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Lichens from Antalya, Çankiri, Konya and Nevşehir Provinces (Turkey)

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Abstract: A contribution to the lichen flora of Turkey is performed. A total of 171 lichen taxa (including 2 subspecies and 2 varieties) and 1 lichenicolous fungus are determined from 14 localities in Antalya, Çankiri, Konya and Nevşehir provinces of Turkey. *Caloplaca scrobiculata* H.Magn. is new to Turkey. Besides *Caloplaca scrobiculata* H.Magn. and *Xanthoria soredata* (Vain.) Poelt were found for the second time in Asia. *Carbonea vitellinaria* (Nyl.) Hertel was found to grow on *Candelariella vitellina* (Hoffm.) Müll.Arg. while *Muellerella pymaea* (Körb.) D. Hawksw. var. *athallina* (Müll. Arg.) Triebel (lichenicolous fungus) on *Tephromela atra* (Huds.) Hafellner as parasitic. All lichen taxa found in Çankiri are new to this province (92 intraspecific taxa), while 39 new to Nevşehir, 8 new to Konya and 5 new to Antalya provinces. For every each taxon, the habitat pattern and distribution data are presented.

Key words: *Ascomycota*, biodiversity, flora, lichen

INTRODUCTION

The lichens of Turkey were not studied as extensive as in many European countries Therefore the lichen flora of Turkey is still largely unknown. In the last year, many lichen taxa were reported for the lichen flora of Turkey (Boom Van Dam *et al.*, 2007; Çobanoğlu, 2007; Çobanoğlu and Yavuz, 2007; Doğru and Güvenç, 2007; Duman and Yurdakulol, 2007; Halici *et al.*, 2007a, b; Kinalioğlu, 2007a,b; Yazici and Aslan, 2007; Yazici and Aptroot, 2007; Yazici *et al.*, 2007a, b; 2008). Nevertheless some literatures (Steiner, 1909; Karabulut and Özdemir, 1998; Nimis and John, 1998; Schindler, 1998; John *et al.*, 2000; Güvenç, 2002; John, 1996, 2002; Breuss and John, 2004; Tufan *et al.*, 2005; Halici *et al.*, 2006; Çobanoğlu, 2005, 2007; Çobanoğlu and Sevgi, 2006; Verseghe, 1982; Çobanoğlu and Yavuz, 2007) include lichens from the provinces presented in this study. Only 3 intraspecific lichen taxa (*Bryoria capillaries* (Ach.) Brodo and D. Hawksw., *Megalania laureri* (Hepp ex Th. Fr.) Hafellner and *Usnea czeczottiae* Motyka) have been noted from Çankiri so far (Kalb and Plöbst, 1979; Steiner, 1916) while only 28 taxa from Nevşehir, 273 from Antalya and 130 from Konya.

The aim of the study is to contribute to the lichen flora of Çankiri and Nevşehir where there are no

intensive studies and also to the lichen flora of Antalya and Konya for their areas which have not been largely studied.

MATERIALS AND METHODS

The lichen samples were collected from 14 stations from 20 May 2005 to 20 April 2006 with altitudes of 100 to 1200 m (Table 1) in Antalya, Çankiri, Konya and Nevşehir provinces, Turkey. After dried at the room temperature, a stereo microscope, a light-microscope and the usual spot tests were used in the identification of the samples, together with the following references: Poelt (1974), Poelt and Vezda (1981), Purvis *et al.* (1992), Wirth (1995) and Brodo *et al.* (2001). Voucher specimens were deposited in the herbarium of the Biology Department, Faculty of Sciences and Arts, Karadeniz Technical University.

Descriptions of the study areas: In this study, lichens of provinces Antalya, Çankiri, Konya and Nevşehir (Fig. 1) were investigated. Çankiri, Konya and Nevşehir have a continental climate. Summers are hot and dry, while winters are cold and snowy. In Nevşehir mean annual temperature 10.6°C, Temperature ranges from a low of -23.6°C in depth of winter to 37.6°C on hottest day in summer. In general rainfall is not seen in

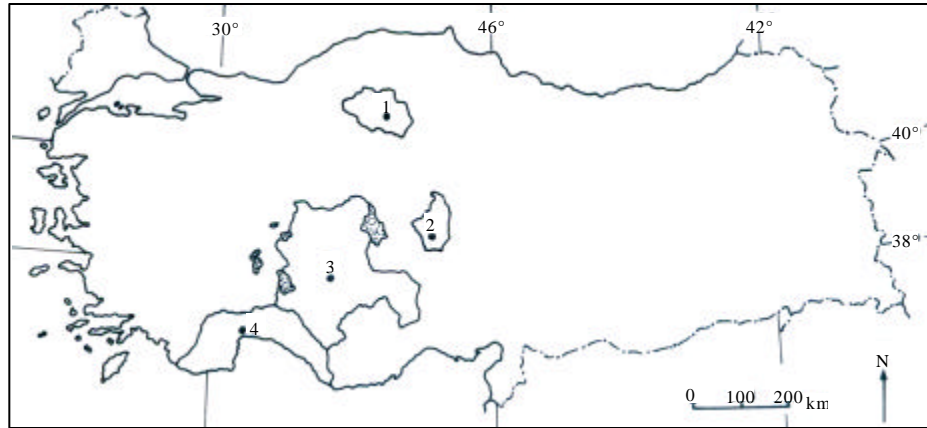


Fig. 1: Map of the study area with collecting sites (1: Çankiri, 2: Nevşehir, 3: Konya, 4: Antalya)

Table 1: Collecting sites

Çankiri-Center, Yanlar Village, 770 m., 41°33' N, 33°04' E, 17.02.2006
Çankiri-Center, Fidanlık, excursion spot, 780 m., 41°35' N, 33°05' E, 17.02.2006.
Çankiri-Center, T.C.D.D. Depo Müdürlüğü Bahçesi, 750 m., 40°37' N, 33°36' E, 18.04.2006
Çankiri-Center, Tüney Village, 720 m., 40°23' N, 33°34' E, 18.04.2006.
Çankiri: Kuşunlu county, Bereket Village 1150 m. 40°52'15" N, 33°19'10" E, 19.04.2006
Çankiri: Kuşunlu county, Çirdak Village, 1155 m, 40°56'35" N, 33°19'30" E, 19.04.2006
Çankiri: Korgun county-Center, 790 m. 40°44'50" N, 33°31'00" E, 20.04.2006
Konya: Seydişehir county, Main roadside to Seydişehir, 1200 m, 37°28' N, 31°48' E, 23.05.2005
Nevşehir: Avanos County-Center, Hisarkale, 950 m, 38°40' N, 34°48' E, 20.05.2005
Nevşehir: Avanos County-center, near the Kizilirmak river, 950 m, 38° 39' N, 34° 47'30" E, 20.05.2005
Nevşehir: Göreme county, 1000 m, 38° 33' N, 34° 45' E, 20.05.2005
Antalya: 19 km E of Akseki, 900 m, 37°01' N, 31° 30' E, 21.05.2005
Antalya: Murtıçı County, 19 km W of Akseki, 900 m, 36° 48' N, 31° 25' E, 22.05.2005
Antalya: Serik County, Surrounding of Aspendos, 200 m, 36° 53' N, 31° 05' E, 22.05.2005

July, August, September and October. Rainfall averages 429.4 mm per year, the highest precipitation is 570.1 mm, the lowest 289.3 mm (Akman, 1999). Cappadocia is a mountain area that was created from a series of volcanic eruptions. Nevşehir has a steppe plants and there is no tree communities. From time to time *Quercus* trees are seen in some areas. *Salix*, *Populus* and *Juglans* grow along valleys. Nevşehir has not high mountains and its aspect is high plateau form (Baytop and Denizci, 1963).

Antalya has a typical Mediterranean climate with mild winters and hot summers, with temperature often rising above 30°C in July and August. Summers are hot and dry, winters are warm and rainy. Average humidity is 64%. Mean annual temperature is 28-36°C in summer while the lowest 10-20°C in January (Akman, 1999). Antalya has a steppe vegetation and forest areas between 500-600 m while *Cedrus* sp., *Juniperus* sp., *Picea orientalis* (L.) Link, *Pinus brutia* Henry and *Pinus nigra* Arnold in upper altitudes (Baytop and Denizci, 1963).

In Çankiri the most of the forest areas have been destroyed so forest communities are seen only some fields. *Abies* sp., *Cornus* sp., *Picea orientalis* and *Quercus* sp. trees are present in high altitudes while

Populus sp. and *Salix* sp. along streams and gardens (Baytop and Denizci, 1963).

Seydişehir (Konya), which is located on Seydişehir Plain, is surrounded by mountains. Mean annual rainfall is 750 mm while mean annual temperature 11-12°C (Akman, 1999). In high altitudes are seen *Abies* sp., *Cedrus* sp., *Juniperus* sp. and *Pinus nigra* while trees are poor in lowlands (Baytop and Denizci, 1963).

RESULTS

The taxonomic survey of Antalya, Çankiri, Konya and Nevşehir (Table 1) yielded 171 lichen taxa (including 2 subspecies and 2 varieties) belonging to 59 genera and 28 families in Ascomycota and 1 lichenicolous fungus from 14 localities. A total of 111 lichen taxa belong to *Lecanoromycetes*. *Caloplaca scrobiculata* H.Magn. is new record for Turkey. Besides, *Caloplaca scrobiculata* and *Xanthoria sorediata* (Vain.) Poelt were found for the second time in Turkey and Asia.

Caloplaca scrobiculata is a crustose species, to 1-3 (-5) cm diam., orange-yellow or pale orange-red ±continuous, wrinkled-plicate to ±areolate centrally,

±plicate-radiate at margins, sometimes very thin, K+purple, saxicolous. Apothecia scattered, 0.2-1.2 mm diam, often numerous centrally, sessile to subpedicellate, rounded or contorted through mutual pressure; disc plane to subconvex, concolorous with thallus, matt to slightly roughened, margins prominent, entire, concolorous with thallus. Ascospores biseriata, 2-locular, fusiform (11-)12-17(-18) × 6.5-8.5 µm. It is a species of the southern Eurasiatic mountains, found on steeply inclined, compact limestone and dolomite.

The most diverse families were Teloschistaceae (30 intraspecific lichen taxa), Physciaceae (26 intraspecific taxa), Parmeliaceae (16 intraspecific taxa) and Verrucariaceae (12 intraspecific taxa), respectively. All lichen taxa found in Çankiri are new to this province (92 intraspecific taxa), while 39 new to Nevşehir, 8 new to Konya and 5 new to Antalya provinces (Table 2). On the other hand, all the taxa are new to their localities except Seydişehir (Konya), since the samples were collected from the 14 collecting sites for the first time.

Table 2: List of lichen taxa and lichenicolous fungi

Species	Stations and herbarium numbers	Substrata
[NE] <i>Acarospora batiqfusca</i> (Nyl.) Th. Fr.	9a; Yazici 1363	Limestone
[ÇA, NE] <i>A. cervina</i> A. Massal.	7, 8, 9a, b, 10; Yazici 1379	Calcareous rock
[ÇA, NE] <i>A. fuscata</i> (Nyl.) Arnold	5, 9a, 10; Yazici 1365	Calcareous rock Limestone
<i>A. impressula</i> Th. Fr.,	8; Yazici 1376	Siliceous rock
[ÇA] <i>A. umbilicata</i> Bagl	7; Yazici 1407	Siliceous rock
[NE] <i>A. veroneis</i> A. Massal.	9a; Yazici 1412	Limestone
[NE] <i>A. versicolor</i> Bagl. and Carestia	9a, 10; Yazici 1418	Limestone
<i>Anaptychia ciliaris</i> (L.) Körb.	11; Yazici 1416	<i>Pinus</i> sp.
[AN] <i>A. setifera</i> Räsänen	11; Yazici 1422	<i>Pinus</i> sp.
[ÇA] <i>Arthonia dispersa</i> (Schrad.) Nyl.	5; Yazici 1364	<i>Robinia pseudoacacia</i>
[ÇA] <i>Arthonia pinastri</i> Anzi	1; Yazici 1367	<i>Pinus</i> sp.
[ÇA] <i>Arthonia radiata</i> (Pers.) Ach.	5; Yazici 1417	<i>Fraxinus</i> sp.
[ÇA] <i>Aspicilia calcarea</i> (L.) Mudd	7, 8, 13; Yazici 1419	Calcareous rock
[ÇA] <i>A. cinerea</i> (L.) Körb.	7; Yazici 1431	Siliceous rock
[ÇA] <i>A. contorta</i> (Hoffm.) Kremp. subsp. <i>contorta</i>	1, 5, 8, 11; Yazici 1377	Calcareous rock
[ÇA] <i>A. contorta</i> (Hoffm.) Kremp. subsp. <i>hoffmanniana</i> S. Ekman and Fröberg	1, 5, 11, 13; Yazici 1423	Calcareous rock
[ÇA] <i>A. desertorum</i> (Kremp.) Mereschk	4, 8; Yazici 1439	Calcareous rock
[AN] <i>Bagliettoa baldensis</i> (A. Massal.) Vezda	12, 13; Yazici 1526	Limestone
<i>Buellia ocellata</i> (Flot.) Körb.	8; Yazici 1528	Calcareous rock
[ÇA] <i>B. spuria</i> (Schaer.) Anzi	7; Yazici 1378	Limestone
[NE] <i>Caloplaca agardhiana</i> (A. Massal.) Clanzade and Cl. Roux	9a; Yazici 1424	Calcareous rock
<i>C. aurantia</i> (Pers.) Hellb.	13; Yazici 1368	Calcareous rock
[NE] <i>C. bicolorina</i> (A. Massal.) J. Steiner	8, 9a, 10; Yazici 1431	Calcareous rock
[ÇA] <i>C. cerina</i> (Ehrh. ex Hedw.) Th. Fr.	4, 7; Yazici 1529	<i>Prunus armeniaca</i>
[ÇA, NE] <i>C. citrina</i> (Hoffm.) Th. Fr.	7, 8, 9a; Yazici 1527	Calcareous rock
<i>C. crenularia</i> (With.) J.R. Laundon	11, 13; Yazici 1524	Siliceous rock
<i>C. crenulatella</i> (Nyl.) H. Olivier	10; Yazici 1425	Limestone
[ÇA] <i>C. decipiens</i> (Arnold) Blomb. and Forssell	1, 8, 9a, b; Yazici 1516	Calcareous rock
[NE] <i>C. erythrocarpa</i> (Pers.) Zwackh	9a; Yazici 1380	Limestone
[ÇA] <i>C. flavorubescens</i> (Huds.) J.R. Laundon	2, 4; Yazici 1483	Calcareous rock
[ÇA] <i>C. flavovirescens</i> (Wulfen) Dalla Torre and Samth.	4; Yazici 1511	<i>Prunus armeniaca</i>
[ÇA] <i>C. holocarpa</i> (Ach.) A.E. Wade	4, 5; Yazici 1370	Calcareous rock
[NE] <i>C. lactea</i> (A. Massal.) Zahlbr.	9b, 10; Yazici 1381	Limestone
[ÇA] <i>C. obscurella</i> (J. Lahm ex Körb.) Th. Fr.	2; Yazici 1482	<i>Acer platanoides</i>
[ÇA] <i>C. lobulata</i> (Flörke) Hellb.	1, 2, 3, 6; Yazici 1500	<i>Prunus</i> sp.
<i>C. ochracea</i> (Schaer.) Flagey	12; Yazici 1426	Calcareous rock
[ÇA] <i>C. pollinii</i> (A. Massal.) Jatta	3, 7; Yazici 1372	<i>Prunus</i> sp.
<i>C. polycarpa</i> (A. Massal.) Zahlbr.	9b, 13; Yazici 1484	Calcareous rock
[ÇA] <i>C. saxicola</i> (Hoffm.) Nordin	1, 7, 8, 9b; Yazici 1373	Calcareous rock
•[KO] <i>C. scrobiculata</i> H. Magn.	8; Yazici 1481	Siliceous rock
<i>C. teicholyta</i> (Ach.) J. Steiner	9b; Yazici 1382	Calcareous rock
[NE] <i>C. variabilis</i> (Pers.) Müll. Arg.	9a, b, 10; Yazici 1523	Limestone
[ÇA] <i>C. xerica</i> Poelt and Vezda	1; Yazici 1371	Calcareous rock
[ÇA] <i>Candelaria concolor</i> (Dicks.) Stein	2; Yazici 1383	<i>Acer platanoides</i>
[ÇA] <i>Candelariella anrella</i> (Hoffm.) Zahlbr.	2, 3, 4, 5; Yazici 1428	<i>Prunus armeniaca</i>
[ÇA, NE] <i>C. coralliza</i> (Nyl.) H. Magn.	5, 7, 9a; Yazici 1496	Siliceous rock
[NE] <i>C. reflexa</i> (Nyl.) Lettau	10; Yazici 1499	<i>Prunus</i> sp.
[ÇA, NE] <i>C. vitellina</i> (Hoffm.) Müll. Arg.	1, 2, 3 11; Yazici 1384	Siliceous rock
		<i>Prunus</i> sp.
		Limestone

Table 2: Continued

Species	Stations and herbarium numbers	Substrata
<i>C. xanthostigma</i> (Ach.) Lettau	8; Yazici 1485	Siliceous rock
[NE] <i>Carbouea vitellinaria</i> (Nyl.) Hertel	10; Yazici 1494	<i>Candelariella vitellina</i>
[NE] <i>Cladonia cervicornis</i> (Ach.) Flot	13; Yazici 1362	Soil
[ÇA] <i>C. rangiformis</i> Hoffm.	5, 7, 13; Yazici 1521	Soil
<i>C. subcervicornis</i> (Vain.) Kemst.	13; Yazici 1495	Soil
[ÇA] <i>Collema tenax</i> (Sw.) Ach.	3, 13; Yazici 1522	stone
[ÇA] <i>Dermatocarpon minutum</i> (L.) W. Mann	1; Yazici 1359	Siliceous rock
[KO] <i>Dimelaena oreina</i> (Ach.) Norman	8; Yazici 1501	Calcareous rock
[ÇA] <i>Diploschistes muscorum</i> (Scop.) R.Sant.	2, 4; Yazici 1498	Moss
<i>D. ocellatus</i> (Vill.) Norman	13; Yazici 1479	Calcareous rock
[ÇA] <i>D. scruposus</i> (Schreb.) Norman	6; Yazici 1487	Siliceous rock
[ÇA] <i>Diplotomma albostratum</i> (Hoffm.) Flot.	7; Yazici 1374	Calcareous rock
[NE] <i>D. epipolium</i> (Ach.) Arnold	8, 9a; Yazici 1502	Calcareous rock
[KO] <i>Endocarpon adscendens</i> (Anzi) Müll. Arg.	8; Yazici 1531	Soil
[ÇA] <i>Flavoparmelia caperata</i> (L.) Hale	2, 3, 5, 7; Yazici 1432	<i>Prunus</i> sp. Calcareous rock
[ÇA] <i>Fuscopannaria leucophaea</i> (Vahl) P.M. Jorg.	7; Yazici 1357	Siliceous rock
[ÇA] <i>Graphis scripta</i> (L.) Ach.	2, 3, 6; Yazici 1385	<i>Prunus</i> sp. <i>Populus</i> sp.
[NE] <i>Halecania cf. alpivaga</i> (Th.Fr.) Mayrhofer	10; Yazici 1478	Calcareous rock
[ÇA] <i>Hypogymnia physodes</i> (L.) Nyl.	1; Yazici 1492	<i>Pinus</i> sp.
<i>H. tubulosa</i> (Schaer.) Hav.	11; Yazici 1375	<i>Pinus</i> sp.
[ÇA] <i>Immersaria athrocarpa</i> (Ach.) Rambold and Pietschm.	7, 11; Yazici 1386	Calcareous rock
[NE] <i>Lecania inundata</i> (Körb.) M.Mayrhofer	10; Yazici 1433	Siliceous rock
[ÇA] <i>L. cyrtella</i> (Ach.) Th.Fr.	7; Yazici 1461	<i>Fraxinus</i> sp.
[ÇA] <i>L. fuscella</i> (Schaer.) A. Massal.	2; Yazici 1437	<i>Acer</i> sp.
[ÇA] <i>L. naegelii</i> (Hepp) Diederich and Van den Boom	2; Yazici 1456	<i>Quercus</i> sp.
<i>L. turicensis</i> (Hepp) Müll. Arg.	13; Yazici 1488	Limestone
[ÇA] <i>Lecanora argentata</i> (Ach.) Malme	5; Yazici 1387	<i>Acer</i> sp.
[ÇA] <i>Lecanora bolcana</i> (Pollini) Poelt	5, 7, 8, 11; Yazici 1434	Calcareous rock
[NE] <i>L. campestris</i> (Schaer.) Hue	10; Yazici 1389	Calcareous rock
[ÇA] <i>L. cenisia</i> Ach.	7; Yazici 1471	Siliceous rock
[ÇA] <i>Lecanora chlorotera</i> Nyl.	2; Yazici 1474	<i>Acer</i> sp.
<i>L. crenulata</i> (Dicks.) Hook.	10; Yazici 1486	Calcareous rock
[ÇA, NE] <i>L. dispersa</i> (Pers.) Röhl.	1, 9a, 9b, 10; Yazici 1472	Calcareous rock Limestone
[ÇA] <i>L. garovagii</i> (Körb.) Zahlbr.	5, 6, 11; Yazici 1473	Calcareous rock
[ÇA] <i>L. rupicola</i> (L.) Zahlbr.	7, 8, 13; Yazici 1503	Siliceous rock
[ÇA] <i>L. umbrina</i> (Ach.) A.Massal.	7; Yazici 1489	Siliceous rock
[NE] <i>Lecidea confluens</i> (Weber) Ach.	10; Yazici 1476	Limestone
<i>L. fuscoatra</i> (L.) Ach.	11; Yazici 1477	Siliceous rock
<i>L. lapicida</i> (Ach.) Ach. var. <i>pantherina</i> Ach.	12; Yazici 1480	Siliceous rock
[ÇA] <i>L. lithophila</i> (Ach.) Ach.	7; Yazici 1388	Siliceous rock
[NE] <i>Lecidella carpathica</i> Körb.	9a; Yazici 1463	Siliceous rock
<i>L. stigmatea</i> (Ach.) Hertel and Leuckert	11, 12; Yazici 1438	Calcareous rock
[ÇA] <i>Lepraria iucana</i> (L.) Ach.	7, 13; Yazici 1436	Calcareous rock
[KO] <i>Lobothalia praeradiosa</i> (Nyl.) Hafellner	8; Yazici 1449	Siliceous rock
<i>L. radiosa</i> (Hoffm.) Hafellner	8, 9a, 13; Yazici 1470	Siliceous rock
[NE] <i>Melanohalea elegantula</i> O. Blanco <i>et al.</i>	9a, 10; Yazici 1435	Calcareous rock
<i>Melanohalea exasperata</i> O. Blanco <i>et al.</i>	12; Yazici 1451	<i>Pinus</i> sp.
[NE] <i>Muellerella pygmaea</i> (Körb.) D. Hawksw. var. <i>athallina</i> (Müll. Arg.) Triebel	10; Yazici 1452	<i>Tephromela atra</i>
[ÇA] <i>Opegrapha atra</i> Pers.	5; Yazici 1467	<i>Fraxinus</i> sp.
[ÇA] <i>Opegrapha varia</i> Pers.	5; Yazici 1441	<i>Fraxinus</i> sp.
<i>Parmelia saxatilis</i> (L.) Ach.	11; Yazici 1440	<i>Pinus</i> sp.
<i>P. sulcata</i> Taylor	11; Yazici 1454	<i>Pinus</i> sp.
<i>Parmelina tiliacea</i> (Hoffm.) Hale	11; Yazici 1459	<i>Pinus</i> sp.
[ÇA] <i>Peltigera canina</i> (L.) Willd.	6, 13; Yazici 1442	Moss
<i>Peltigera ueckeri</i> Hepp	12; Yazici 1390	Moss
[ÇA] <i>Peltigera polydactylon</i> (Neck.) Hoffm.	6; Yazici 1450	Moss
[ÇA] <i>Peltigera rufescens</i> (Weiss) Humb.	6; Yazici 1448	Moss
[ÇA] <i>P. praetextata</i> (Flörke ex Sommerf.) Vain	2, 5, 7, 13; Yazici 1447	Soil Moss
[ÇA] <i>Pertusaria albescens</i> (Huds.) M. Choisy and Werner	6, 7, 12; Yazici 1446	<i>Quercus</i> sp. <i>Pinus</i> sp.
[ÇA] <i>P. lactea</i> (L.) Arnold	7; Yazici 1490	Siliceous rock
[ÇA] <i>P. pertusa</i> (Weigel) Tuck.	1; Yazici 1460	<i>Quercus</i> sp.
[ÇA, NE] <i>Phaeophyscia cernohorskyi</i> (Nádv.) Essl.	7, 9a; Yazici 1445	Calcareous rock
[ÇA] <i>P. nigricans</i> (Flörke) Moberg	4, 5; Yazici 1457	<i>Prunus</i> sp.
[ÇA] <i>P. orbicularis</i> (Neck.) Moberg	1, 2, 2, 4; Yazici 1443	<i>Prunus armeniaca</i> <i>Acer platanoides</i> <i>Amigdalus communis</i> <i>Fraxinus excelsior</i>

Table 2: Continued

Species	Stations and herbarium numbers	Substrata
[ÇA, NE] <i>Physcia adscendeus</i> (Fr.) H. Olivier	3, 4, 5, 9a	<i>Robinia pseudoacacia</i> <i>Morus</i> sp.
[ÇA] <i>P. aipolia</i> (Ehrh. ex Humb.) Fűrnr.	9a; Yazici 1361 2, 7; Yazici 1453	<i>Prunus</i> sp. <i>Quercus</i> sp. <i>Fraxinus excelsior</i>
[ÇA] <i>P. caesia</i> (Hoffm.) Fűrnr.	1, 5, 7; Yazici 1392	Calcareous rock
[ÇA] <i>P. dubia</i> (Hoffm.) Lettau	5, 8; Yazici 1458	Siliceous rock
[ÇA] <i>P. stellaris</i> (L.) Nyl.	3, 4; Yazici 1469	<i>Prunus armeniaca</i>
[ÇA] <i>P. tenella</i> (Scop.) DC.	3, 4; Yazici 1444	<i>Prunus armeniaca</i>
[ÇA] <i>Physconia distorta</i> (With.) J.R.Laundon	7; Yazici 1468	<i>Quercus</i> sp.
[NE] <i>P. enteroxantha</i> (Nyl.) Poelt	10; Yazici 1491	<i>Prunus</i> sp.
[ÇA] <i>P. grisea</i> (Lam.) Poelt	4, 9a; Yazici 1504	<i>Prunus armeniaca</i>
[NE] <i>Placidium squamulosum</i> (Ach.) Breuss	9a; Yazici 1462	Soil
<i>Placocarpus schæereri</i> (Fr.) Breuss	8; Yazici 1393	Calcareous rock
<i>Placynthium nigrum</i> (Huds.) Gray	12; Yazici 1455	Calcareous rock
[AN] <i>Platismatia norvegica</i> (Lyng.) W.L.Culb. and C.F.Culb.	11; Yazici 1493	<i>Pinus</i> sp.
[ÇA] <i>Porpidia ciuereoatra</i> (Ach.) Hertel and Knoph	7, 8; Yazici 1394	Siliceous rock
[ÇA] <i>P. macrocarpa</i> (DC.) Hertel and A.J. Schwab	7; Yazici 1464	Siliceous rock
[NE] <i>Protoparmeliopsis achariana</i> (A.L. Sm.) Moberg and R. Sant.	10; Yazici 1505	Limestone
[ÇA] <i>P. muralis</i> (Schreb.) M. Choisy	5, 7, 9a, 13; Yazici 1391	Calcareous rock
<i>Pseudevernia furfuracea</i> (L.) Zopf var. <i>ceratea</i> (Ach.) D.Hawksw	11; Yazici 1403	<i>Pinus</i> sp.
<i>P. f.</i> (L.) Zopf var. <i>furfuracea</i>	11; Yazici 1427	<i>Pinus</i> sp.
<i>Psora decipiens</i> (Hedw.) Hoffm.	13; Yazici 1420	Soil
[AN] <i>Psorotichia schæereri</i> (A.Massal.) Arnold	13; Yazici 1421	Calcareous rock
<i>Ramalina farinacea</i> (L.) Ach.	11, 12; Yazici 1404	<i>Pinus</i> sp.
[NE] <i>R. polymorpha</i> (Lilj.) Ach.	9a; Yazici 1405	Limestone
[ÇA, NE] <i>Rhizocarpon geminatum</i> Körb.	7, 10; Yazici 1369	Calcareous rock
[ÇA] <i>R. geographicum</i> (L.) DC.	7, 8, 10; Yazici 1506	Siliceous rock
[ÇA, NE] <i>R. lecanorinum</i> Anders	7; Yazici 1356	Siliceous rock
[NE] <i>R. reductum</i> Th.Fr.	9a, 10; Yazici 1508	Limestone
<i>Rinodina bischoffii</i> (Hepp) A. Massal.	8, 13; Yazici 1513	Calcareous rock
<i>R. calcarea</i> (Arnold) Arnold	8; Yazici 1518	Calcareous rock
<i>R. guzzinii</i> Jatta	8; Yazici 1465	Calcareous rock
[ÇA] <i>R. lecanorina</i> (A. Massal.) A. Massal.	7, 8, 10; Yazici 1520	Limestone
[AN] <i>R. obnasceus</i> (Nyl.) H. Olivier	13; Yazici 1519	Siliceous rock
[ÇA] <i>R. pyrina</i> (Ach.) Arnold	4; Yazici 1509	<i>Prunus armeniaca</i>
[ÇA] <i>R. sophodes</i> (Ach.) A. Massal	1; Yazici 1515	<i>Prunus</i> sp.
[KO] <i>Sarcogyne regularis</i> Körb.	8; Yazici 1517	Calcareous rock
<i>Schaereria fuscocinerea</i> (Nyl.) Clauzade and Cl. Roux	8; Yazici 1510	Siliceous rock
[ÇA, NE] <i>Tephromela atra</i> (Huds.) Hafellner	1, 10; Yazici 1466	Calcareous rock
[NE] <i>T. grumosa</i> (Pers.) Hafellner and Cl.Roux	10; Yazici 1395	Limestone
<i>Toninia candida</i> (Weber) Th. Fr.	8; Yazici 1514	Soil
[KO] <i>T. cinereovireus</i> (Schaer.) A. Massal.	8; Yazici 1512	Soil
<i>T. sedifolia</i> (Scop.) Tindal	8; Yazici 1507	Soil
<i>Tuckermannopsis chlorophylla</i> (Willd.) Hale	11; Yazici 1396	<i>Pinus</i> sp.
[ÇA, NE] <i>Xanthomendoza fallax</i> Söchting, Kärnefelt and S.Y. Kondr.	2, 6, 10; Yazici 1400	<i>Prunus</i> sp.
[ÇA] <i>X. fulva</i> (Hoffm.) Söchting, Kärnefelt and S.Y. Kondr.	6; Yazici 1401	<i>Prunus</i> sp.
[ÇA] <i>Xanthoparmelia conspersa</i> (Ehrh. ex Ach.) Hale	7, 8; Yazici 1360	Siliceous rock
[ÇA] <i>X. pulla</i> (Ach.) O. Blanco <i>et al.</i>	7; Yazici 1399	Siliceous rock
[ÇA] <i>X. stenophylla</i> (Ach.) Ahti and D. Hawksw.	5, 7; Yazici 1410	Siliceous rock
[ÇA] <i>X. verruculifera</i> (Nyl.) O. Blanco	7; Yazici 1402	Siliceous rock
[ÇA] <i>Xanthoria candelaria</i> (L.) Th. Fr.	6; Yazici 1415	<i>Prunus armeniaca</i>
[ÇA] <i>X. elegans</i> (Link) Th. Fr.	5, 6, 7, 8, 9a,b; Yazici 1430	Calcareous rock
[ÇA] <i>X. parietina</i> (L.) Th. Fr.	1, 2, 3, 7; Yazici 1413	<i>Quercus</i> sp. <i>Acer platanoides</i> <i>Morus</i> sp. <i>Robinia pseudoacacia</i>
[ÇA] <i>X. polycarpa</i> (Hoffm.) Rieber	7; Yazici 1355	<i>Pyrus</i> sp.
[NE] <i>X. sorediata</i> (Vain.) Poelt	10; Yazici 1398	Limestone
<i>Verrucaria calciseda</i> DC.	12, 13; Yazici 1408	Calcareous rock
<i>V. fuscilla</i> (Turner) Winch	12, 13; Yazici 1406	Calcareous rock
[KO] <i>V. fuscula</i> Nyl.	8; Yazici 1397	Calcareous rock
[KO, NE] <i>V. lecideoides</i> (A.Massal.) Trevis.	8, 10; Yazici 1411	Calcareous rock
<i>V. marmorea</i> (Scop.) Arnold	12; Yazici 1409	Calcareous rock
[ÇA] <i>V. muralis</i> Ach.	7, 9a, 10; Yazici 1414	Limestone
<i>V. nigrescens</i> Pers.	8, 13; Yazici 1358	Calcareous rock

●: New record for Turkey, [ÇA]: New to Çankiri, [KO]: New to Konya, [NE]: new to Nevşehir, [AN]: New to Antalya, !: lichenicolous fungus

DISCUSSION AND CONCLUSION

In the study area all of the species were found on 20 substrata. Of the species, 118 are crustose, 46 are foliose, 6 are fruticose and 1 is leprose.

A total of 50 species were growing as epiphytes, 101 to be only saxicolous, 9 to be only terricolous, 4 to be epiphytic as well as saxicolous and 1 to be epiphytic as well as terricolous. Five species were seen to be growing on mosses only. Fourteen species were only growing on *Pinus* sp., and 15 growing only *Prunus* sp. and *Prunus armeniaca* L. while 35 species only deciduous trees. *Carbonea vitellinaria* (Nyl.) Hertel was found to growing on *Candelariella vitellina* (Hoffm.) Müll.Arg. while *Muellerella pymaea* (Körb.) D. Hawksw. var. *Athallina* (Müll. Arg.) Triebel (lichenicolous fungus) on *Tephromela atra* as parasitic.

In this study, 92 lichen intraspecific taxa were collected from Çankiri while 48 from Antalya, 47 from Nevşehir, 37 from Konya.

Station 7, in which 44 intraspecific taxa were defined, is the most intensive one in terms of diversity of species. The second is station 8, in which 38 intraspecific taxa were found. The next highest species-rich stations are 10, 9a, 13 and 5, respectively.

Only 3 intraspecific lichen taxa have been noted from Çankiri so far while only 28 taxa from Nevşehir, 273 from Antalya and 130 from Konya. Additionally a few researchers have reported lichen taxa from Antalya, Çankiri, Konya and Nevşehir provinces in previous studies (Table 3). Table 3 shows that 9 researchers have reported lichen taxa from Antalya while 6 from Konya. On the other hand Çankiri and Nevşehir have not been largely studied.

Table 3: Number of lichen taxa noted from Antalya, Çankiri, Konya and Nevşehir provinces in previous studies

References	Antalya	Çankiri	Konya	Nevşehir
Steiner (1909)	-	-	31	-
Steiner (1916)	-	2	23	-
Kalb and Plöbst (1979)	-	1	-	-
Versegly (1982)	-	-	29	6
John (1996)	117	-	-	-
Karabulut and Özdemir (1998)	-	-	89	-
Nimis and John (1998)	98	-	-	-
Schindler (1998)	15	-	-	-
John et al. (2000)	25	-	-	-
Güvenç (2002)	-	-	28	-
John (2002)	-	-	-	2
Breuss and John (2004)	15	-	-	-
Tufan et al. (2005)	161	-	-	-
Çobanoğlu (2005)	6	-	4	-
Halici et al. (2006)	-	-	-	19
Çobanoğlu and Sevgi (2006)	54	-	-	-
Çobanoğlu and Yavuz (2007)	79	-	-	-

-: Absent

Genera such as *Acarospora*, *Caloplaca*, *Lecanora*, *Rinodina*, *Verrucaria* and *Xanthoria* are the most common in the study area. *Caloplaca*, growing on both rocks and many deciduous trees, is the most common among them (23 taxa). On the other hand *Acarospora*, *Lecanora*, *Rinodina* and *Verucaria* were found always on calcareous rock and limestones. Crustose lichen species are identified more frequently than the others. It can be said that crustose species can grow on rocks, deciduous and coniferous trees.

All samples were collected from on 15 substrata (except *Candelariella vitellina* and *Tephromela atra* (Huds.) Hafellner substrata). Most of these specimens were endolithic. On the other hand some are seen on coniferous trees (only on *Pinus* sp.). But foliose and crustose species were epiphytic on nine different deciduous trees such as *Acer* sp., *Amygdalus communis* L., *Fraxinus* sp., *Morus* sp., *Populus* sp., *Prunus* sp., *Pyrus* sp., *Quercus* sp. and *Robinia pseudoacacia* L. Interestingly, most of the intraspecific taxa were grown significantly on limestones, especially in Nevşehir (Fig. 2). Nevşehir has a structure originated from a series of volcanic eruptions. Therefore the rocks are very soft and fragile.

Crustose species are very common in station 7, 8, 10. Especially Korgun (Çankiri) is very rich in respect to crustose species as a result of rocks-rich while Seydişehir (Konya) is poor with regard to substrata such tree and rock. Thus, Seydişehir (Konya) has a large of lowlands (Seydişehir Plain). Because of this only crustose species such as *Placocarpus*, *Rhizocarpon*, *Rinodina*, *Toninia* and *Xanthoria* on rocks and some foliose species on *Salix* sp. were found main-roadside in Seydişehir.

Interestingly that crustose genus with lirellate apothecia such as *Graphis* was only found in Çankiri on

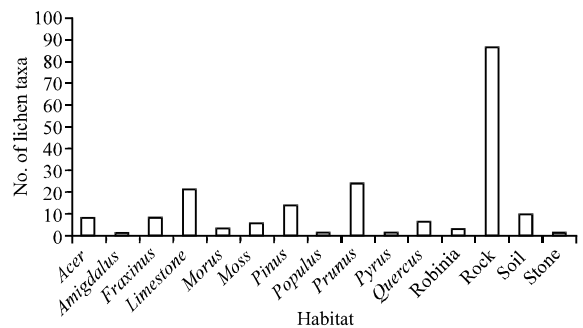


Fig. 2: Numerical distribution of lichen taxa on habitats (except *Muellerella pygmaea* var. *athallina* and *Carbonea vitellinaria*)

Populus sp. and *Prunus* sp., whereas species belonging *Graphina*, *Opegrapha* and *Phaeographis* were not seen in these stations

Foliose species were mostly found on *Pinus* sp. (Antalya) and deciduous trees (Çankiri and Seydişehir). Species such as *Xanthoparmelia conspersa* (Ehrh. ex Ach.) Hale and *X. stenophylla* (Ach.) Ahti and D. Hawksw. were defined on rocks only Çankiri and Konya. Besides *Physcia*, *Phaeophyscia* and *Physconia* were seen always on *Fraxinus* sp., *Morus* sp., *Prunus* sp., *Pyrus* sp. and *Quercus* in Çankiri.

Interestingly genera such as *Alectoria*, *Peltigera*, *Ramalina* and *Usnea* were not found abundantly as expected. That's because of as a result of deficiency of trees, especially coniferous and as well as bare fields.

As regards to choosing substrata *Candelariella vitelina*, *Phaeophyscia orbicularis* (Neck.) Moberg, *Physcia adscendens* (Fr.) H. Olivier and *Xanthoria parietina* (L.) Th. Fr. were defined to be the least sensitive. Both *Phaeophyscia orbicularis* and *Xanthoria parietina*, growing on 4 different deciduous trees, were found in 4 stations. *Candelariella vitellina* and *Physcia adscendens* were growing on 3 different deciduous trees. Besides, the most common foliose species are *Physcia adscendens*, *Protoparmeliopsis muralis* (Schreb.) M. Choisy and *Xanthoria elegans* (Link) Th. Fr. Station 12 and 13 is situated near a lime pit. *Bagliettoa baldensis* (A.Massal.) Vezda and *Verrucaria calciseda* DC., which are determined as indicator species of lime and calcareous substratum, was found only in this station. At the same station, saxicolous species such as *Aspicilia calcarea* (L.) Mudd, *Verrucaria nigrescens* Pers, *Verrucaria calciseda* and *Verrucaria marmorea* (Scop.) Arnold were also recorded.

Arthonia pinastri Anzi, *Lecidea lapicida* (Ach.) Ach var. *pantherina* Ach., *Lecidea lithophila* (Ach.) Ach., *Phaeophyscia cernohorskyi* (Nádv.) Essl., *Protoparmeliopsis achariana* (A.L. Sm.) Moberg and R. Sant., *Rinodina guzzinii* Jatta, *Xanthoria sorediata* (Vain.) Poelt and *Verrucaria lecideoides* (A.Massal.) Trevis. have been rarely defined in Turkey so far.

Cladonia rangiformis Hoffm *Flavoparmelia caperata* (L.) Hale, *Hypogymina physodes* (L.) Nyl., *Peltigera canina* (L.) Willd., *Pseudevernia furfuracea* (L.) Zopf var. *ceratea* (Ach.) D.Hawksw *P. furfuracea* (L.) Zopf var. *Furfuracea*, *Ramalina farinacea* (L.) Ach. and *Xanthoria parietina*, were also defined in the study area. It is known that these fungi are used among native population, but publications based on this subject are not intensive.

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