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The Bryophyte Flora of Ermenek Valley (Karaman, Mersin-Turkey)

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Abstract

In this study, the bryophyte flora of Ermenek Valley (Karaman, Mersin) was investigated. In a total 163 taxa belonging to 27 families and 64 genera were determined by identifying the bryophyte specimens collected from 33 stations at different habitats and different vegetation periods between the years 2019 and 2020. Marchantiophyta, 10 taxa belonging to 8 families and 10 genera, Bryophyta, 153 taxa belonging to 19 families and 54 genera are represented. Among them, 39 taxa are new records for C12 grid square and, also *Fissidens gymnandrus* is recorded for the second time from Turkey. While Pottiaceae (44 taxa) and Brachytheciaceae (26 taxa) two largest families in the study area, *Ptychostomum* (11 taxa), *Syntrichia* and *Grimmia* (10 taxa) are the most species rich genera. Taxa in the floristic list, along with ecological characteristics and life forms were given.

Keywords: Bryophyte, Ermenek Valley, flora, Karaman, Mersin, Türkiye.

Ermenek Vadisi (Karaman, Mersin-Türkiye)'nin Briyofit Florası

Öz

Bu çalışmada, Ermenek Vadisi'nin (Karaman, Mersin) briyofit florası araştırılmıştır. 2019 ve 2020 yılları arasında vejetasyonun farklı dönemlerinde 33 istasyonun farklı habitatlarından toplanan briyofit örnekleri teşhis edilerek 27 familya ve 64 cinse ait toplam 163 takson tespit edilmiştir. Marchantiophyta, 8 familya ve 10 cinse ait 10 takson, Bryophyta, 19 familya ve 54 cinse ait 153 takson ile temsil edilmektedir. Bunlardan 39 takson C12 karesi için yeni kayıtır ve ayrıca *Fissidens gymnandrus* Türkiye'den ikinci kez kaydedilmiştir. Pottiaceae (44 takson) ve Brachytheciaceae (26 takson) en büyük iki familya olurken, *Ptychostomum* (11 takson), *Syntrichia* ve *Grimmia* (10 takson) tür bakımından en zengin cislerdir. Floristik listede taksonlar, ekolojik özellikleri ve hayat formları ile birlikte verilmiştir.

Anahtar kelimeler: Briyofit, Ermenek Vadisi, flora, Karaman, Mersin, Türkiye,

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1. Introduction

Turkey is an important country in the northern hemisphere, in the Holarctic (circumboreal) Kingdom, with its rich biodiversity. Turkey's geomorphological and geographical location has led to the richness of biodiversity. The fact that Turkey is located at the intersection of three phytogeographic regions namely, Euro-Siberian, Mediterranean and Irano-Turanian has allowed the elements of all three phytogeographical regions to spread and the phytological diversity to increase (Karakaş and Ezer, 2017).

Bryo-floristic studies in Turkey have been progressing rapidly in recent years. According to the studies on bryophyte flora in Turkey, the total taxa of bryophytes in the country is about ±1056 (Erata and Batan, 2020; Kürschner and Frey, 2020; Unan et al., 2020; Uygur et al., 2020, 2021; Erata et al., 2021; Keskin et al., 2021; Kırmacı et al., 2021; Ursavaş et al., 2021). With new studies, this number will definitely increase.

Ermenek Valley, which has been determined as the research area, is located in the Mediterranean Region in Turkey and has the status of Key Biodiversity Area. Furthermore, the Valley is one of the 122 Important Plant Areas determined by the World Wildlife Fund (Özhatay et al., 2003). Although various studies have been carried out on vascular plants in the Ermenek Valley (Sümbül and Erik, 1988; Sezer and Ertuğrul, 2012), no studies have been conducted on bryophytes. The present study aimed to reveal the bryophyte flora of the Ermenek Valley and to contribute to the Bryophyte Flora of Turkey.

1.1 Study area

Ermenek Valley, which is located within the Karaman and Mersin Provinces in the Mediterranean Phytogeographical Region of Turkey, is a deep valley formed by Ermenek Stream, one of the main branches of Göksu River. This stream is a junction of some small streams such as Küçük Stream and Gevne Stream. The altitude of the valley varies between 200 m and 2427 m. The most altitude of the valley is Oyuklu Mountain (Eken et al., 2006). The valley, located in the transition zone between the Irano-Turanian and Mediterranean phytogeographic regions, lies in the C12 square of the grid system of Turkey adopted by Henderson (1961) (Figure 1).

Forest, rock and hygrophyte vegetation types can be seen in the Ermenek Valley. *Pinus brutia* Ten. forests are seen at low parts and *Cedrus libani* A.Rich. forests are seen at higher parts of the valley. *C. libani*, *Abies cilicica* subsp. *isaurica* Coode & Cullen and *Pinus nigra* subsp. *pallasiana* (Lamb.) Holmboe together with it forms mixed forests in places. Furthermore, *Quercus coccifera* L. is also found in damaged maquis and *Juniperus excelsa* M. Bieb. is found in the higher parts of the valley. In the steep rocky habitats of the valley, important endemic plant communities are encountered both on the south-facing and north-facing more humid and cooler parts (Özhatay et al., 2003).

Ermenek District and surrounding has 48 endemic vascular taxa (Sezer and Ertuğrul, 2012; Ertuğrul and Tugay, 2018). 13 taxa of them exist only in the Ermenek Valley in the world. These ones are *Alkanna dumanii* H. Sümbül, *Alkanna saxicola* Hub.-Mor., *Campanula leucosiphon* Boiss. & Heldr., *Campanula pubicalyx* (P. H. Davis) Damboldt, *Cousinia davisiana* Hub.-Mor, *Delphinium kitianum* İlarslan, *Euphorbia isaurica* M.L.S. Khan, *Silene ermenekensis* Vural & Kit Tan, *Isatis ermenekensis* Yıldırımlı, *Sedum samium* subsp. *micranthum* 't Hart & Alpınar, *Verbascum isauricum* Boiss. & Heldr., *Verbascum leuconeurum* Boiss. & Heldr. and *Cephalaria ekimiana* Göktürk & Sümbül (Eken et al., 2006). In addition, members of hygrophyte vegetation are abundant on the banks of streams. For instance, *Ulmus canescens* Melville, *Platanus orientalis* L., *Tamarix parviflora* DC., *Tamarix smyrnensis* Bunge, *Vitex agnus-castus* L., *Juglans regia* L., *Salix alba* L., *Salix pseudomedemii* E.Wolf exist intensely throughout Ermenek Stream (Sümbül and Erik, 1988).

According to data of the Ermenek Meteorology Station, study area has semi-arid, warm Mediterranean climate (Akman, 2011). The mean annual temperature is 12.9 °C. The highest mean temperature is 30.4 °C in August, and the lowest is -0.1 °C in January. The mean annual precipitation is 497.1 mm (Figure 2).

Pre-Alpine formations are encountered on the Ermenek Valley. The dominant lithological unit in these formations is limestone. However, different units such as schist, marble, shale and quartzite are also encountered. The southern and middle parts of the Ermenek Valley are composed of Early Miocene limestones, while the higher parts are composed of Jurassic-Cretaceous limestones. In addition, mid-Miocene neritic limestone formations are encountered in the north of the valley (Buldur et al., 2007).

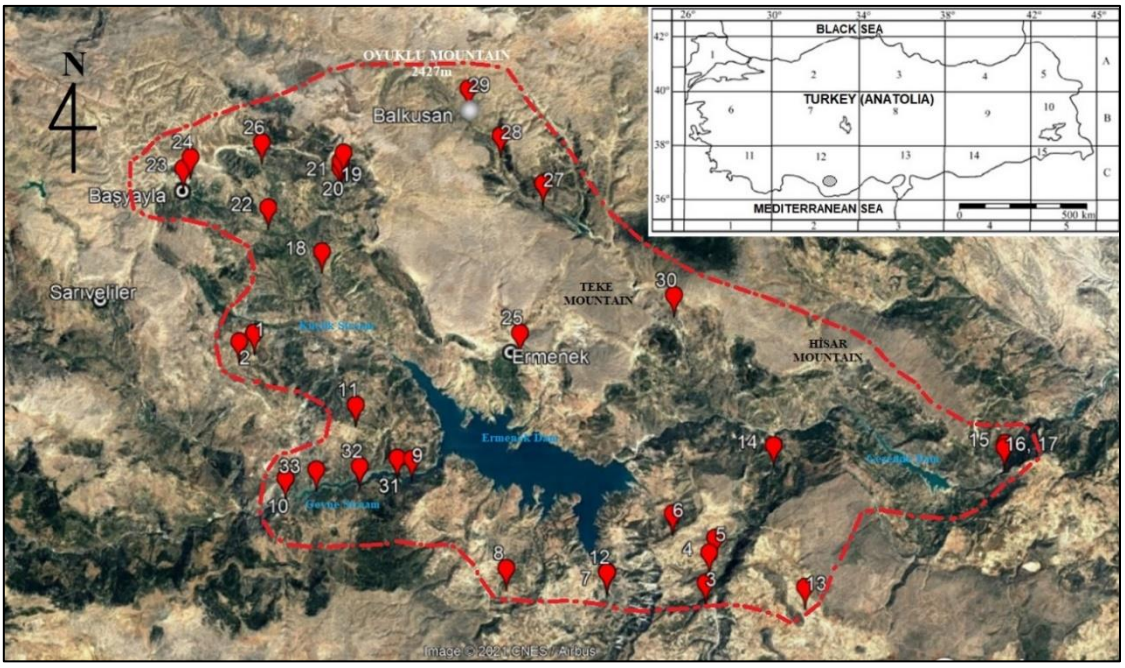

Figure 1. Grid system of Turkey adopted by Henderson (1961) and the study area (modified from Google Earth).

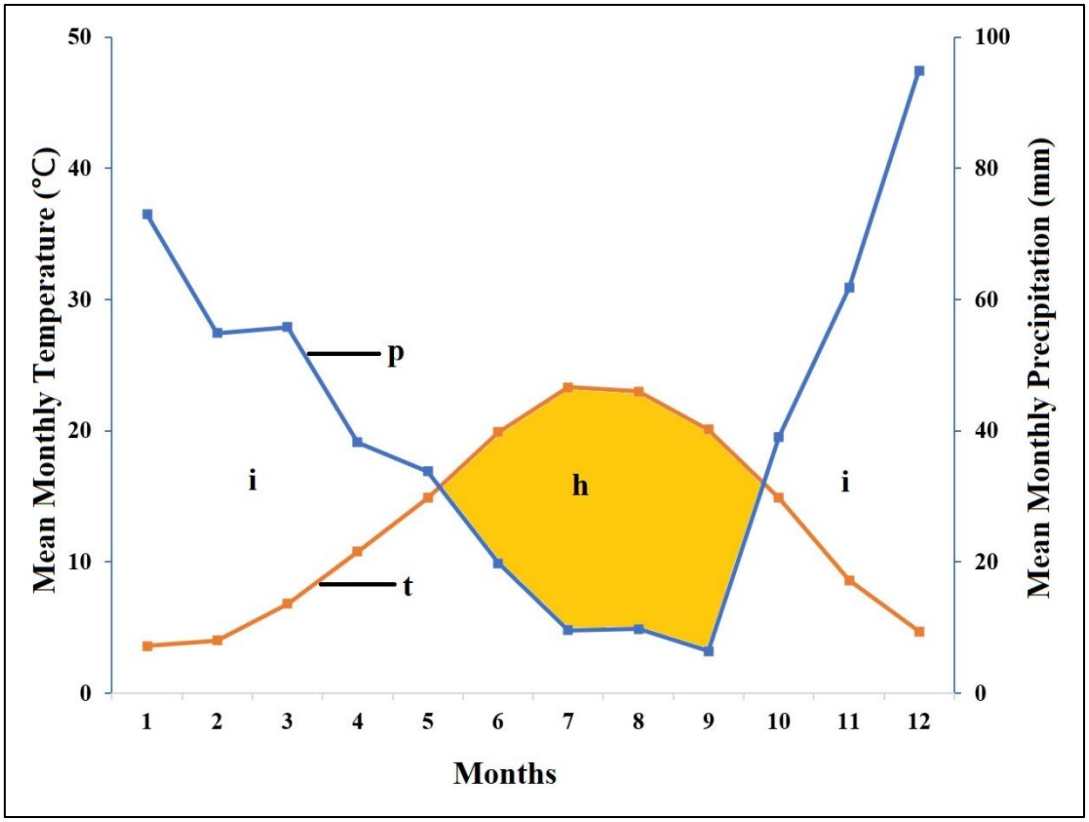

Figure 2. The ombro-thermic diagram of Ermenek Valley (p: precipitation, t: temperature, i: humid season, h: arid season)

2. Materials and Methods

The bryophyte specimens, material of present study, were collected from various habitats and substrates within the 33 different localities in Ermenek Valley between 26 April 2019 and 01 September 2020 (Table 1).

Table 1. Locality details

LN	Date	Locations	Altitude (m)
1	26.04.2019	**Karaman:** Başyayla, Sarıveliler-Güneyyurt road, 36°39'19.13"N / 32°42'43.23"E	1331
2	26.04.2019	**Karaman:** Başyayla, Sarıveliler-Güneyyurt road, 36°39'5.0904"N / 32°42'1.8"E	1450
3	06.06.2019	**Karaman:**Ermenek, Olukpınar Village, roadside, small stream surrounding, 36°28'48.01"N / 33° 0'31.06"E	1330
4	06.06.2019	**Karaman:** Ermenek, Yalındal Village, Ermenek Road, Darısekisi place, small stream surrounding, 36°29'49.0488"N / 33°0'50.2668"E	1312
5	06.06.2019	**Karaman:** Ermenek, between Yalındal Village and Güngören Village, 36°30'17.568"N / 33°1'10.4844"E	1450
6	06.06.2019	**Karaman**: Ermenek, Güngören Village, Ermenek road, 36°31'18.426"N / 32°59'30.354"E	1500
7	06.06.2019	**Karaman:** Ermenek, Zeyve bazaar, 36°29'36.16"N / 32°56'24.40"E	800
8	06.06.2019	**Karaman:** Ermenek, Anamur road, Kazancı entrance, 36°30'10.854"N / 32°52'8.7132"E	1120
9	06.06.2019	**Karaman:** Ermenek, Pınarönü, Ardıçkaya road, DSİ canal entrance, 36°34'19.7868"N / 32°48'44.1936"E	1120
10	06.06.2019	**Karaman:** Ermenek, Yeşilköy, Gevne Stream surrounding, 36°34'12.98"N / 32°43'15.44"E	750
11	06.06.2019	**Karaman:** Ermenek, between Yerbağ and Pamuklu, 36°36'24.9804"N / 32°46'38.6328"E	1250
12	30.06.2019	**Karaman:** Ermenek, Zeyve bazaar, 36°29'35.96"N / 32°56'23.65"E	800
13	17.08.2019	**Mersin:** Gülnar, Bardat Village, 36°28'12.558"N / 33°4'42.9384"E	1420
14	17.08.2019	**Mersin:** Gülnar, Ilısu Village, Ilısu Waterfall, 36°33'11.18"N / 33°4'10.37"E	600
15	07.06.2020	**Mersin:** Mut, Yerköprü Waterfall Road surrounding, 36°32'12.68"N / 33°14'1.50"E	250
16	07.06.2020	**Mersin:** Mut, Yerköprü Waterfall, 36°32'4.46"N / 33°13'58.08"E	275
17	15.08.2020	**Mersin:** Mut, Yerköprü Waterfall, 36°32'4.46"N / 33°13'58.08"E	275
18	16.08.2020	**Karaman:** Ermenek, Başyayla road, Serper small stream, 36°41'47.85"N / 32°46'2.67"E	770
19	16.08.2020	**Karaman:** Ermenek, Aşağıçağlar Village Road, bridge surrounding, 36°44'34.16"N / 32°47'16.70"E.	1000
20	16.08.2020	**Karaman:** Ermenek, Aşağıçağlar Village Road, small stream surrounding, 36°44'48.22"N / 32°47'20.26"E	1000
21	16.08.2020	**Karaman:** Ermenek, Aşağıçağlar Village, Kapız place, 36°45'4.26"N / 32°47'29.93"E	1040
22	16.08.2020	**Karaman:** Başyayla, Kışla Village, small stream surrounding, 36°43'31.86"N / 32°43'59.54"E	875
23	16.08.2020	**Karaman:** Başyayla, 36°45'14.74"N / 32°40'35.09"E	1360
24	16.08.2020	**Karaman:** Başyayla surrounding, 36°45'35.78"N / 32°40'57.47"E	1475
25	16.08.2020	**Karaman:** Ermenek, 36°38'8.86"N / 32°54'1.01"E	1240
26	16.08.2020	**Karaman:** Ermenek, north of Katranlı Village, 36°45'46.94"N / 32°44'4.50"E	1210
27	17.08.2020	**Karaman:** Ermenek, Balkusan Village Road, west of the Balkusan Dam, small stream surrounding, 36°43'8.94"N / 32°55'49.38"E	1500
28	17.08.2020	**Karaman:** Ermenek, Balkusan road, small stream surrounding, 36°44'57.78"N / 32°54'16.68"E	1530
29	17.08.2020	**Karaman:** Ermenek, Balkusan Village, 36°46'42.93"N / 32°53'10.11"E	1650

30	31.10.2020	**Karaman:** Ermenek, north of the Gökçeseki Village, north of the Karen hydroelectric power plant, 36°38'45.14"N / 33° 0'46.38"E	1170
31	01.11.2020	**Karaman:** Ermenek, Nadire Canyon, 36°34'25.40"N / 32°48'6.97"E	750
32	01.11.2020	**Karaman:** Ermenek, Nadire Canyon, Ardıçkaya Village Road, 36°34'18.38"N / 32°46'28.84"E	750
33	01.11.2020	**Karaman:** Ermenek, Nadire Canyon, Yeşilköy, 36°34'22.66"N / 32°44'36.82"E	710

The specimens were identified using various floras, revisions and monographs (Zander, 1993; Paton, 1999; Greven, 2003; Smith, 2004; Pedrotti, 2001, 2006; Kürschner and Frey, 2020). Nomenclature of the species follows Hodgetts et al. (2020). The status of bryophyte taxa was evaluated by reviewing related literature for the C12 square (Özenoğlu Kiremit et al., 2007; Kırmacı and Özçelik, 2010; Batan and Özdemir, 2016; Özçelik et al., 2016; Ursavaş and Keçeli, 2020). Ecological characteristics and life forms of the identified specimens were determined according to Dierssen (2001) and Hill et al. (2007). Voucher specimens are deposited in the herbarium of Biology Department, Faculty of Science, Niğde Ömer Halisdemir University, Turkey.

For each taxon, localities, substrate, life form and ecological characteristics were given in the floristic list. The new records for the C12 grid-square are indicated with (*), the second records from Turkey are indicated with (**) in the bryofloristic list. All taxa are new for Karaman Province.

Abbreviations: Locality number (LN). Substrate (Sub.): rock (r), soil (s), tree (t), concrete (c). Life form (LF): Solitary creeping (Sc), Mat, smooth (Ms), Mat, thalloid (Mt), Turf (Tf), Tuft (Tuft). Acidity (pH): Acidophyte (A), Subneutrophyt (S), Basiphyt (B), Neutrophyt (N). Humidity (H): hygrophyt (h), mesophyt (m), xerophyt (x), tolerant to desiccation (td). Light (L): phorophyte (p), sciophyt (sc). m: meter.

3. Results

As a result of the identification of bryophyte specimens collected from different habitats in the Ermenek Valley, a total of 163 taxa (10 liverworts, 153 mosses) were determined (Table 2).

Table 2. Floristic list

Families	Taxa	LN	Sub.	LF	pH	H	L
Marchantiophyta							
Adelanthaceae	**Syzygiella autumnalis* (DC.) K. Feldberg, Váňa, Hentschel & Heinrichs	33	s	Ms	A	h	p
Cephaloziellaceae	**Cephaloziella baumgartneri* Schiffn	13, 33	s	Sc	S	m	p
Jungermanniaceae	**Mesoptychia badensis* (Gottsche ex Rabenh.) L.Söderstr. & Váňa	16	s	Ms	S	h	sc
Southbyaceae	*Gongylanthus ericetorum* (Raddi) Nees	16, 30	s, r	Sc	A	h	p
	Southbya tophacea (Spruce) Spruce	13, 16	r	Ms	S	h	sc
Pelliaceae	*Apopellia endiviifolia* (Dicks.) Nebel & D. Quandt	30,33	s, r	Mt	S	h	sc
	Pellia epiphylla (L.) Corda	12, 13, 14, 16, 17, 19, 25, 30, 33	s, r, c	Mt	A	h	p
Lunulariaceae	*Lunularia cruciata* (L.) Lindb.	12, 13, 16	s, r	Mt	S	m	p
Aytoniaceae	*Reboulia hemisphaerica* (L.) Raddi	12	s	Mt	B	h	sc
Marchantiaceae	*Marchantia polymorpha* subsp. *montivagans* Bischl. & Boissel. Dub.	16, 25	s, c	Mt	A	h	sc
Bryophyta							
Encalyptaceae	*Encalypta vulgaris* Hedw.	5, 17, 27, 32	s, r	Tuft	S	x	p
Funariaceae	*Funaria hygrometrica* Hedw.	2, 33	s, r	Tuft	A	m	p
	Physcomitrium eurystomum Sendtn.	16	r	Tf	S	h	p
	P. pyriforme (Hedw.) Bruch & Schimp.	33	r	Tuft	S	h	p
Dicranellaceae	*Dicranella howei* Renauld & Cardot	18	s, r	Tt	B	x	p
	D. varia (Hedw.) Schimp.	5, 14, 19, 20, 29, 30	s, r	Tf	B	h	p
Fissidentaceae	*Fissidens taxifolius* Hedw.	12	s	Tf	A	m	sc
	**F. arnoldii* R. Ruthe	12, 31	s, r	Tf	B	td	p
	**F. crassipes* Wilson ex Bruch & Schimp.	32, 33	s, r	Tf	B	h	p
	F. crispus Mont.	31, 33	r	Tf	S	m	p

	**F. curvatus* Hornsch.	33	r	Ts	S	m	sc
	***F. gymnandrus* Büse	30, 33	r	Tf	S	h	p
	F. viridulus (Sw. ex anon.) Wahlenb.	30	r	Tf	S	m	sc
	F. exilis Hedw.	16, 33	r	Ts	A	h	sc
Rhabdoweisiaceae	*Dicranoweisia cirrata* (Hedw.) Lindb.	31	t	Tf	B	m	sc
Pottiaceae	*Barbula unguiculata* Hedw.	2, 7, 17, 18, 19, 21	s, r	Tf	A	h	p
	Cinclidotus aquaticus (Hedw.) Bruch & Schimp.	20, 21, 33	r	At	S	h	p
	C. bistratosus Küschner & Lübenau:Nestl	21	r, t	At	S	h	sc
	**C. pachylomoides* Bizot	18, 21, 33	r, t	At	N	h	p
	Crossidium squamiferum var. *pottioideum* (De Not.) Monk.	24	r	Tf	B	x	p
	Dialytrichia mucronata (Brid.) Broth.	33	r	Tuft	S	h	p
	Didymodon acutus (Brid.) K.Saito	12, 19	r	Tf	B	m	p
	D. cordatus Jur.	12, 33	r	Tf	B	m	p
	D. icmadophilus (Schimp. ex Miill.Hal.) K. Saito	33	r	Tf	S	h	p
	D. insulanus (De Not.) M.O. Hill	12, 19, 20, 26, 31, 32	s, r, t	Tf	S	m	sc
	D. luridus Hornsch. ex Spreng	9, 18, 19	r, t	Tf	B	x	p
	**D. nicholsonii* Culm.	19, 33	s, r	Tf	B	x	p
	D. sinuosus (Mitt.) Delogne	12, 21	r, t	Tf	S	m	sc
	D. tophaceus (Brid.) Lisa	3, 4, 5, 19, 20, 21, 30, 32, 33	s, r, t	Tf	B	h	p
	D. vinealis (Brid.) R.H. Zander	3, 12, 18, 19, 31, 32	s, r, t	Tuft	S	x	p
	Microbryum starckeanum (Hedw.) R. H. Zander	15	s	Ts	S	m	p
	Pseudocrossidiu revolutum (Brid.) R.H. Zander	31	r	Tf	B	x	p
	Pterygoneurum ovatum (Hedw.) Dixon	2, 24	s, r	Tf	B	x	p
	**P. subsessile* (Brid.) Jur.	24	s	Tf	B	x	p
	Syntrichia calcicola J.J. Amann	26	s	Tf	S	x	p
	**S. caninervis* var. *gypsophila* (J.J.Arnrnan ex G.Roth) Ochyra	2, 13, 24	s, r	Tf	S	x	p
	S. handelii (Schiffn.) S. Agnew & Vondracek	3, 19, 24, 27, 31, 33	r, t	Tf	B	x	p
	S. latifolia (Bruch ex Hartm.) Huebener	15	s	Tf	S	m	p
	S. montana Nees	24, 30	r	Tf	S	x	p
	S. princeps (De Not.) Mitt.	2, 21, 22, 33	r, t	Tf	A	x	p
	S. ruraliformis (Besch.) Mans.	28	r	Tf	S	x	p
	S. ruralis (Hedw.) F. Weber & D. Mohr	1, 2, 3, 8, 9 12, 21, 24, 25, 27, 31, 33	r, s	Tf	S	x	p
	**S. subpapillosissima* (Bizot & R.B. Pierrot ex W. Kramer) M.T. Gallego & I. Guerra	2	s, t	Tf	S	x	sc
	S. virescens (De Not.) Ochyra	2, 5, 12, 21, 22, 31	s, r, t	Tf	S	x	p
	Tortula acaulon var. *pilifera* (Hedw.) R.H. Zander	2	s	Tf	S	m	p
	T. brevissima Schiffn.	5, 21, 22, 24, 25	r	Tf	S	m	p
	T. inermis (Brid.) Mont.	2, 3, 24, 27	s, r, t	Tf	S	x	p
	T. muralis Hedw.	1, 3, 5, 9, 12, 25, 29	r	Tf	S	m	sc
	T. subulata Hedw.	2	s	Tuft	S	x	sc
	Streblotrichum convolutum (Hedw.) P. Beauv.	4, 27, 32	s, r	Tf	S	m	p
	**Anoectangium aestivum* (Hedw.) Mitt.	30	s	Cu	A	h	sc
	Eucladium verticillatum (With.) Bruch & Schimp.	4, 5, 13, 14, 16, 18, 28, 30, 32, 33	s, r	Tf	S	h	sc

	**Gymnostomum aeruginosum* Sm.	16	r	Tf	S	h	sc
	G. calcareum Nees & Hornsch.	17, 30	s, r	Tf	B	h	sc
	G. viridulum Brid.	15, 16	s, r	Tf	B	x	p
	Tortella humilis (Hedw.) Jenn.	32	s, r	Tf	S	x	p
	T. nitida (Lindb.) Broth.	16	r	Cu	S	x	sc
	T. squarrosa (Brid.) Limpr	17	r	Tf	B	x	p
	T. tortuosa (Hedw.) Limpr.	31	r	Tuft	B	x	p
Seligeriaceae	*Seligeria donniana* (Sm.) Müll.Hal.	32	r	Ts	S	m	sc
Grimmiaceae	*Grimmia anodon* Bruch & Schimp.	28, 29	s. r	Cu	S	x	p
	G. dissimulata E. Maier	31	r	Cu	S	x	p
	G. elatior Bruch ex Bals. Criv. & De Not.	31	r	Cu	A	h	p
	**G. elongata* Kaulf.	17, 31, 33	r	Cu	A	h	sc
	G. leavigata (Brid.) Brid.	31	r	Cu	A	x	p
	**G. meridionalis* (Müll. Hall.) E. Maier	33	r	Cu	A	m	sc
	G. orbicularis Bruch ex Wilson	15, 17, 31 ,32	s, r	Cu	B	x	p
	G. ovalis (Hedw.) Lindb.	12, 31	r	Cu	A	x	sc
	G. pulvinata (Hedw.) Sm.	1, 3, 5, 8, 9, 12, 17, 19, 24, 25, 26, 27, 28, 29, 30, 31, 32	s, r	Cu	A	x	p
	G. tergestina Tomm. ex Bruch & Schimp.	15, 17, 28, 30	s, r	Cu	S	x	p
	Schistidium apocarpum (Hedw.) Bruch & Schimp.	5, 28, 30, 31	r	Tf	B	x	p
	**S. confertum* (Funck) Bruch & Schimp.	24, 26, 27, 28, 29, 31	r	Cu	S	x	p
	S. flaccidum (De Not.) Ochyra	24, 29, 30	r	Cu	S	x	p
	S. helveticum (Schkuhr) Deguchi	30	r	Tf	S	m	sc
	S. rivulare (Bridel) Podpera	3, 27, 31, 32	r	At	A	h	p
	**S. sordidum* I. Hagen	6	r	Cu	S	h	p
Bartramiaceae	*Philonotis rigida* Brid.	30	s, r	Tf	S	h	sc
	P. calcarea (Bruch & Schimp.) Schimp.	4	r	Tf	B	h	p
	**P. capillaris* Lindb.	14	s	Tf	S	h	sc
Bryaceae	*Bryum argenteum* Hedw.	27	s	Tf	S	m	p
	B. canariense Brid.	33	r	Tf	S	x	p
	B. dichotomum Hedw.	1, 2, 5, 17, 18, 19, 21, 30	s.r	Tf	S	m	p
	Imbribryum alpinum (Huds. ex With.) N. Pedersen	30	r	Tf	B	m	p
	I. mildeanum (Jur.) J.R. Spence	4, 18, 19, 30	s, r	Cu	S	h	p
	Ptychostomum capillare (Hedw.) Holyoak & N. Pedersen	2, 27, 31, 32, 33	s, r	Tf	S	m	p
	P. compactum Hornsch.	27, 28	r	Tf	S	m	p
	P. donianum (Grev.) D.T.Holyoak & N.Pedersen	33	r	Tf	S	m	p
	P. imbricatulum (Müll. Hal.) Holyoak & N. Pedersen	2, 30	s	Tf	S	x	p
	P. inclinatum (Sw. ex Brid.) J.R. Spence	2	s	Tf	B	h	p
	**P. knowltonii* (Barnes) J.R. Spence	2	s	Tf	S	h	p
	P. kunzei (Homsch.) J.R. Spence	5	r	Tf	S	m	p
	**P. moravicum* (Podp.) Ros & Mazimpaka	2, 12, 27 31	s, r, t	Tf	S	m	sc
	P. torquescens (Bruch & Schimp.) Ros & Mazimpaka	1, 2, 28, 30, 33	s, t	Tf	B	x	p
	**P. turbinatum* (Hedw.) J.R. Spence	30	s	Tf	A	x	p
	**P. warneum* (Röhl.) J.R. Spence	30	r	Tf	S	h	p
Mniaceae	*Pohlia elongata* Hedw. var. *elongata*	3, 5, 13, 14, 16, 19, 27, 29, 30	s, r	Tf	A	m	sc
	**P. elongata* var. *greenii* (Brid.) A.J.E.Sm.	29, 30, 33	s, r	Tf	A	m	sc
	P. melanodon (Brid.) A.J.Shaw	3, 5, 7, 10, 18, 19, 21, 30, 32, 33	s, r	Tf	S	h	sc

	**Plagiomnium ellipticum* (Brid.) T.J. Kop.	7, 31, 33	s, r	Tf	S	h	sc
	**P. medium* (Bruch & Schimp.) T.J. Kop.	12	s, r	Ms	A	h	sc
	P. undulatum (Hedw.) T.J. Kop	12,33	r	Tf	A	h	sc
Orthotrichaceae	*Lewinskya rupestris* (Schleich. ex Schwägr.) F. Lara, Garilleti & Goffinet	32, 33	r, t	Cu	A	x	p
	L. sordida (Sull. & Lesq.) F. Lara, Garillet & Goffinet	2, 12	r, t	Cu	S	m	p
	Orthotrichum anomalum Hedw.	6	r	Cu	S	x	p
	**O. bistratosum* (Schiffn.) Guerra	5, 17, 18, 28, 29, 31	r, t	Cu	S	x	p
	O. cupulatum var. *cupulatum* Hoffm. ex Brid.	3, 21, 22, 30, 31, 32, 33	r	Cu	S	x	p
	**O. cupulatum* var. *riparium* Huebener	25, 27	r	Cu	S	h	sc
	O. diaphanum Brid.	12, 18, 25	r, t	Cu	S	x	p
	**O. hispanicum* F.Lara, Garilleti & Mazimpaka	21	r	Cu	S	x	p
	O. macrocephalum F. Lara, Garilleti & Mazimpaka	18, 22	s, t	Cu	S	x	sc
	O. pumilum Sw. ex anon.	12	r	Cu	S	x	p
	**O. stellatum* Brid.	12	t	Cu	S	m	sc
	**Zygodon catarinoi* C. Garcia, F. Lara, Sergio & Sim:Sim	32	r	Tf	S	m	sc
	Z. rupestris Schimp. ex Lorentz	12	t	Tf	B	x	sc
Fabroniaceae	*Fabronia pusilla* Raddi	31, 32	s, r	We	S	x	p
Amblystegiaceae	*Cratoneuron filicinum* (Hedw.) Spruce	3, 4, 7, 10, 12, 16, 17, 19, 20, 21, 23 ,25, 26, 28, 33	s, r, t, c	We	B	h	p
	**Palustriella commutata* (Hedw.) Ochyra	4, 10, 12, 13, 16, 17, 26, 29, 30, 33	s, r	We	B	h	p
	*P. falcata (*Brid.) Hedenäs	4, 12, 26, 28, 30, 33	s, r	We	B	h	p
	Amblystegium serpens (Hedw.) Schimp.	12, 17, 18, 22	s, r	Mr	S	h	sc
	**Campyliadelphus chrysophyllus* (Brid.) R. S. Chopra	20	t	We	S	m	p
	Hygroamblystegium fluviatile (Hedw.) Loeske	33	r	At	S	h	p
	H. tenax (Hedw.) Jenn.	20, 33	s, r	Mr	S	h	p
	H. varium (Hedw.) Monk.	12, 17, 18, 19, 21, 23, 27, 28, 30, 33	s, r, t	Mr	S	m	sc
	Leptodictyum riparium (Hedw.) Warnst.	17, 27	s, r	Mr	S	h	p
Pseudoleskeellaceae	**Pseudoleskeella nervosa* (Brid.) Nyholm	16, 20	s, r, t	Mr	B	m	p
Brachytheciaceae	*Rhynchostegium confertum* (Dicks.) Schirnp.	16	s	Mr	S	h	sc
	R. megapolitanum (Blandow ex F. Weber & D. Mohr)	18	s	Mr	S	h	sc
	R. riparioides (Hedw.) Dixon	7, 12, 13, 18, 19, 20, 21, 22, 25, 26, 29, 32, 33	s, r, t, c	Ms	A	h	sc
	S. deflexifolium (Solms) M. Fleisch. & Loeske	16	r	Mr	S	h	sc
	Microeurhynchium pumilum (Wilson) Ignatov & Vanderpoorten	1	r	Mr	S	x	sc
	Oxyrrhynchium hians (Hedw.) Loeske	25	r, c	Mr	A	h	p
	O. speciosum (Brid.) Warnst.	19, 20, 21, 22, 25, 32, 33	s, r, t, c	Mr	A	h	sc
	Rhynchostegiella curviseta (Brid.) Limpr.	12, 16, 22	r	Ms	A	h	sc
	R. litorea (De Not.) Limpr.	20, 23	s, t	Mr	B	h	sc
	**Brachytheciastrum trachypodium* (Brid.) Ignatov & Huttunen	3, 27	s, r, t	Mr	A	m	p

	B. velutinum (Hedw.) Ignatov & Huttunen	3, 8, 11, 26, 27, 31, 32	s, r, t	Mr	A	x	p
	**Brachythecium geheebii* Milde	22	r	Mr	S	m	sc
	B. glareosum (Bruch ex Spruce) Schimp	19, 22	s, r, t	Mr	S	m	p
	**B. mildeanum* (Schimp.) Schimp	21, 22 27, 28, 30	s, r, t	We	S	h	p
	B. rivulare Schimp.	25, 33	r, c	Mr	S	a	sc
	B. rutabulum (Hedw.) Schimp.	12, 21, 25, 28	r, t, c	Mr	A	m	p
	B. salebrosum (Hoffm. ex F. Weber & D. Mohr) Schimp.	12, 21, 24, 27	s, r, t	Mr	S	m	p
	**B. tommasinii* (Sendtn. ex Boulay) Ignatov &Huttunen	22, 27	s, r	We	B	m	sc
	Homalothecium aureum (Spruce) H.Rob.	18, 26, 31, 32, 33	s, r, t	Mr	B	x	p
	H. lutescens (Hedw.) H. Rob.	28	r	We	S	x	p
	H. philippeanum (Spruce) Schimp.	3, 5, 9, 11, 27, 28	r, t	Mr	B	x	sc
	Kindbergia praelonga (Hedw.) Ochyra	25, 33	s, t	Mr	A	h	sc
	**Sciuro-hypnum populeum* (Hedw.) Ignatov	28	s	We	A	m	p
	S. starkei (Brid.) Ignatov & Huttunen	1	s	Mr	S	m	p
	Scleropodium touretii (Brid.) L. F. Koch	12	s, t	Mr	A	x	p
Pylaisiaceae	*Calliergonella cuspidata* (Hedw.) Loeske	28, 30	s, r	We	S	h	p
Leucodontaceae	*Leucodon sciuroides* (Hedw.) Schwägr	9, 12, 32	r, t	Mr	A	x	p
Neckeraceae	*Thamnobryum alopecurum* (Hedw.) Gangulee	33	r	De	S	h	sc

4. Discussion and Conclusions

As a result of the identification of bryophyte specimens collected from Ermenek Valley, a total of 163 taxa belonging to 29 family and 64 genera were determined. Marchantiophyta is represented by 10 taxa belonging to 8 family and 10 genera, Bryophyta is represented by 153 taxa belonging to 19 family and 54 genera. From the Bryophyta taxa, 113 are acrocarpous, 40 are pleurocarpous. The distribution of numbers of taxa determined in the study area according to families are shown in Table 3.

Pottiaceae is the most species-rich family in the study area as being in Turkey (Table 3). Pottiaceae, the acrocarpous moss family, contains many desiccation-tolerant members that can adapt to variable environments (Zander, 1993). Therefore, members of the family are common and abundant in the study area. The second richest family is Brachytheciaceae and its members usually grow on calcareous soil, rock and bark. Other species-rich families, Grimmiaceae and Bryaceae are containing drought-resistant taxa and growing on soil and rocks. Ermenek Valley which is located nearby Central Anatolian Region has different habitats such as humid, mesic, and arid environment. Furthermore, the climate of study area is semi-arid warm. These situations explain diversity of species and first rank. *Ptychostomum* (11 taxa) is the most common genus in the Ermenek Valley. Members of the genus grow on soil and rocks and have turf life form. Other common genera are *Syntrichia* and *Grimmia*. All two genera which have xerophytic members are represented by 10 taxa in the study area.

Table 3. The distrubition of the taxa according to the families.

Family	**Number of taxa**	**Percentage of taxa according to total number of taxa (%)**
Pottiaceae	44	26.99
Brachytheciaceae	26	15.95
Grimmiaceae	16	9.82
Bryaceae	16	9.82
Orthotrichaceae	13	7.98
Amblystegiaceae	9	5.52
Fissidentaceae	8	4.91
Mniaceae	5	3.07
Funariaceae	3	1.84
Bartramiaceae	3	1.84
Dicranellaceae	2	1.23
Southbyaceae	2	1.23
Pelliaceae	2	1.23
Adelanthaceae	1	0.61
Cephaloziellaceae	1	0.61
Jungermanniaceae	1	0.61
Lunulariaceae	1	0.61
Aytoniaceae	1	0.61
Marchantiaceae	1	0.61
Seligeriaceae	1	0.61
Pylaisiaceae	1	0.61
Leucodontaceae	1	0.61
Encalyptaceae	1	0.61

Rhabdoweisiaceae	1	0.61
Fabroniaceae	1	0.61
Neckeraceae	1	0.61
Pseudoleskeellaceae	1	0.61
Total	**163**	**100**

The acrocarpous taxa of the *Grimmia* (10 species) are characteristically common on the calcareous rocks in the study area. *Syntrichia ruralis*, *Grimmia pulvinata*, *Cratoneuron filicinum*, *Hygroamblystegium varium*, and *Rhynchostegium riparioides* are the most common species in the Ermenek Valley.

When the environmental acidity preferred by the taxa in the study area is considered; it is seen that 56.44% had subneutrophyte, 20.86% had acidophyte, 22.09% had basiphyte and 0.61% had neutrophyte character (Figure 3).

When the humidity tendencies of the taxa were evaluated, it was determined that 36.81% had hygrophyte, 27.61% mesophyte and 34.97% xerophyte characters (Figure 3). These results showed that humid, semi-arid and xeric habitats coexist in the Ermenek Valley.

When the light requirements of the taxa were analysed; It was determined that 107 taxa are photophytes and 56 taxa are sciophytes (Figure 3). While the photophytes are wide spreads on calcareous rocks in open areas of the valley, sciophytes are wide spreads on soil and rock under the humid forest floor and also on the tree trunks.

According to life forms analysis of the taxa, the turfs are in the first place with 42.94%. The cushions are in the second with 16.56% and the rough mats are in the third place with 15.95% (Figure 4). These results are not surprising in the study area, because especially acrocarpous mosses are dominant in the valley and also these taxa, most which are xerophytes have turf and cushion life forms. Other life forms are represented with relatively less proportions. These results are consistent with ecological and climatic feature of the study area.

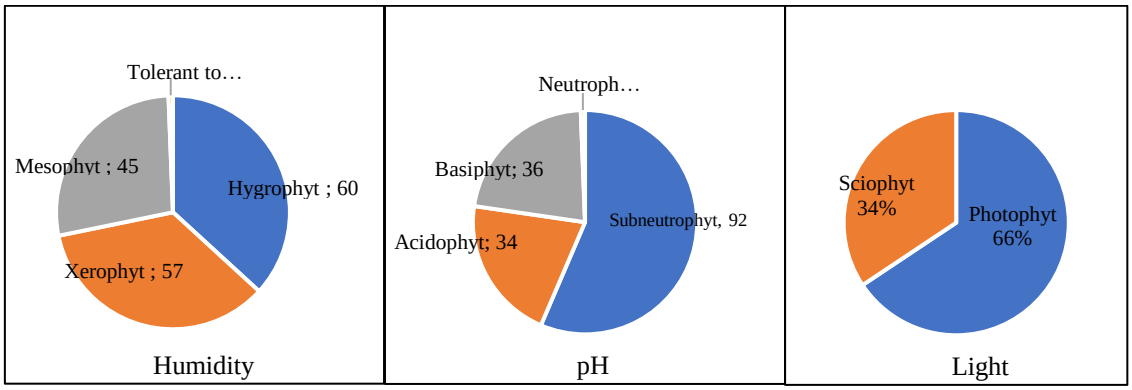

Figure 3. Taxa's humidity, acidity, and light preferences.

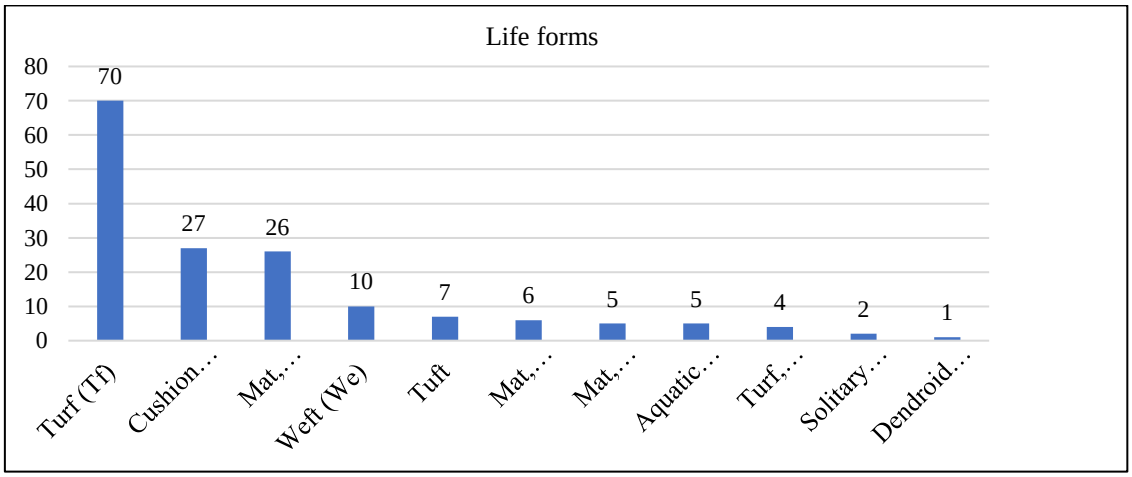

Figure 4. Life forms spectrum of taxa.

According to Henderson (1961)'s grid-square system, study area is located in the C12 square. Among the taxa identified from the study area, 39 are new for C12 square. From Marchantiophyta; 3 taxa, from Bryophyta; 36 are new for C12. *Fissidens gymnadrus* is recorded for the second time from Turkey (Figure 5). First record of the species was given from Mardin Province in C14 square (Ezer, 2016). Furthermore, *Pterygoneurum subsessile*, *Ptychostomum warneum*, *Orthotrichum hispanicum*, *Zygodon catarinoi* and *Seligeria donniana* are recorded for the third time from Turkey. At the same time, these taxa are new for the Mediterranean Region of Turkey.

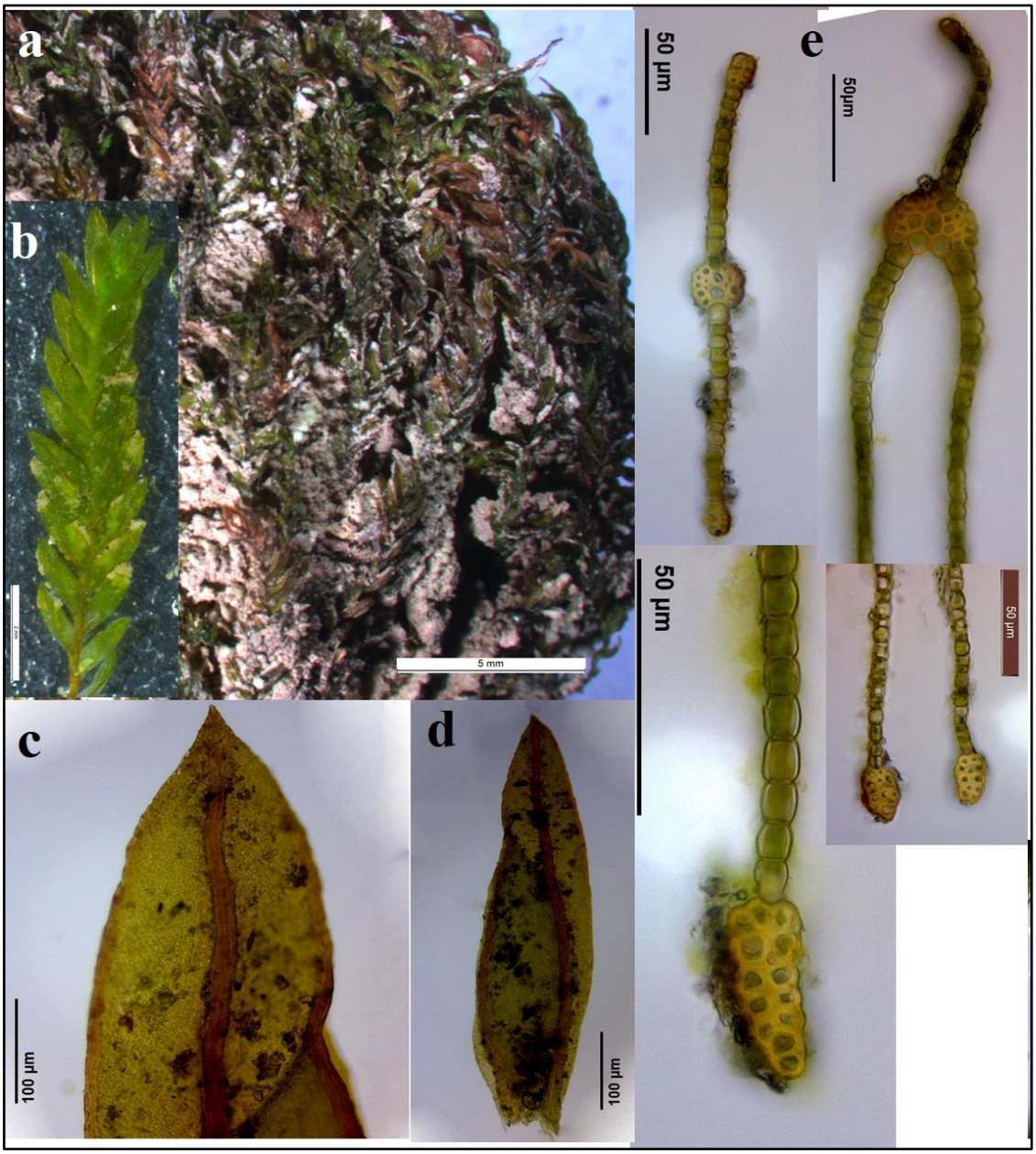

Figure 5. *Fissidens gymnandrus;* a) general view, b) habitus, c) apex of the leaf d) leaf, e) cross-section of leaf.

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