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Abstract

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From Tandoureh National Park, Razavi Khorasan province, and Darkesh Reserved Region, Northern Khorasan province, NE Iran, 51 lichen species are reported. Four species *(Anema nodulosum, Arthonia lapidicola, Collema conglomeratum, Leptogium trichophorum)* are new to Iran and 28 species are new to their provinces.

Additional key words: biodiversity, lichenized fungi, Khorasan, Tandoureh, Darkesh

Introduction

Northeastern Iran is occupied by the region of Khorasan, with a surface area of 313 335 km^2, situated between 30°21'-38°17'N and 55°28'-61°20'E. It consists of three separate provinces, Northern Khorasan, Razavi Khorasan and Southern Khorasan. Biogeographically the area belongs to the Irano-Turanian Region and the Armenian-Iranian Province (Takhtajan 1986). The region is hardly explored for lichens, though Dzhuraeva (1978) published an account of the lichens from the nearby Kopet Dag mountains in adjacent Turkmenistan. The first author has started an investigation of the lichen flora of this area, which revealed many floristic novelties (Seaward & al. 2004; Hadji Moniry & al. 2005). The present paper reports further additions from two sites in the two principal mountain chains in the north of the area (Fig. 1).

The first investigated site, Darkesh Reserved Region, is situated in the southern mountain chain, in the Ala Dagh (Fig. 1), 75 km from Bojnurd, Northern Khorasan province (37°24'-37°27'N, 56°4'-56°49'E). It comprises 4000 hectares, ranges from c. 1000 to 2455 m and has an annual precipitation of c. 500 mm. The climate is influenced by three different air transport systems, Mediterranean, Khazari and Siberian and belong to the cold-wet and semi wet classes (Huetz de Lemps 1970). Notable are slow winds in the mornings, which become strong during the rest of the day, all the year round. The average temperature is 15 °C. The substrate is composed of limestone, conglomerate, dolomite, shale and marl (Aghanabati 2004). The vascular plant flora is rich and includes nine species of ferns, four species of gymnosperms, 80 species of monocotyledons and 413 species of dicotyledons (Rashed & al. 1982-87; Aidani 2004). Dominant trees and shrubs are (Aidani 2004): *Acer monspessulanum* subsp. *turcomanicum* (Pojark.) Rech. f., *Salix aegyptiaca* L., *Juniperus sabina* L., *Celtis caucasica* Willd., *Cerasus microcarpa* (C. A. Mey.) Boiss., *Colutea buhsei* (Boiss.) Shap., *Cornus australis* C. A. Mey., *Cotoneaster ovata* Pojark., *Crataegus pentagyna* Waldst. & Kit., *Jasminum fruticans* L., *Lonicera floribunda* Boiss. & Buhse, *L. iberica* M. Bieb., *L. nummularifolia* Jaub. & Spach, *Mespilus germanica* L., *Palliurus spina-christi* Mill. var. *spina-christi, Pyrus boissieriana* Boiss. & Buhse, *Quercus castaneifolia* C. A. Mey. subsp. *castaneifolia* and *Rosa canina* L. The dominant herbs include (Aidani 2004): *Achillea biebersteinii* Afan., *Eremurus spectabilis* M. Bieb. subsp. *spectabilis, Dianthus orientalis* subsp. *stenocalyx* (Boiss.) Rech. f., *Hypericum helianthemoides* (Spach) Boiss., *H. scabrum* L., *Phlomis herba-venti* L., *Stachys subaphylla* Rech. f., *S.*

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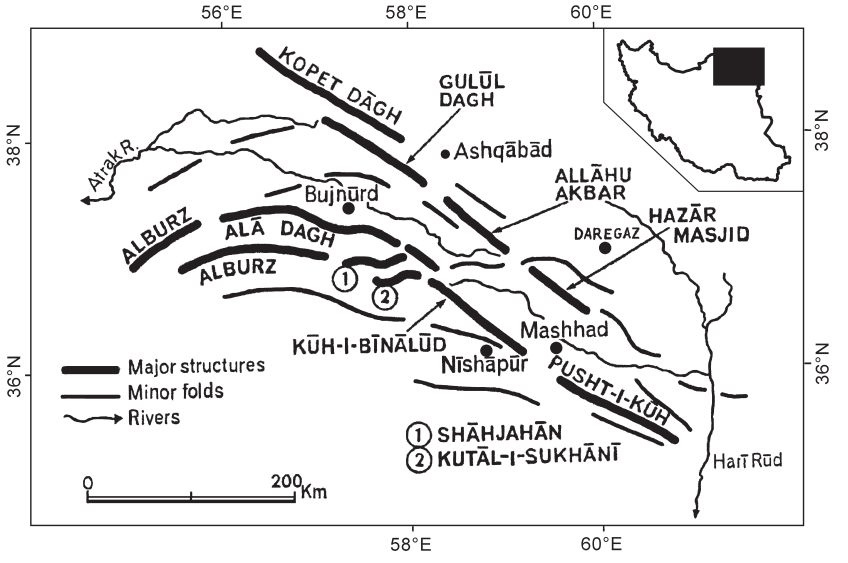

Fig 1. Map of the Khorasan region, NE Iran, showing the position of the mountain ranges Hazar Masjid and Ala Dagh (after Parsa 1978).

turcomanica Trautv., *Tulipa montana* var. *chrysantha* (Boiss.) Wendelbo and *Verbascum sinuatum* L.

The second investigated area, Tandoureh National Park, is located in the dry part of the northern mountain chain, in the Hazar Masjid Mts (Fig. 1). It covers 73 435 hectares near Daregaz, Razavi Khorasan province (37°18'-37°35'N, 58°33'-58°57'E). It reaches up to c. 3000 m altitude and receives an annual precipitation of c. 200-300 mm. Due to the wide altitudinal range the temperature varies considerably between different parts of the park. The southern and western parts have cold steppe climate with at least four snowy months. The northern part has a temperate climate during the winter. The bedrock in the area dates from the Cretaceous period and includes limestone, sandstone and shale rock, which are often covered by alluvial deposits (Aghanabati 2004). Woody species in its flora include (Rashed & al. 1982-87): *Acer monspessulanum* L., *Berberis integerrima* Bunge, *Celtis caucasica* Willd., *Cerasus chorassanica* Pojark., *C. microcarpa* (C. A. Mey.) Boiss., *Colutea buhsei* (Boiss.) Shap., *Crataegus pontica* C. Koch, *Elaeagnus angustifolia* L., *Ficus carica* L., *Juniperus excelsa* M. Bieb., *Lonicera bracteolaris* Boiss. & Buhse, *L. nummularifolia* Jaub. & Spach, *Rhamnus pallasii* subsp. *sintenisii* (Rech. f.) Browisz & J. Zieliński, *Rosa beggeriana* Schrenk, *R. canina* L., *Rubus sanctus* Schreb., *Thuja orientalis* L. and *Zygophyllum atriplicoides* var. *megacarpa* (Boiss.) Akhianni.

Table 1. Investigated localities.

A Darkesh Reserved Region, Northern Khorasan
- A1 Darvishparan, 1100 m, 14.3.2005
- A2 Ghareaghaj, 1415 m, 27.10.2004, 29.3.005, 29.5.2004
- A3 Nale-e biaab, 1130 m, 30.3.2005
- A4 Nargesli, 2450 m,15.3.2005

B Tandoureh National Park, Razavi Khorasan
- B1 Alibolagh Rd, 1360 m, 27.10.2004
- B2 Chelmir, 1165 m, 11.5.2004
- B3 Chelmir, 1290 m, 10.5.2004
- B4 Ghanbarali Mt, 2340 m, 26.10.2004
- B5 Shekaraab, 2200 m, 9.5.2004
- B6 Tivan, 2300 m, 10.5.2004

Material and methods

The first of the two investigated areas was visited on 29.5.2004 and 14.-15. + 29.-30.3.2005, the second on 9.-11.5.2004, 26.-27.10.2004 and 30.3.2005. Various parts were studied, see Table 1. All specimens were taken by the first author and carry her collection numbers, 312 and 140 samples, respectively. They are stored in the Herbarium of the Department of Botany of the Ferdowsi University in Mashad (FUMH), with selected duplicates deposited in the Herbarium of the Botanic Garden and Botanical Museum Berlin-Dahlem (B).

The specimens were identified using a stereomicroscope, a normal light microscope with mounts in tap water, 10 % KOH and KI, and the usual colour tests (Orange & al. 2001). Identifications were made using Sipman (2003), Temina & al. (2005) and further literature given in the list of taxa.

Results and discussion

So far 105 samples have been identified to species level, representing 51 species as listed below. These include four species new to Iran, marked in the list with a double asterisk (**), and 28 species new to Northern Khorasan and Razavi Khorasan, respectively, marked with a single asterisk (*). Many samples remain unidentified because of poor development or lack of adequate identification tools.

The most remarkable discovery is *Leptogium trichophorum,* a widespread and conspicuous species of E Asia, so far known to be distributed from China and the Philippines to N India (Jørgensen 1997). The Iranian record constitutes a considerable range extension to the west. The other species first recorded for Iran, *Anema nodulosa, Arthonia lapidicola* and *Collema conglomeratum,* are inconspicuous or poorly known species with a wide distribution as far as known (for *Collema conglomeratum* see Degelius 1974). Most of the listed species are apparently widespread in the steppe areas of

Iran and surrounding regions (Seaward & al. 2004, 2008). Some of these seem restricted to Central Asia, such as *Aspicilia oxneriana* and *Lecanora usbekika,* while others are widespread in areas with a temperate climate, such as *Evernia prunastri*.

List of taxa

Given are locality abbreviations according to Table 1, the substrate, the collection numbers of the first author in italics and notes on the identification, where appropriate.

Anamylopsora pulcherrima (Vain.) Timdal – A4, calcareous rock, *1908*.

Anaptychia ciliaris (L.) Körb. – A4, *Quercus castaneifolia, 1896*.

Anaptychia desertorum (Rupr.) Poelt – B1, *Pyrus boissieriana, 1871, 1875, 1875b;* B5, *Celtis caucasica, 1786* p.p.

Anaptychia setifera Räsänen – A2, broad-leaved trees, *1895*.

***Anema nodulosum* (Nyl.) Forssell – A4, soil, *1948;* det. M. Schultz.

***Arthonia lapidicola* (Taylor) Branth & Rostr. – B4, calcareous rock, *1841c*.

**Aspicilia desertorum* (Kremp.) Mereschk. – B2, calcareous rock, *1820b*.

**Aspicilia oxneriana* Blum – B1, calcareous rock, *1850, 1852*. – Identification after Oxner (1971).

**Caloplaca flavorubescens* (Huds.) J. R. Laundon – A2, *Acer monspessulanum, 1968*.

**Caloplaca polycarpoides* (J. Steiner) M. Steiner & Poelt – B1, *Rosa canina, 1872*.

Caloplaca variabilis (Pers.) Müll. Arg. – B3, calcareous rock, *1820* p.p; B6, calcareous rock, *1790, 1797a.*

Candelariella aurella (Hoffm.) Zahlbr. – B4, calcareous rock, *1841c* p.p.

**Cladonia furcata* (Huds.) Schrad. – A4, soil, *1904.*

**Cladonia pocillum* (Ach.) Grognot – A4, soil, *1903*.

**Cladonia pyxidata* (L.) Hoffm. – B1, soil, *1864*.

Collema auriforme (With.) Coppins & J. R. Laundon – A4, soil, *1925*.

**Collema cristatum* (L.) F. H. Wigg. – A3, mosses, *2011;* B1, mosses, *1868a, 1884;* B2, mosses, *1822*.

***Collema conglomeratum* Hoffm. – A4, mosses, *1923.* – Identification after Schultz & al. (2004) and Degelius (1974).

**Collema polycarpon* Hoffm. – B1, mosses, *1870a*.

**Collema subflaccidum* Degel. – A4, soil, *1924*.

Dermatocarpon miniatum (L.) W. Mann – A1, calcareous rock, *1955;* A4, calcareous rock, *1886, 1937;* B1, calcareous rock, *1857, 1858, 1859*.

Diploschistes ocellatus (Vill.) Norman – A1, calcareous rock, *1951*.

**Evernia prunastri* (L.) Ach. – A4, *Quercus castaneifolia, 1906, 1907.*

**Fulgensia fulgens* (Sw.) Elenkin – B1, soil, *1885;* B2, soil, *1818.*

Lecanora muralis (Schreb.) Rabenh. – A3, calcareous rock, *2023;* B3, calcareous rock, *1815*.

Lecanora usbekica Poelt – B4, calcareous rock, *1848b*.

Lecidella carpathica Körb. – B4, calcareous rock, *1849a;* B5, calcareous rock, *1744*.

**Lecidella euphorea* (Flörke) Hertel – A4, *Acer monspessulanum, 1892*.

**Leptogium gelatinosum* (With.) J. R. Laundon – B1, mosses, *1868*.

**Leptogium lichenoides* (L.) Zahlbr. – A4, mosses, *1922;* B1, mosses, *1884* p.p.

***Leptogium trichophorum* P. M. Jørg. & Wallace – A4, mosses, *1889.* – Identification following Jørgensen (1975, 1997) and Awasthi & Akhtar (1977).

**Melanelixia glabra* (Schaer.) O. Blanco & al. – A4, mosses, *1926*.

Mycobilimbia lurida (Ach.) Hafellner & Türk – A3, soil, *2014;* A4, soil, *1939;* B1, soil, *1860*.

Peltigera monticola Vitik. – A3, soil, *2009, 2010;* A4, moss, *1911;* B1, mosses, *1882, 2009, 2010.* – Identification after Vitikainen (1994); identity of the last two specimens confirmed by O. Vitikainen.

**Peltigera praetextata* (Flörke ex Sommerf.) Zopf – B1, soil, *1880, 1881, 1883;* B5, soil, *1767*.

**Peltigera rufescens* (Weiss) Humb. – B5, mosses, *1761*.

**Physcia adscendens* (Fr.) H. Olivier – A1, broad-leaved trees, *1957*.

**Physcia dimidiata* (Arnold) Nyl. – A4, mosses, *1929;* B1, mosses, *1856;* B5, mosses, *1755*.

**Physcia tenella* (Scop.) DC. – B5, broad-leaved trees, *1786(1)* p.p.

**Physconia enteroxantha* (Nyl.) Poelt – A4, mosses, *1927*.

Physconia perisidiosa (Erichsen) Moberg – A4, mosses, *1928*.

**Ramalina* cf. *nervulosa* (Müll. Arg.) Des Abb. – A4, *Quercus castaneifolia, 1905*.

**Ramalina sinensis* Jatta – A4, *Quercus castaneifolia, 1891*.

Rhizocarpon geographicum (L.) DC. – B5, calcareous rock, *1737*.

**Sarcogyne regularis* Körb. – A4, calcareous rock, *1930;* A2, calcareous rock, *1986*.

Seirophora contortuplicata (Ach.) Frödén – B6, soil, *1801*.

**Squamarina concrescens* (Müll. Arg.) Poelt – B1, mosses, *1884a*.

Toninia diffracta (A. Massal.) Zahlbr. – A4, soil, *1938;* B1, soil, *1862, 1863;* B2, soil, *1807.*

Toninia sedifolia (Scop.) Timdal – B1, soil, *1861, 1863a, 1866*.

**Xanthomendoza fulva* (Hoffm.) Søchting & al. – B5, broad-leaved tree, *1786*.

**Xanthoria parietina* (L.) Th. Fr. – A2, *Rosa canina, 1964;* A4, *Quercus castaneifolia, 1887*.

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