'04.1"E	1160	Quercus sp., Juniperus sp.
69	Dimçayı	36˚32'36.7"N-032˚11'00.9"E	210	Pinus brutia, Arbutus sp.
70	Dimçayı, Gümüşkavak Village	36˚33'23.1"N-032˚13'10.1"E	100	Platanus orientalis, Alnus orientalis, Pinus brutia
71	Upper parts of Dimçayı Dam	36˚32'55.1"N-032˚11'55.0"E	216	Platanus orientalis, Alnus orientalis, Pinus brutia.

3. Results

In consequence of this study, 143 taxa belonging to 40 families were determinated. Among them, 13 families and 20 taxa belong to Marchantiophyta (liverworts), 1 family and 1 taxon belongs to Anthoceratophyta (hornworts), 26 families and 122 taxa belong to Bryophyta (mosses) (Table-2). The bryofloristic list was arranged according to Goffinet and Shaw (2009), and new records for C12 square were indicated with an asterisk (*).

Table 2. Bryofloristic list (A: Acidity, M: Moisture, L: Light, Subs: Substrate, N: Subneutrophyte, B: Baziphyte, A: Acidophyte, Mz: Mesophyte, X: Xerophyte, H: Hygrophyte, R: Reophyte, Am: Amphiphyte, P: Photophye, S: Sciophyte, So: Soil, R/S: Rock or stone, Tr: Tree, Br: Other bryophytes, Dc: Decaying wood)

Family	Taxon	Loc. Nr.	A	M	L	Subs
	MARCHANTIOPHYTA					
Lunulariaceae	*Lunularia cruciata* (L.) Dumort. ex Lindb.	52	N	Mz	P	R/S
Aytoniaceae	*Reboulia hemisphaerica* (L.) Raddi	5, 7, 8, 9, 10, 16, 20, 22, 23B, 24, 25, 29, 44, 51, 55, 66	B	X	P	So, R/S
Cleveaceae	*Athalamia hyalina* (Sommerf.) S.Hatt.	22, 23B, 44	N	X	P	So
Ricciaceae	**Riccia bifurca* Hoffm.	23B	N	H	P	So
	Riccia canaliculata Hoffm.	32	A	H	P	So
Targioniaceae	*Targionia hypophylla* L.	51, 53	N	Mz	P	So
Pelliaceae	*Pellia endiviifolia* (Dicks.) Dumort.	14A, 18, 20	N	H	P	So, R/S
Fossombroniaceae	*Fossombronia angulosa* (Dicks.) Raddi	53, 56	A	H	P	So
	Fossombronia caespitiformis De Not. ex Rabenh.	57	A	H	P	So

Table 2.(devam ediyor)

	***Fossombronia pusilla* (L.) Nees.**	**53**	**A**	**Mz**	**P**	**So**
Aneuraceae	*Aneura pinguis* (L.) Dumort.	14A, 32	N	H	S	So
Metzgeriaceae	*Metzgeria conjugata* Lindb.	52, 53	N	H	S	R/S
	Metzgeria furcata (L.) Dumort.	61, 69, 71	A	Mz	P	Tr
Porellaceae	*Porella cordaeana* (Huebener) Moore	8, 20	N	H	S	So, R/S
	Porella platyphylla (L.) Pfeiff.	8, 21, 23B, 52	N	Mz	S	So
Frullaniaceae	*Frullania dilatata* (L.) Dumort.	52	A	X	P	Tr
Lejeuneaceae	**Lejeunea cavifolia* (Ehrh.) Lindb.	56	N	Mz	S	So, Tr
	**Cololejeunea rossettiana* (C.Massal.) Schiffn.	52	B	H	S	Br
Jungermanniaceae	*Leiocolea turbinata* (Raddi) H.Buch	20, 52, 57	B	H	S	So, R/S
Arnelliaceae	*Southbya tophacea* (Spruce) Spruce	52, 53	N	H	S	So
	ANTHOCEROTOPHYTA					
Anthocerotaceae	*Phaeoceros laevis* (L.) Prosk.	53, 57	N	Mz	S	So
	BRYOPHYTA					
Buxbaumiaceae	**Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl.	47	N	H	S	Dc
Timmiaceae	**Timmia bavarica* Hessl.	35	N	Mz	S	So
Encalyptaceae	*Encalypta streptocarpa* Hedw.	35, 44	N	X	S	R/S
	Encalypta vulgaris Hedw.	14B, 25, 29, 30, 35	N	X	P	So, R/S
Funariaceae	*Entosthodon convexus* (Spruce) Brugués	29, 30, 44, 48	N	Mz	P	So
	Funaria hygrometrica Hedw.	5, 15, 28, 47, 50	N	Mz	P	So
	**Physcomitrium pyriforme* (Hedw.) Brid.	23	N	H	P	So
Grimmiaceae	*Grimmia anodon* Bruch & Schimp.	6, 11, 13, 14B, 35	N	X	P	R/S
	**Grimmia dissimulata* E.Maier	50	N	X	P	R/S
	Grimmia montana Bruch & Schimp.	42	A	X	P	R/S
	Grimmia pulvinata (Hedw.) Sm.	1, 15, 36, 50	N	X	P	R/S
	Grimmia trichophylla Grev.	21	A	X	P	R/S
	Schistidium atrofuscum (Schimp.) Limpr.	5, 15, 36, 41, 47	B	X	P	So, R/S
	Schistidium confertum (Funck) Brunch & Schimp.	13, 18	N	X	P	R/S
Seligeriaceae	*Seligeria acutifolia* Lindb.	47, 52, 53, 66	B	Mz	S	R/S
Fissidentaceae	**Fissidens crassipes* subsp. *warnstorfii* (M.Fleisch.) Brugg.-Nann.	58	N	R	S	R/S
	Fissidens dubius P.Beauv.	20, 27, 40, 44, 47, 69	N	Mz	S	R/S
	Fissidens pusillus (Wilson) Milde	46	A	H	S	R/S
	Fissidens taxifolius Hedw.	52, 53, 59	N	Mz	S	R/S, Dc
	Fissidens viridulus (Sw. Ex anon.) Wahlenb.	1, 11, 14B, 28, 46	N	Mz	S	So, R/S
Ditrichaceae	*Ceratodon purpureus* (Hedw.) Brid.	32	N	Mz	P	So
	Distichium capillaceum (Hedw.) Bruch & Schimp.	25, 44	A	Mz	S	So
	Pleuridium acuminatum Lindb.	52	N	Mz	P	So
Dicranaceae	*Dicranella howei* Renauld & Cardot	54	B	X	P	So
	Dicranella varia (Hedw.) Schimp.	20, 43	B	H	P	R/S
	Dicranoweisia cirrata (Hedw.) Lindb.	35, 44	B	H	P	Tr
Pottiaceae	*Eucladium verticillatum* (With.) Brunch & Schimp.	46, 55	B	H	P	R/S
	Gymnostomum calcareum Nees & Hornsch.	20, 31	B	H	S	R/S
	Tortella tortuosa (Hedw.) Limpr.	20, 35, 40	B	X	P	So, R/S
	Weissia condensa (Voit) Lindb.	35	N	X	P	R/S
	Weissia controversa Hedw.	32	N	X	P	So
	Aloina ambigua (Bruch & Schimp.) Limpr.	57	N	X	P	R/S
	Barbula convoluta var. *sardoa* Bruch & Schimp.	46	N	Mz	P	R/S
	Barbula unguiculata Hedw.	13, 31	A	X	P	So
	Bryoerythrophyllum recurvirostrum (Hedw.) P.C.Chen	29, 30, 35	N	Mz	S	So
	Dialytrichia mucronata (Brid.) Broth.	58	N	H	P	Tr

Table 2. (devam ediyor)

	***Didymodon insulanus* (De Not.) M.O.Hill**	**30, 46A, 46B**	**N**	**Mz**	**S**	**R/S**
	Phascum cuspidatum Hedw.	13, 31	N	Mz	P	So
	Pterygoneurum ovatum (Hedw.) Dixon	31	B	X	P	So
	Crossidium squamiferum var. *pottioideum* (De Not) Mönk	4, 28	B	X	P	So, R/S
	Syntrichia ruralis (Hedw.) F.Weber & D.Mohr.	13, 14A, 15, 18, 20, 30	N	X	P	So, R/S
	Syntrichia virescens (De Not.) Ochyra	2, 13	N	X	P	Tr, R/S
	Turtula cuneifolia (Dicks.) Turner	53	B	X	P	So
	Tortula inermis (Brid.) Mont	15, 31, 32, 37, 42	N	X	P	So, R/S, Tr
	Tortula muralis Hedw.	28	N	Mz	P	R/S
	Tortula subulata Hedw.	14A, 28	N	X	S	So, R/S
	Timmiella barbuloides (Brid.) Mönk.	53	B	X	P	So
	**Hymenostylium recurvirostrum* (Hedw.) Dixon	20	B	H	S	R/S
Cinclidotace	*Cinclidotus aquaticus* (Hedw.) Bruch & Schimp.	2, 18, 56, 58	B	R	P	R/S
	Cinclidotus bistratosus Kurschner & Lübenau - Nestle.	18, 58	B	R	P	R/S
	Cinclidotus fontinaloides (Hedw.) P.Beauv.	14A, 15, 37, 43, 46B, 58	B	R	P	R/S
	Cinclidotus riparius (Host ex Brid.) Arn.	2, 14A, 18, 37, 46B	N	R	P	R/S
Bryaceae	*Bryum alpinum* Huds. ex With.	31	B	Mz	P	So
	Bryum argenteum Hedw.	5, 13, 34, 49	N	X	P	So, R/S
	Bryum pseudotriquetrum (Hedw.) P.Gaertn. et al.	32	N	H	P	So
	Ptychostomum archangelicum (Bruch & Schimp.) J.R.Spence	16	N	Mz	P	R/S
	Ptychostomum capillare (Hedw.) Holyoak & N.Pedersen	36, 56	N	Mz	P	So, R/S
	Ptychostomum donianum (Grev.) Holyoak & N.Pedersen	53	N	Mz	P	So
	Ptychostomum imbricatulum (Müll.Hal.) Holyoak & N.Pedersen	31, 62	N	Mz	P	So
	Pohlia melanodon (Brid.) A.J.Shaw	53	A	H	P	So
	Pohlia elongata Hedw.	71	A	H	P	R/S
	**Epipterygium tozeri* (Grev.) Lindb.	52	N	Mz	S	So
Mniaceae	**Plagiomnium affine* (Blandow ex Funck) T.J.Kop.	71	A	H	S	S
	**Plagiomnium elatum* (Bruch & Schimp.) T.J.Kop.	46B, 56, 61, 67, 69	N	H	S	So, R/S
	Plagiomnium undulatum (Hedw.) T.J.Kop.	46	N	H	S	R/S
Bartramiaceae	*Bartramia stricta* Brid.	53	A	H	S	So
	**Philonotis caespitosa* Jur.	31, 48	A	H	S	R/S
Orthotrichaceae	*Orthotrichum affine* Schrad. ex Brid.	2, 14B, 19, 40, 66, 67, 68	N	Mz	S	Tr
	Orthotrichum anomalum Hedw.	42, 52	N	X	P	R/S
	Orthotrichum cupulatum Hoffm. ex Brid. var. *cupulatum*	15, 18, 19, 30, 44, 52, 67	N	Mz	P	So, R/S, Tr
	Orthotrichum cupulatum Hoffm. ex Brid. var. *bistratosum* Schiffn.	48	N	Mz	P	R/S
	Orthotrichum lyellii Hook. & Taylor	27, 37, 40, 42, 66, 68	N	Mz	P	Tr
	Orthotrichum pumilum Sw. ex anon.	25	N	X	P	Tr
	Orthotrichum rupestre Schleich. ex Schwägr.	2, 46	N	X	P	Tr
	**Orthotrichum schimperi* Hammar	2	N	X	P	Tr
	Orthotrichum speciosum Nees var. *speciosum*	14B	N	Mz	P	Tr
	Zygodon rupestris Schimp. ex Lorentz	52, 58, 70	B	X	P	Tr
Aulacomniaceae	*Aulacomnium androgynum* (Hedw.) Schwägr.	47	A	H	S	Dc
Fontinalaceae	*Fontinalis antipyretica* Hedw.	46B, 58	N	R	P	R/S
Amblystegiaceae	*Cratoneuron filicinum* (Hedw.) Spruce	33, 43, 46	B	H	P	R/S, Tr

Table 2. (devam ediyor)

	***Drepanocladus aduncus* (Hedw.) Warnst.**	**23**	**N**	**Am**	**P**	**So**
	Palustriella commutata (Hedw.) Ochyra	11, 14A, 21	B	Am	P	R/S
	Palustriella falcata (Hedw.) Ochyra	14A, 32	B	Am	P	So
Leskeaceae	*Pseudoleskea incurvata* (Hedw.) Loeske	35	N	X	P	So
Brachytheciaceae	*Brachytheciastrum velutinum* (Hedw.) Ignatov & Huttunen var. *velutinum*	30, 31, 44, 51	N	Mz	P	So, Tr
	Brachytheciastrum velutinum var. *salicinum* (Schimp.) Ochyra & Zarnowiec	20, 31	N	Mz	P	Tr
	Brachythecium albicans (Hedw.) Schimp.	15, 47	A	Mz	P	So, R/S
	**Brachythecium glareosum* (Bruch ex Spruce) Schimp.	45	N	Mz	S	So
	Brachythecium rivulare Schimp.	46B, 67	N	Am	S	R/S
	Brachythecium rutabulum (Hedw.) Schimp.	59, 60	N	Mz	S	So, R/S
	Brachythecium salebrosum (Hoffm. ex F.Weber & D.Mohr) Schimp.	30, 32, 71	N	Mz	S	So
	Cirriphyllum crassinervium (Taylor) Loeske & M.Fleisch.	46, 49	N	Mz	S	R/S
	Eurhynchium meridionale (Schimp.) De Not	51, 52, 53, 58, 69	N	H	S	So, Tr
	Eurhynchium striatulum (Spruce) Schimp.	52	N	H	S	R/S
	Eurhynchium striatum (Hedw.) Schimp.	51	N	H	S	So
	Homalothecium aureum (Spruce) H.Rob.	46	N	H	S	R/S
	Homalothecium lutescens (Hedw.) H.Rob.	30	N	X	P	R/S
	Homalothecium philippeanum (Spruce) Schimp.	40	B	X	S	R/S
	Homalothecium sericeum (Hedw.) Schimp.	14B, 20, 25, 40	B	X	P	Tr
	Microeurhynchium pumilum (Wilson) Loeske.	52, 70	N	X	S	So
	Oxyrrhynchium hians (Hedw.) Loeske	46	N	Mz	S	R/S
	Platyhypnidium riparioides (Hedw.) Dixon	11, 46, 53	N	H	S	R/S
	Rhynchostegiella tenella (Dicks.) Limpr.	52, 54	N	H	S	R/S
	Rhynchostegium megapolitanum (Blandow ex F.Weber & D.Mohr) Schimp.	57	N	H	S	So
	Scleropodium touretii (Brid.) L.F.Koch	51, 62	N	Mz	S	So
	Scorpiurium circinatum (Bruch) M.Fleisch. & Loeske	46, 52, 54, 59	B	X	P	R/S
Hypnaceae	*Calliergonella cuspidata* (Hedw.) Loeske.	14A, 32	N	H	P	So
	Hypnum cupressiforme Hedw. var. *cupressiforme*	61, 71, 75	N	X	P	R/S
	**Hypnum cupressiforme* var. *filiforme* Brid.	52	N	X	P	Tr
	Hypnum cupressiforme var. *resupinatum* (Taylor) Schimp.	46	A	Mz	S	Tr
	Hypnum lacunosum (Brid.) Hoffm. ex Brid.	25, 52	N	X	P	So, R/S
Pterigynandraceae	**Myurella tenerrima* (Brid.) Lindb.	33	N	Mz	S	So
	Pterigynandrum filiforme Hedw.	40, 45, 49	N	Mz	S	Tr, Dc
Hylocomiaceae	*Ctenidium molluscum* (Hedw.) Mitt.	47	N	H	S	R/S
Leucodontaceae	*Antitrichia californica* (Hedw.) Brid.	21, 52	N	Mz	S	Tr
	Leucodon sciuroides var. *morensis* (Schwägr.) De Not.	21, 27, 25, 51	N	X	P	So, R/S, Tr
	Leucodon sciuroides (Hedw.) Schwägr. var. *sciuroides*	20	N	X	P	R/S
	Pterogonium gracile (Hedw.) Sm.	25, 51, 71	N	X	P	R/S
Neckeraceae	*Homalia trichomanoides* (Hedw.) Brid.	52	N	Mz	S	R/S
	Neckera menziesii Drumm.	46A, 46B, 67	N	Mz	S	R/S
	Thamnobryum alopecurum (Hedw.) Gangulee	52, 56, 58, 71N	N	H	S	So, R/S
Leptodontaceae	*Leptodon smithii* (Hedw.) F.Weber & D.Mohr	51, 58, 66, 71	N	Mz	P	R/S

4. Conclusions and discussion

As a result of this study, 17 taxa (*Riccia bifurca* Hoffm., *Lejeunea cavifolia* (Ehrh.) Lindb., *Cololejeunea rossettiana* (C. Massal.) Schiffn., *Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl., *Timmia bavarica* Hessl., *Physcomitrium pyriforme* (Hedw.) Bruch & Schimp, *Grimmia dissimulata* E.Maier., *Fissidens crassipes* subsp. *warnstorfii* (M.Fleisch.) Brugg.-Nann., *Hymenostylium recurvirostrum* (Hedw.) Dixon, *Epipterygium tozeri* (Grev.) Lindb., *Plagiomnium affine* (Blandow ex Funck) T.J.Kop., *Plagiomnium elatum* (Bruch & Schimp.) T.J.Kop., *Philonotis caespitosa* Jur., *Orthotrichum schimperi* Hammar, *Brachythecium glareosum* (Bruch ex Spruce) Schimp., *Hypnum cupressiforme* var. *filiforme* Brid., and *Myurella tenerrima* (Brid.) Lindb.) are new records for C12 square.

Buxbaumia viridis is one of the most interesting new grid square records in this study. It can only be found on wet, decaying logs of Caucasican fir (*Abies nordmanniana* subsp. *bornmuelleriana* (Matff.) Coode & Cullen) at A2 grid square of Turkey before (Abay and Çetin, 2003; Uyar et al., 2007; Ursavaş and Abay, 2009; Ören et al., 2012; Alataş and Uyar, 2015). A2 square situated in Black Sea region of Turkey and have oceanic or humid climate that mostly charcterised with lacking of an arid season. With this study, this species has been recorded from another grid square except A2 for the first time. C12 square is under effect of Mediterrinnean climate with severe drought periods during summer. At this square, *B. viridis* collected on decaying logs of Cilician fir (*Abies cilicica* (Antoine & Kotschy) Carrière). *B. viridis* classified in VU (Vulnerable) category according to IUCN Red List (ECCB, 1995). With this remarkable found, IUCN category and adaptive capacity of Turkish *B. viridis* should be reconsidered.

Pottiaceae (24 taxa, 17%) and Brachytheciaceae (21 taxa, 15%) are the richest bryophyte families at the study area (Figure-4). These two families are highly cosmopolitan, also there are a lot of taxa adopted different environmental conditions classified under them. Because of these reasons, these two families are the richest ones in Turkey, like other Mediterranean and Southwest Asian countries (Kürschner and Frey, 2011; Ros et al., 2013).

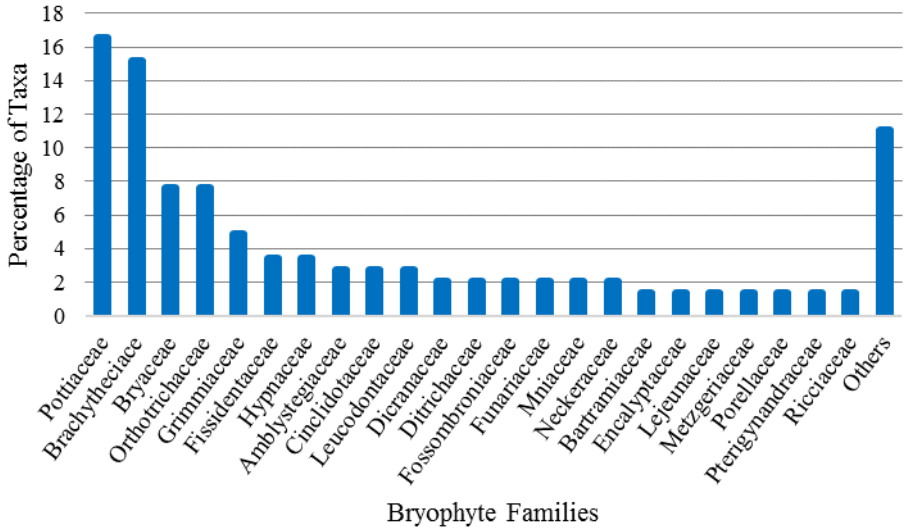

Figure 4. Families and percentage of taxa classified under them

As can be seen eological features of taxa on the bryoflorsitic list, most of the taxa prefer subneutrophic conditions (97 taxa, 68%). 61% of taxa are photophye and rest of 39% are sciophyte. The percentage of mesophytic, xerophytic and hygrophytic taxa are close to each other (34%, 31% and 28%, respectively) (Figure-5). These results can be explained with different ecological features and diversity of habitats at the study area. Gevne Valley is characterized with arid climate, high altitudes and steppe vegetation. Xerophytic and photophytic taxa inhabit on bare rocks and soil are common, and also rock crevices host a great deal of mezophytic and sciophytic taxa. But some hygrophytic taxa can be found on soil that sooked with melting snow. In contrast to Gevne Valley, Dimçayı Valley has more temperate climate, also most of this valley covered with deciduous forests that provide shadow and moist environment for sciophytic, mesophytic and/or hygrophytic taxa. Also, some photophytic bryophytes can be found on open areas in Dimçayı Valley. Rheophytic and amphiphytic taxa are occur at aquatic habitats in these areas. Geological and climatic differences in these areas cause habitat diversification and species richness for bryophytes.

Gevne and Dimçayı Valleys have diverse ecosystems and habitats. For this reason, study area has rich bryophyte flora and host a threatened bryophyte species, *Buxbaumia viridis*. These KBAs are threatened by antropogenic factors, such as increasing tourism potential, construction of new roads, hydroelectric plants and therefore must be carefully managed.

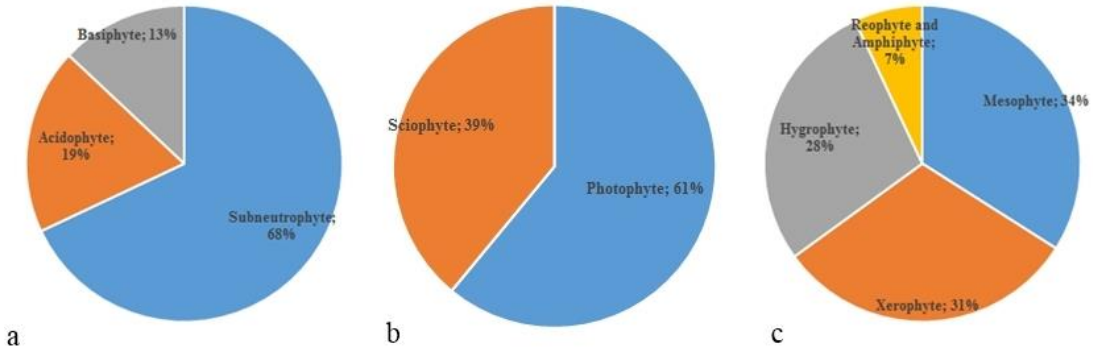

Figure 5. Percentage of ecological features of taxa a: acidity b: light c: moisture

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