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Lichen taxonomic composition from MustafaKemalpaşa, Bursa district (Turkey)

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A total of 130 lichen taxa belonging to 24 families in *Ascomycotina* are listed for MustafaKemalPaşa, NW Turkey. *Tuckneraria laureri* and *Usnea substerilis* are newly recordeds for Turkey. Distribution and substrates are presented.

Key Words: Lichen, check list, MustafaKemalpaşa, Turkey

Introduction

Large parts of Turkey are still really unexplored with regards to their lichen flora. In recent years, however, there has been a substantial increase in the number of lichenogical papers referring to Turkey (ASLAN 2000, 2002a, b, GÖNÜLOL et al. 1995, JOHN et al. 2000, ÖZDEMIRTÜRK 2003, ÖZTÜRK and KAYNAK 1999, YAZICI 1995a, b, c, YAZICI 1996, YAZICI 1999a, YAZICI and ASLAN 2002a, b, YAZICI and ASLAN 2003). So far, no special work has been performed on lichens in MustafaKemalpaşa, while the other parts of Bursa have been studied (ÇOBANOĞLU 2005, GÜVENÇ and ASLAN 1994, GÜVENÇ and ÖZTÜRK 2004, ÖZDEMIR and ÖZTÜRK 1992, ÖZTÜRK 1990 and 1992, ÖZTÜRK and GÜVENÇ 1998, KALB and PLÖBST 1978, 1979, PISUT 1970, SCHINDLER 1998, STÄINER 1916, SZATALA 1960, VERSEGHY 1982, YAZICI 1999b). The present paper makes further contributions to our knowledge of the lichen flora of Turkey.

Study area

Investigations were mostly performed along and surrounding the Emet, Talan and Orhaneli Streams. In the study area, especially along the Emet and Talan Streams and their surroundings are seen forests densely and some rocks towards the summit of the mountains. In addition some areas, especially in the north and south-west of Emet and the west of Talan Stream, are covered by prairie areas. The study area is situated 39° 44’ 35’’ – 40° 13’

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00'' N and 28° 11' 00'' – 28° 48' 00'' E at localities with altitudes of 150–710 m (Fig. 1). MustafaKemalpaşa, located in in south-west of Bursa, is situated in the west of Turkey and to the south of the Marmara Sea. Most of the study area is located in the south and the south-west of MustafaKemalpaşa.

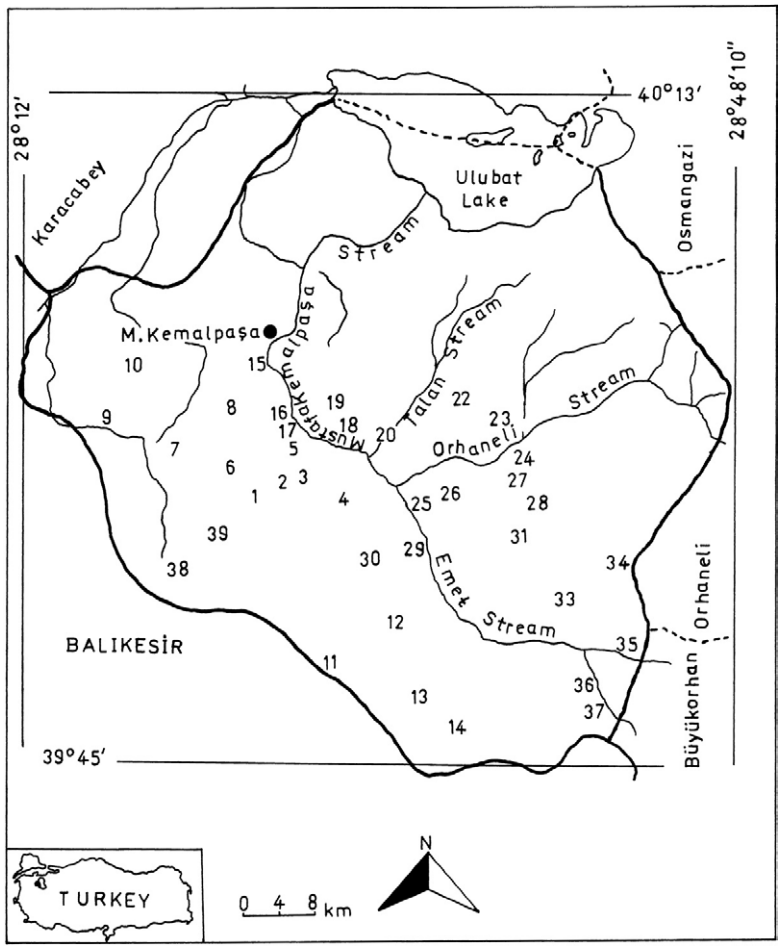

Fig. 1. Map of the study area with collecting sites and numbers

Especially in the north and south-west of Emet stream and the western part of Talan stream large areas have been converted into prairie. While the northern part consists of abundant prairie, from time to time in the south and south east the hills reach 700–800 m. There are few vallies and the height of the mountains decreases by 100–150 m towards the north.

Below 400 m the dominant vegetation type is macchia. Between 400 and 700 m, forest appears, especially along streams such as Emet and Talan and in their surroundings, mostly *Pinetum*, *Quercetum*, *Carpinetum*. In addition *Salix*, *Pinus Populus, Prunus, Alnus*, *Olea,*

Juniperus and *Pyrus* occur sparsely among other vegetation types in some parts of the study area. Especially in the north and south-west of Emet stream and the west of Talan stream large areas have turned into grassland.

The climate of Mustafa Kemalpaşa (Bursa) is mild and cool in summer. It is between continental and cool Mediterranean. Rainfall averages 668 mm per year, the highest precipitation occurring in January (94 mm) and December (118 mm) and the lowest in July (16 mm) and August (18 mm). Mean annual temperature is 14. 6 °C. Temperature ranges from a low of –16 °C in depth of winter to 40 °C on the hottest day in summer. Normally the highest annual temperature is in July, 23.6 °C, and the lowest in January, 4.9° C. It is quite humid (average 73%).

Materials and methods

The samples were collected from 39 different stations between August 1, 2002 and August 26, 2003 in MustafaKemalpaşa, Bursa (Tab. 1).

Tab. 1. The collecting stations and sites in MustafaKemalpaşa, Bursa

	Stations	Altitude	Latitude	Longitude	Date of colllection
1	Muradiye Sarnıç	350 m	39°56'25''	28°24'00''	1.viii.2002
2	Bahariye village, roadside	400 m	39°56'40''	28°25'30''	1.viii.2002
3	Akarca village, roadside	450 m	39°57'25''	28°26'30''	1.viii.2002
4	Şapcı village	500 m	39°56'20''	28°31'45''	2.viii.2002
5	Derekadı village	160 m	39°58'35''	28°25'50''	2.viii.2002
6	Şünlük village, roadside	150 m	39°57'35''	28°22'50''	2.viii.2002
7	Karapınar village	150 m	39°58'25''	28°19'30''	3.viii.2002
8	Kayabaşı village	150 m	39°59'25''	28°02'30''	3.viii.2002
9	Bostandere village	150 m	39°58'45''	28°15'45''	5.viii.2002
10	Boğazköy village	150 m	40°00'50''	28°17'15''	5.viii.2002
11	Soğucak village	650 m	39°49'25''	28°27'45''	7.viii.2002
12	Güvem village	600 m	39°51'00''	28°31'10''	7.viii.2002
13	Çakallar village	650 m	39°49'45''	28°32'25''	8.viii.2002
14	Sarımustafalar village, Roadside	650 m	39°46'45''	28°34'40''	8.viii.2002
15	Yalıntaş village	150 m	40°01'05''	28°24'00''	2.viii.2003
16	Orhaniye village	150 m	39°59'15''	28°25'00''	4.viii.2003
17	Hamidiye village	165 m	39°58'30''	28°26'00''	6.viii.2003
18	Karaorman village	200 m	39°58'30''	28°27'40''	9.viii.2003
19	Hisaraltı village	200 m	39°59'35''	28°27'40''	11.viii.2003
20	Çardakbelen village, Roadside	250 m	39°58'10''	28°30'25''	12.viii.2003
21	Güller village and roadside	450 m	40°00'00''	28°32'50''	12.viii.2003
22	Çamlıca village and roadside	500 m	39°59'35''	28°34'30''	13.viii.2003
23	Çömlekçi vilage and roadside	550 m	39°58'45''	28°36'40''	13.viii.2003
24	Karacalar village	500 m	39°57'15''	28°37'45''	14.viii.2003
25	Kösehoroz village	500 m	39°55'00''	28°32'00''	14.viii.2003
26	Yenibalçık vilage	550 m	39°55'35''	28°33'50''	14.viii.2003

Tab. 1. – Continued

	Stations	Altitude	Latitude	Longitude	Date of colllection
27	Soğukpınar vilage, roadside	600 m	39°56'15''	28°37'30''	15.viii.2003
28	Yenikızılelma, roadside	600 m	39°55'25''	28°38'40''	15.viii.2003
29	Yenice village and suroundings	600 m	39°54'15''	28°32'30''	16.viii.2003
30	Tırnova village	650 m	39°53'45''	28°29'45''	16.viii.2003
31	Fındıcak village	650 m	39°54'40''	28°38'00''	16.viii.2003
32	Alpagut village	600 m	39°51'45''	28°34'10''	17.viii.2003
33	Karaköy village	650 m	39°52'05''	28°40'15''	18.viii.2003
34	Çiviliçam village	680 m	39°53'45''	28°43'10''	18.viii.2003
35	Aşağıbalı village	650 m	39°50'00''	28°43'20''	20.viii.2003
36	Karaağaç, roadside	700 m	39°48'25''	28°41'10''	22.viii.2003
37	Hacıahmet, roadside	710 m	39°47'40''	28°41'45''	22.viii.2003
38	Surroundings of Suuçtu Waterfall	650 m	39°53'00''	28°19'00''	24 viii.2003
39	5 km to Suuçtu Waterfall, roadside	450 m	39°54'45''	28°21'45''	26 viii.2003

After drying at room temperature, a stereo microscope, a light microscope and the usual spot tests were used in the identification of the samples according to the reference books (CLAUZADE and ROUX 1985, DOBSON 1981, MOBERG and HOLMÅSEN 1992, POELT 1974, POELT and VĚZDA 1981, PURVIS et al. 1992, WIRTH 1995). Vouchers were deposited in the herbarium of the Biology Department, Giresun Science and Art Faculty, Karadeniz Technical University.

Results

The lichen taxa represented by collection station and substratum are listed alphabetically (Tab. 2). The taxonomic survey yielded 130 lichen taxa belonging to 57 genera in the MustafaKemalpaşa district. A total of 96 species belong to *Lecanorales*. The most diverse families were the *Parmeliaceae* (24 species), *Lecanoraceae* (15), *Physciaceae* (12), and *Theloschistacea* (12). In addition, 12 species were classified as *Teloschistales* and 9 species as *Peltigerales.*

The most abundant lichens at this study were *Flavoparmelia caperata,* (23 stations), *Cladonia rangiformis* (17 stations), *Parmotrema chinense* (14), and *Peltigera praetextata* (13) *Xanthoria parietina* (10) respectively.

Tab. 2. New records for the study area. (»#« indicates a new record for Turkey and »*« for Bursa)

SPECIES	STATIONS	SUBSTRATA
Acarospora cervina A. Massal.	38	calcareous rock
Acarospora fuscata (Nyl.) Arnold	39	calcareous rock
Anaptychia ciliaris (L.) Körb.	36	on the soil
	38	*Pinus sp.*
Arthonia glaucomaria (Nyl.) Nyl.	34	calcareous rock
Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold	13, 21	calcareous rock

Tab. 2. – Continued

SPECIES	STATIONS	SUBSTRATA
Aspicilia calcarea (L.) Mudd	3, 18	calcareous rock
Aspicilia cinerea (L.) Körb.	3	siliceous rock
Aspicilia intermutans (Nyl.) Arnold	39	calcareous rock
Caloplaca aurantia (Pers.) Hellb.	19	calcareous rock
Caloplaca biatorina (A.Massal). J. Steiner	21	calcareous rock
Caloplaca cerina (Ehrh. ex Hedw.) Th.Fr.	25	*Populus* sp.
**Caloplaca citrina* (Hoffm.) Th.Fr.	30, 31	calcareous rock
Caloplaca crenularia (With) J.R. Laundon	11	calcareous rock
**Caloplaca dolomiticola* (Hue) Zahlbr.	19	siliceous rock
Caloplaca flavovirescens (Wulfen) Dalla Torre et Sarnth.	8, 10, 38	siliceous rock
**Caloplaca marmorata* (Bagl.) Jatta	38	siliceous rock
Caloplaca saxicola (Hoffm.) Nordin	27, 38	calcareous rock
Caloplaca variabilis (Pers.) Müll. Arg.	34, 37	siliceous rock
Candelariella aurella (Hoffm.) Zahlbr.	7, 16, 23, 38	calcareous rock
Candelariella vitellina (Hoffm.) Müll. Arg.	7, 9, 16	siliceous rock
**Cetraria cetrarioides* (Del. ex Duby) W.Culb. et C.Culb	38	*Fagus* sp.
Cetraria islandica (L.) Ach	14, 27, 28, 35, 37, 38	on the soil
**Cetraria muricata* (Ach.) Eckfeldt	14, 35, 37, 38	on the soil
Cladonia cervicornis (Ach.) Flot.	26	on the soil
Cladonia foliacea (Huds.) Willd.	15, 16, 24, 25	on the soil
Cladonia furcata (Huds.) Schrad.	1	on the mosses
Cladonia pyxidata (L.) Hoffm. ssp. *pyxidata* (L.) Hoffm.	27, 28, 36, 38, 39	on soil
Cladonia rangiformis Hoffm.	1, 2, 3, 4, 7, 10, 11, 17,18, 20, 22, 24 26, 27, 34, 38, 39	on the soil
Cladonia symphycarpa (Flörke) Arnold	38	on the soil
Collema crispum (Huds.) Weber ex Wigg.	8 8	on the mosses calcareous rock
**Dermatocarpon luridum* (Dill. Ex With.) J.R.Laundon	38	calcareous rock
Dermatocarpon miniatum (L.) W.Mann	10, 18, 25, 39	calcareous rock
Diploschistes ocellatus (Vill.) Norman	26	calcareous rock
Diploschistes scruposus (Schreb.) Norman	3, 28	calcareous rock
**Diplotomma venustum* (Körb.) Körb.	39	calcareous rock
Evernia prunastri (L.) Ach.	34, 36, 37 38 38	*Carpinus* sp. *Pinus* sp. *Quercus* sp.
Flavoparmelia caperata (L.) Hale	1, 2, 8, 17, 23, 39 24, 33, 34, 38 14, 26, 34, 36 5, 6, 7, 10, 15, 16, 39 5, 20, 25, 35, 37	calcareous rock, *Quercus* sp. *Carpinus* sp *Populus* sp. *Prunus* sp

Tab. 2. – Continued

SPECIES	STATIONS	SUBSTRATA
**Hypogymnia austerodes* (Nyl.) Räsänen	38	*Pinus* sp.
	28	on the mosses
Hypogymnia physodes (L.) Nyl.	11, 36, 38	*Pinus* sp.
Immersaria athroocarpa (Ach.) Rambold et Pietschm.	39	calcareous rock
Lasallia pustulata (L.) Mérat	38	calcareous rock
Lecanora albella (Pers.) Ach.	38	*Carpinus* sp.
**Lecanora argentata* (Ach.) Malme	36	*Carpinus* sp.
**Lecanora argopholis* (Ach.) Ach.	34	calcareous rock
**Lecanora bolcana* (Pollich) Poelt	13, 17	calcareous rock
Lecanora campestris (Schaer.) Hue	2	siliceous rock
Lecanora crenulata (Dicks.) Hook.	4, 39	siliceous rock
Lecanora dispersa (Pers.) Röhl.	21	siliceous rock
Lecanora polytropa (Hoffm.) Rabenh.	36	siliceous rock
**Lecanora pruinosa* Chaub.	19	calcareous rock
Lecanora pulicaris (Pers.) Ach.	38	*Carpinus* sp.
Lecidea atrobrunnea (Ramond) Schaer.	39	calcareous rock
**Lecidea fuscoatra* (L.) Ach.	39	siliceous rock
**Lecidea lurida* Ach.	38	on the soil
Lecidea plana J.Lahm.	34	siliceous rock
Lecidea promiscens Nyl.	37	siliceous rock
**Lecidea variegatula* Nyl.	38	calcareous rock
**Lecidella anomaloides* (A.Masal.) Hertel et Kilias	38	calcareous rock
Lecidella elaeochroma (Ach.) M. Choisy	38	*Carpinus* sp.
Lecidella stigmatea (Ach.) Hertel et Leuckert	34	calcareous rock
Lepraria incana (L.) Ach.	8,20	siliceous rock
**Leptogium corniculataum* (Hoffm.) Minks	38	on the mosses
Lobothallia radiosa (Hoffm.) Hafellner	6, 22	calcareous rock
Melanelia exasperata (De Not) Essl.	38	*Pinus* sp.
	38	calcareous rock
Melanelia disjuncta (Erichsen) Essl.	36	siliceous rock
**Melanelia exasperatula* (Nyl.) Essl.	36	calcareous rock
Parmelia saxatilis (L.) Ach.	39	*Quercus* sp.
Parmelia sulcata Taylor	38, 39	*Quercus* sp.
Parmelina quercina (Willd.) Hale	39	*Quercus* sp.
Parmelina tiliacea (Hoffm.) Hale	38	*Quercus* sp.
Parmotrema chinense (Osbeck) Hale et Ahti	3, 14, 26, 38	*Quercus* sp.
	4, 22, 25	*Prunus* sp.
	21, 28, 32	*Pyrus* sp.
	5, 13, 27	*Alnus* sp
	36, 38, 39	*Pinus* sp.
	38	*Carpinus* sp.

Tab. 2. – Continued

SPECIES	STATIONS	SUBSTRATA
**Parmotrema stuppeum* (Taylor) Hale	38	*Pinus* sp.
Peltigera canina (L.) Willd.	23, 24	on the soil
	3, 38	on the mosses
**Peltigera didactyla* (With.) J.R.Laundon	34	on the soil
Peltigera horizontalis (Huds.) Baumg.	13	on the soil
Peltigera malacea (Ach.) Funck	33	on the soil
	39	on the mosses
Peltigera polydactylon (Neck.) Hoffm.	26	on the mosses
Peltigera praetextata (Flörke ex Sommerf.) Vain.	7, 8, 9, 11, 13, 14, 17, 19, 30, 34, 35, 38, 39	on the mosses
Peltigera rufescens (Weiss) Humb.	38	on the soil
	39	on the mosses
**Peltigera venosa* (L.) Baumg.	38	on the soil
Pertusaria amara (Ach.) Nyl. var. *amara*	38	*Carpinus* sp.
Pertusaria pertusa (Weigel) Tuck.	38	*Carpinus* sp.
Phaeophyscia orbicularis (Neck.) Moberg	10, 17	*Alnus* sp.
	18, 19	*Prunus* sp.
Physcia adscendens (Th.Fr.) Olivier	20, 22	*Quercus* sp.
	25, 31	*Pyrus* sp.
	1, 3	calcareous rock
Physcia caesia (Hoffm.) Fürnr.	9, 39	siliceous rock
Physcia semipinnata (J. F. Gmel.) Moberg	38	*Quercus* sp.
	38	*Juniperus* sp.
Physcia tenella (Scop.) DC.	19	*Populus* sp.
**Physconia detersa* (Nyl.) Nyl.	39	on the mosses
Physconia distorta (With.) J.R.Laundon	39	*Quercus* sp.
Physconia muscigena (Ach.) Poelt	32	on the mosses
Placynthium nigrum (Huds) Gray	38	calcareous rock
**Placopyrenium bucekii* (Nádv. et Servit) Breuss	39	siliceous rock
Pleurosticta acetabulum (Neck.) Elix et Lumbsch	38	*Quercus* sp.
**Polysporina simplex* (Davies) Vezda	36	calcareous rock
Porpidia cinereoatra (Ach.) Hertel et Knoph	32, 35	calcareous rock
Porpidia crustulata (Ach.) Hertel et Knoph	4, 16	calcareous rock
**Porpidia macrocarpa* (DC.) Hertel et Schwab	8	calcareous rock
**Protoblastenia rupestris* (Scop.) J. Steiner	35	siliceous rock
Protoparmeliopsis muralis (Schreb.) M.Choisy	2, 9, 15, 25, 31	calcareous rock
Pseudevernia furfuracea (L.) Zopf. var. *furfuracea*	13, 34, 36, 37, 38	*Pinus* sp.
Psora decipiens (Hedw.) Hoffm.	37	on the soil
**Pyrenula nitida* (Weigell) Ach.	38	*Carpinus* sp.
Ramalina farinacea (L.) Ach.	12, 14, 36, 38, 39	*Carpinus* sp.
	13,14, 38	*Quercus* sp.
	29, 34, 37	*Pinus* sp.

Tab. 2. – Continued

SPECIES	STATIONS	SUBSTRATA
Ramalina obtusata (Arnold) Bitter	39	Siliceous rock
	14	calcareous rock
**Ramalina pollinaria* (Westr.) Ach.	33	*Carpinus* sp.
**Ramalina subgeniculata* Nyl.	38	*Fagus* sp.
**Rhizocarpon distinctum* Th. Fr.	36	siliceous rock
Rhizocarpon geographicum (L.) DC.	37	siliceous rock
**Rhizocarpon lavatum* (Fr.) Hazsl.	37	siliceous rock
**Rhizocarpon lecanorinum* Anders	37	siliceous rock
Rhizocarpon obscuratum (Ach.) A.Massal.	37	siliceous rock
**Rinodina oxydata* (A.Massal.) A.Massal.	39	calcareous rock
**Rinodinella controversa* (A. Massal.) H.Mayrhofer et Poelt	37	calcareous rock
**Sarcogyne privigna* (Ach.) A.Massal.	39	siliceous rock
**Sporastatia testitunea* (Ach.) A. Massal.	37	calcareous rock
**Staurothele areolata* (Ach.) Lettau	36	calcareous rock
Tephromela atra (Huds.) Hafellner	15	siliceous rock
Toninia sedifolia (Scop.) Timdal	11, 14	on the soil
**Trapeliopsis granulosa* (Hoffm.) Lumbsch	35	on the soil
**Tuckermannopsis chlorophylla* (Willd). Hale	12, 38	*Pinus* sp.
#*Tuckneraria laureri* (Kremp.) Randlane & A.Thell	38	*Pinus* sp.
Umbilicaria cylindrica (L.) Delise ex Duby	37	siliceous rock
Usnea filipendula Stirt.	37	*Pinus* sp.
#*Usnea substerilis* Motyka	38	*Pinus* sp.
**Verrucaria marmorea* (Scop.) Arnold	39	calcareous rock
**Verrucaria ochrostoma* (Borrer ex Leighton) Trevisan	39	siliceous rock
Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale	5, 10, 18, 22, 32, 38	calcareous rock.
**Xanthoparmelia somloensis* (Gyeln.) Hale	39	siliceous rock
Xanthoria parietina (L.) Th. Fr.	6, 7, 9	*Populus* sp.
	9, 20, 23	*Alnus* sp.
	6, 29	*Prunus* sp.
	5	siliceous rock
	1, 2	calcareous rock
	38	*Quercus* sp.
Xanthoria elegans (Link.) Th. Fr.	34	siliceous rock

Discussion

Tucneraria laureri and *Usnea substerilis* are new records for Turkey and 44 lichen species are newly records for Bursa province.

In the study area all of the species were found on 13 different substrata. Of the species, 71 are crustose (54.6 %), 43 are foliose (33.7 %), 15 are fruticose (11.5 %) and 1 is leprose (0.7 %).

A total of 37 species were defined to be epiphytic only, 68 as saxicolous, 14 as terricolous only, 4 as epiphytic and saxicolous and 3 as epiphytic and terricolous. Besides 4 species were seen growing on mosses only, 3 on the mosses and soil only. 29 species grow on siliceous rock and 40 on calcareous rocks. 26 species grow on deciduous trees. Of these, 11 grow on *Carpinus* L., 12 on *Quercus* L., 4 on *Populus,* 3 on *Prunus* and *Alnus.* 14 species were found on coniferous trees. Of these 12 grow on *Pinus* and 1 on *Juniperus.* In addition 4 species were defined to grow on both coniferous and deciduous trees.

Station 38, where 39 species were identified, is the most reach in species. The second is station 39, where 30 species were found. The highest species densities were observed in stations 37, 36 and 34.

It was determined that the most diverse lichen taxa mostly grew at altitudes of 550–650 m (68 species) (Fig. 2), while the least diversity was found at altitudes of 200–350 m (16 species). The most lichen species were identified at 450 and 650 m and the least at 160 m (Fig. 3). Figure 4 shows that the most diverse crustose lichen taxa were defined between 550–650 m (24 species), and the least between 200–350 m (4 species). On the other hand the most diverse foliose and fruticose lichen taxa were found between 550–650 m. Both foliose and fruticose lichen taxa were defined less in fields at lower than 550 m. Foliose, crustose and fruticose lichen species were determined to be concentrated at 650 m in terms of distribution (Fig. 5).

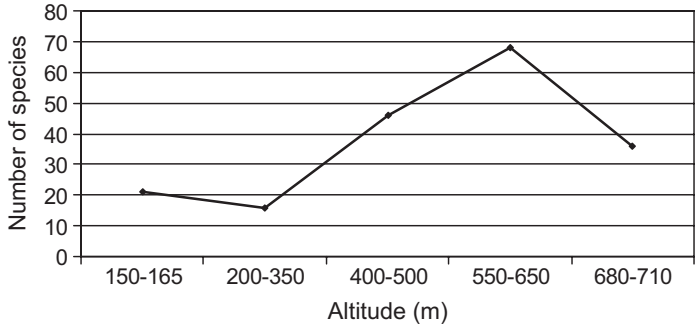

Fig. 2. Numerical distribution of lichen species according to segmentation of altitudes

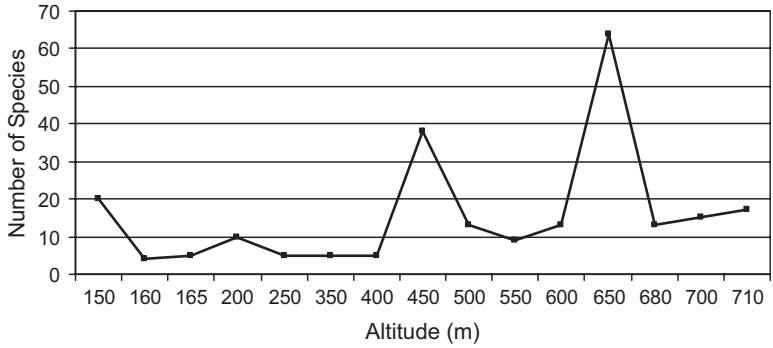

Fig. 3. Numerical distribution of lichen species according to altitudes

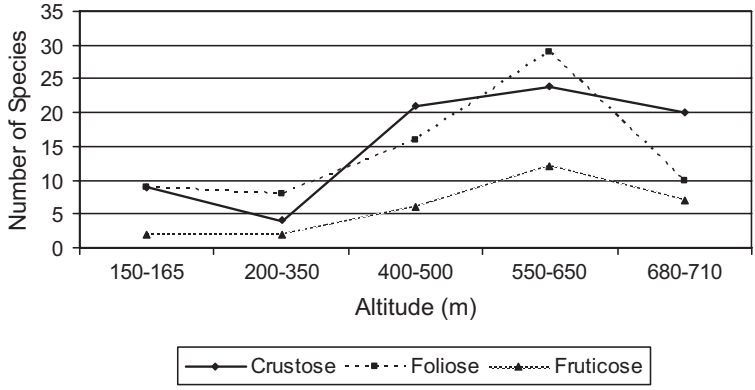

Fig. 4. Distribution of crustose, foliose and fruticose lichen species according to segmentation of altitudes

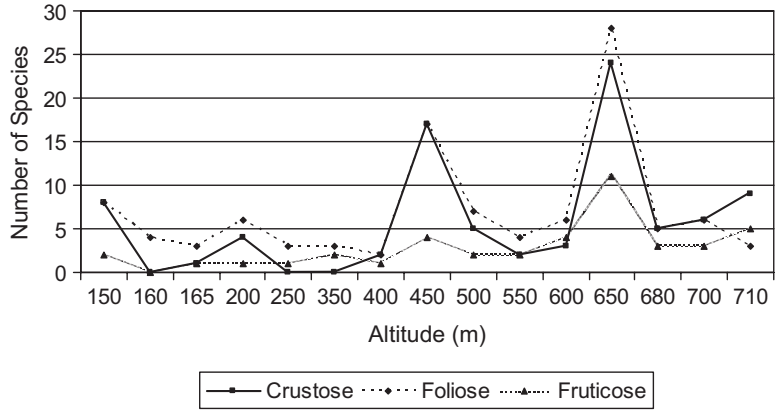

Fig. 5. Distribution of crustose, foliose and fruticose lichen species according to altitudes

Most of the foliose lichens got an opportunity to grow on deciduous and coniferous trees generally at 650 m while the majority of the crustose lichens were found to grow on rocks (57 species) (Fig. 6). It is a striking phenomenon that the rocks were mostly preferred to other habitats by lichen species and only one species was found on *Juniperus* (Fig. 7).

It was seen that there are a lot of rocks, deciduous and coniferous trees especially on the roadside towards the uplands. On the other hand it is a characteristic that there is a deficiency of such trees and rocks in the lower fields. This is why crustose lichen taxa are more abundant than the others. In addition this condition enabled foliose species such as *Parmelia* spp, *Parmelina* spp, *Ramalina farinacea, Physcia* spp *and Physconia* spp to grow on deciduous trees.

In the study area diversity of lichen taxa increases from 150 m towards 710 m and the most diverse foliose, crustose and fruticose lichen species were determined at heights over 550 m, especially the surroundings of Suuçtu Waterfall and also on the roadside towards Suuçtu Waterfall. High rainfall, soft and arid soil do not allow lichen taxa to grow easily in

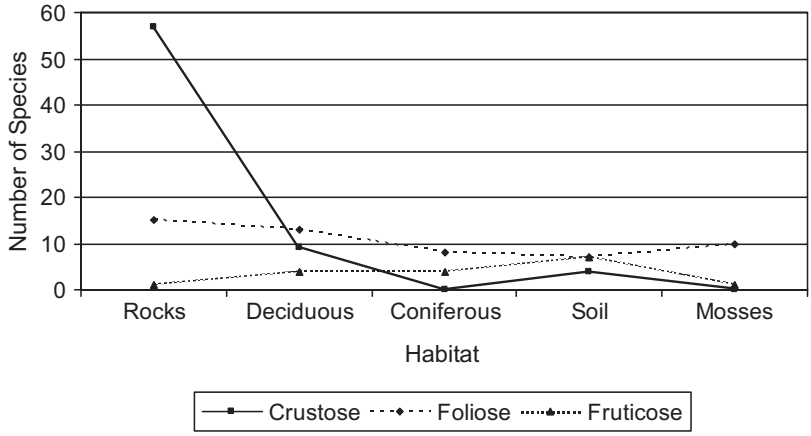

Fig. 6. Numerical distribution of crustose, foliose and fruticose lichens species according to the habitats

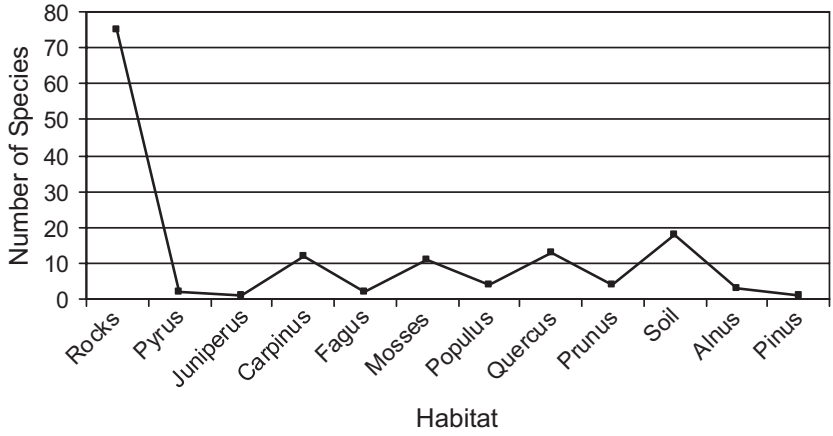

Fig. 7. Numerical distribution of lichens species according to the habitats

lower fields. Besides, large areas are converted into grassland and meadows. Deciduous trees at the sides of the streams and roads, such as *Quercus*, *Carpinus*, *Pyrus* and *Prunus,* and also siliceous and calcareous rocks enable lichen species to grow in the uplands, especially at altitudes of 600–710 m. In these altitudes *Hypogymnia physodes* were commonly defined on the acidic barks of *Pinus* sp.

Common foliose lichen taxa such as *Flavoparmelia*, *Parmelia*, *Melanelia and Ramalina* of fruticose species were mostly found after 450 m on deciduous trees. Of these, *Flavoparmelia caperata* was found abundantly on calcareous rocks, *Quercus, Carpinus*, *Populus* and *Prunus*

In the study area it was expected that *Ramalina*, *Parmelia* and *Melanelia* would be common. But these genera were seen to be scanty at lower altitudes because of structure of the soil, deficiency of the rocks, deciduous and coniferous trees in lower areas above than

Tab. 3. Numerical distribution of the foliose, crustose and fruticose lichen species according to habitats at altitudes. The first column represent crustose lichens, the second foliose lichens and third fruticose lichens.

Habitat	Altitude																													
	150			160			165			200			250			350			400			450			500			550			600			650			680			700			710		
Rocks	8	5	–	–	2	–	1	1	–	4	2	–	–	–	–	–	3	–	2	2	–	8	5	1	4	2	–	2	1	–	3	1	–	16	3	1	5	1	–	4	2	–	8	1	–
Soil	–	–	2	–	–	–	–	–	1	–	–	1	–	–	1	–	–	2	–	–	1	–	1	1	–	1	3	–	1	2	–	–	2	3	4	5	–	–	1	–	1	1	1	–	2
Mosses	–	2	–	–	–	–	–	1	–	–	1	–	–	–	–	–	–	1	–	–	–	–	3	–	–	–	–	–	1	–	–	2	–	–	3	–	–	–	–	–	–	–	–	–
Deciduous	–	3	–	–	2	–	–	1	–	–	–	–	–	3	–	–	–	–	–	–	–	6	1	1	3	–	–	3	–	–	1	7	9	3	–	1	1	1	2	2	–	1	1
Coniferous	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	10	2	–	1	1	–	2	–	–	1	2

400 m. On the other hand these genera were found on deciduous trees and rocks between 600–710 m. Since excessive rain wears away the surface of the soil in the forests, *Cladonia*, *Peltigera, Leptogium* and *Collema* were found not to grow abundantly hereabouts. The majority of these species were determined to grow mostly on the sloping soil of shady and unleached fields in comparison to other fields (Tab. 3).

Protoparmeliopsis muralis, though one of the most common species in Turkey, was not found in abundance, because of the deficiency of nutrient-rich and calcareous rocks.

The most diverse genera are *Lecanora* (10 species), *Caloplaca* (10), *Peltigera* (8) and *Cladonia* (6) *and Rhizocarpon* (5). The genus *Lecanora* grows on siliceous and calcareous rock between 450–700 m while *Caloplaca* was found mostly at 650 m on calcareous rocks. All *Rhizocarpon* species grow on siliceous rocks in the Karaağaç and Hacıahmet districts at 700 and 710 and while *Peltigera* species were seen to grow on the mosses and soil on roadside near streams and in the forests especially at 450 and 650 m.

Some species were found to grow on *Pinus* at altitudes of 650, 680 and 700 m. These are *Anaptychia ciliaris, Tuckermannopsis chlorophyla, Tuckneraria laureri, Evernia prunastri, Hypogymnia austerodes, Hypogymnia physodes, Parmotrema chinense, Melanelia exasperata*, *Pseudevernia furfuracea.* var. *furfuracea* and *Ramalina farinacea*.

It is a characteristic that from time to time *Cetraria islandica* was seen to be growing together with *Cetraria muricata* in 6 stations.

Crustose lichen taxa such as *Lecanora*, *Lecidea*, *Caloplaca* and *Rhizocarpon* were seen mostly to grow on siliceous and crustose rocks on the roadside by Mustafa-Kemalpaşa, Talan and Emet streams between 500–710 m.

Xanthoria parietina, being one of the other most common lichen taxa in Turkey, was mostly found on deciduous trees at roadsides at both lower and high altitudes, except for a few on siliceous and calcareous rocks. In addition it was found that this species, like *Protoparmeliopsis muralis*, *Cladonia*, especially *Cladonia rangiformis* and *Peltigera*, was not plentiful because of the unsuitable habitat, erosion of the soil, arid soil and excessive grassland.

As regards to choosing substrata *Xanthoria parietina*, *Parmotrema chinense Flavoparmelia caperata* were defined to be the least sensitive. *Flavoparmelia caperata,* growing on 5 different substrata, was found in 23 stations, *Parmotrema chinense* found in 15 stations grew on 6 different substrata and *Xanthoria parietina,* found in 11 stations, grows on 6 different substrata.

Consequently it is a striking phenomenon of this study area that crustose lichen species are identified more frequently than the others because the acid bark of *Pinus, Ulmus*, *Acer* and *Fraxinus* may have restricted the growth of foliose and some fruticose lichen species such as *Usnea*, *Bryoria*, *Evernia*, *Ramalina.* In addition the soft and eroded soil and large grassland areas may have also restricted the reproduction of the fruticose lichen taxa. Foliose lichens are more common at altitudes of 450 and 650 m than at the other altitudes This is why there are more deciduous and coniferous trees at these altitudes (Tab. 3).

Economic and medical species such as *Evernia prunastri*, *Pseudevernia furfuracea* var. f*urfuracea, Anaptychia ciliaris, Ramalina farinacea, Xanthoria parietina, Cetraria islandica, Peltigera canina, Cladonia rangiformis* were also defined in the study area. It is known that these plants are used among Turkish people, but publications based on this subject are not intensive.

Tucneraria laureri and *Usnea substerilis* usually grow on acidic habitats like the bark of *Pinus* and *Picea* in the forests. Genera *Tucneraria* and *Usnea* are mostly seen on *Picea*, *Fagus* and *Pinus* in the forests of Black Sea Region.

Arthonia glaucomaria, Lecidea fuscoatra, Leptogium corniculataum, Immersaria athroocarpa, Melanelia disjuncta Parmotrema stuppeum, Placopyrenium bucekii, *Polysporina simplex, Ramalina obtusata, Rhizocarpon lavatum, Rinodina oxydata, Rinodinella controversa, Sarcogyne privigna, Trapeliopsis granulosa, Verrucaria marmorea* are among those rarely defined in Turkey.

Dermatocarpon luridum, Lecidea variegatula, Lecidella anomaloides, Ramalina subgeniculata, Verrucaria ochrostoma were defined for only the second time in Turkey.

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