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SHORT COMMUNICATION

Study of Some Lichens of Qatar

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Abstract

The desert regions of North and central Qatar were surveyed for lichens. Twelve species were reported. The most common lichens are of the crustose type and all fungi of the lichens collected are Ascomycete.

Keywords: Lichens, Crustose, Qatar.

Introduction

Qatar is a peninsula and a small country located at Longitude 51° 15' E and Latitude 25° 30' N on the eastern banks of Saudi Arabia with the Kingdom of Bahrain beyond the Gulf on its northwestern boundaries. The mainland of Qatar is characterized by dominance of a stony desert (which constitute >85% of Qatar) with isolated scattered depressions (Rodat) with few trees and shrubs characteristic of arid zones. The climate is harsh in summer and mildly cool in winter being the period of seasonal rains. It is very hot and humid between June and August, and pleasant between November and February. The average annual rainfall is 81 mm, average maximum temperature is 31°C, average minimum temperature is 22°C, absolute maximum temperature is 50° C, absolute minimum temperature is 1°C, average morning relative humidity is 71 %, and average afternoon relative humidity is 43%.

Lichens live on various surfaces (soil, trees, rocks and walls) and in various environments: some survive in the dry arid conditions of deserts and others on frozen soil of the pole regions. Lichens grow very slowly, sometimes only a few cm in a whole year. Humans use lichens in food preparation, as dyes for textiles and rugs (William, 2000). Lichen metabolites exert a wide variety of biological actions including antibiotic, antimycobacterial, antiviral, anti-inflammatory, analgesic, antipyretic, antiproliferative and cytotoxic effects (Melgarejo et al., 2008). Even though these manifold activities of lichen metabolites have now been recognized, their therapeutic potential has not been fully explored and thus remains pharmaceutically unexploited (Müller, 2002). The utility of lichens is due to the production of a range of secondary compounds by them (Boustie and Grube, 2005). Some lichens are very sensitive to air pollution and some of them accumulate toxic materials (e.g. SO_2) (Bačkor et al., 2003). Accordingly, lichens are suited as biological indicators for monitoring environmental quality. Pollution can be assessed by chemical analysis of the lichen thalli.

Lichens are unique organisms formed by an association of green algae or cyanobacteria and fungi of the Ascomycetes or Basidiomycetes. There are three forms of lichens: crustose, foliose, fructicose. Up to date mainly crustose lichens are common on rocky outcrops and only one each of the foliose and fructicose lichens have been encountered in Qatar. Encounter of lichens is mentioned in various reports (Babikir and Kürschner, 1992; Abdel Bari, 1997a,b; Abulfatih et al., 2001) but none of these publications covered a detailed study of lichens of Qatar. Meanwhile, there have been studies of lichens in neighboring

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Arabian Gulf countries. Most literature records are from Saudi Arabia. Bokhary et al. (1993) and Abu-Zinada et al (1986) listed about 100 species. Brown (1998) provided a provisional list of species occurring in Kuwait about 40 distinct species have been found on the Northern side of Kuwait Bay. Mandeel and Aptroot (2004) recorded only seven species, all crustose, from Bahrein Kingdom. Brown et al. (2002) recorded 36 species of lichens from the Sultaanate of Oman. Hellyer and Aspinall (2005) have been found that lichens as a prominent feature of coastal rocks on some islands in United Arab Emirates and rocky environments including several species of the genus Caloplaca, Lecania subcaesia, Buellia subalbula, Verrucaria sp. and Ramalina maciformis. Schultz (1998) reported a total of 36 lichen taxa were found in the South of the Yemen Arab Repuplic.

Field collection of lichens (deposited at the Herbarium of Biological and Environmental Science Department, Qatar University) commenced in 1994 and the first publication on the record of fructicose lichen was in 1997 (Abdel Bari, 1997a). In 2004 a study on lichens in Qatar was undertaken as a student project (Lichens of Qatar). This raised further interest in the group particularly as Qatar is now undergoing major constructions all over and fear of loss of biodiversity is a great concern.

Materials and Methods

During numerous field trips, stone fragments with lichens were randomly collected from different sites (mostly from rocky hills). These were labeled with details and kept safe. Selected samples are cleaned, sprayed with water and photographed. Photos include general plates and close up of morphological appearance. Identification and classification was carried out by 3 methods:

Morphology: based on the identification of lichens by their colors, types of growth, types of substrates and presence or absence of the fruiting body.

Anatomy: the lichen thallus typically consists of three basic layers: cortex, (algal and fungi) layer and medulla. These are not always present. Longitudinal or transversal sections in the thalli of the lichens were used to identify the composition of the lichen thallus layers.

Chemical Analysis: lichens can be easily distinguished with a simple spot test of KOH, hypochlorite or p-phenyldiamine solutions. The color reactions occur because lichens produce acids which react with chemical solutions changing the color of the lichen thallus.

Results

Identification Keys of Reported Species

The most common lichens in Qatar are of the crustose type (Fig. 1-2) and all fungi of the lichens collected are Ascomycete. Lichens were collected from North and Central Qatar. As to date a total of 12 species were recorded. These fall in 11 genera of 10 families (Table 1, Fig. 3-4). All species are new records for the country.

Macroscopic and Microscopic Characters

Acarospora sulphurata (Arnold) Arnold
Asci multispored; ascospores colourless, 2-4 x 2-3 µm, non-septate; apothecia immersed, appearing as irregular cracks, yellowish brown; prothallus indistinct.

Collema tenax (Sw.) Ach. Em. Degel.
Thallus rosette-like and thick that is variable in size. It is usually dark olive green or black in color adpressed to the substratum. Apothecia are small

Gloeoheppia turgid (Ach.) Gyeln.
Squamules convex, markedly swollen even when dry, adpressed and appearing almost areolate from above.

Lecidella euphorea (Firke) Hertel
Apothecia lecideine, with a black margin and plane to convex disc.

Buellia subalbula (Nyl.) Müll. Arg.
Thallus white; K-; ascospores 14-17 x 7 µm

Ramalina maciformis (Delise) Bory
Fruticose lichen and characterized by greenish-yellow and an erect thallus with thick yellwish epithecium. The ascocarp disc is pale green and is surrounded by a corticate exciple. The asci contain 8 colourless spores which are 2- or sometimes 4-septate. The spores are ellipsoid or slightly curved

Caloplaca brouardii (B. de Lesd.) Zahlbr
Thallus forming rosettes, placodioid, with radiating lobes at the margins but becoming areolate centrally; apothecia absent; numerous scale-like isidia (phyllidia) developing from the surface of the lobes

Caloplaca aurantia (Pers.) J. Steiner
Thallus has many colour forms: typically, it has dull orange-coloured
margins, Thallus and apothecia K^+ (purple).

Xanthoria parietina (L.) Th. Fr
Thallus forming rosettes, often exceeding 2 µcm diam; lobes flat-tened against the substratum; soralia absent; orange apothecia common.

Diploschistes albescens Lett
Greyish-white to greyish pruina thallus, 1-3 mm thick. Ascospores brown, muriform, 20-40 x 9-17 µm with 5-6 transverse septa, 12-14 µm wide.

Table 1. Most common lichen species in Qatar.

Species	Family	KOH	Chemical Hypochlorite	Tests P-Phenyldiamine	Type of substratum
Acarospora sulphurata (Arnold) Arnold	Acarosporaceae	K-	C-	P-	Rocks
Collema tenax (Sw.) Ach.Em.Degel.	Collemataceae	K-	C-	P-	Rocks
Gloeoheppia turgid (Ach.) Gyeln.	Gloeoheppiaceae	K-	C-	P-	Rocks
Lecidella euphorea (Flörke) Hertel	Lecanoraceae	K-	C-	P-	Rocks
Lecidea sp.	Lecideaceae	K-	C-	P-	Rocks
Buellia subalbula (Nyl.) Müll.Arg.	Physciaceae	K-	C-	P-	Rocks
Ramalina maciformis (Delise) Bory	Ramalinaceae	K-	C-	P-	Rocks
Caloplaca brouardii (B. de Lesd.) Zahlbr *Caloplaca aurantia* (Pers.) J. Steiner *Xanthoria parietina* (L.) Th.Fr	Teloschistaceae	K+(violet) K+(violet) K+(violet)	C+(dark read) C+(dark read) C+(dark read)	P- P- P-	Rocks
Diploschistes albescens Lett.	Thelotremataceae	K-	C-	P-	On compacted sand in rock crevices.
Verrucaria sp.	Verrucariaceae	K-	C-	P-	Rocks

Fig. 1. Above: General view of the stony desert in mainland Qatar; growth of Crustose lichens on rocks on surfaces facing the sun (R.H.S). Below: Clay loam soils with crustose lichens.

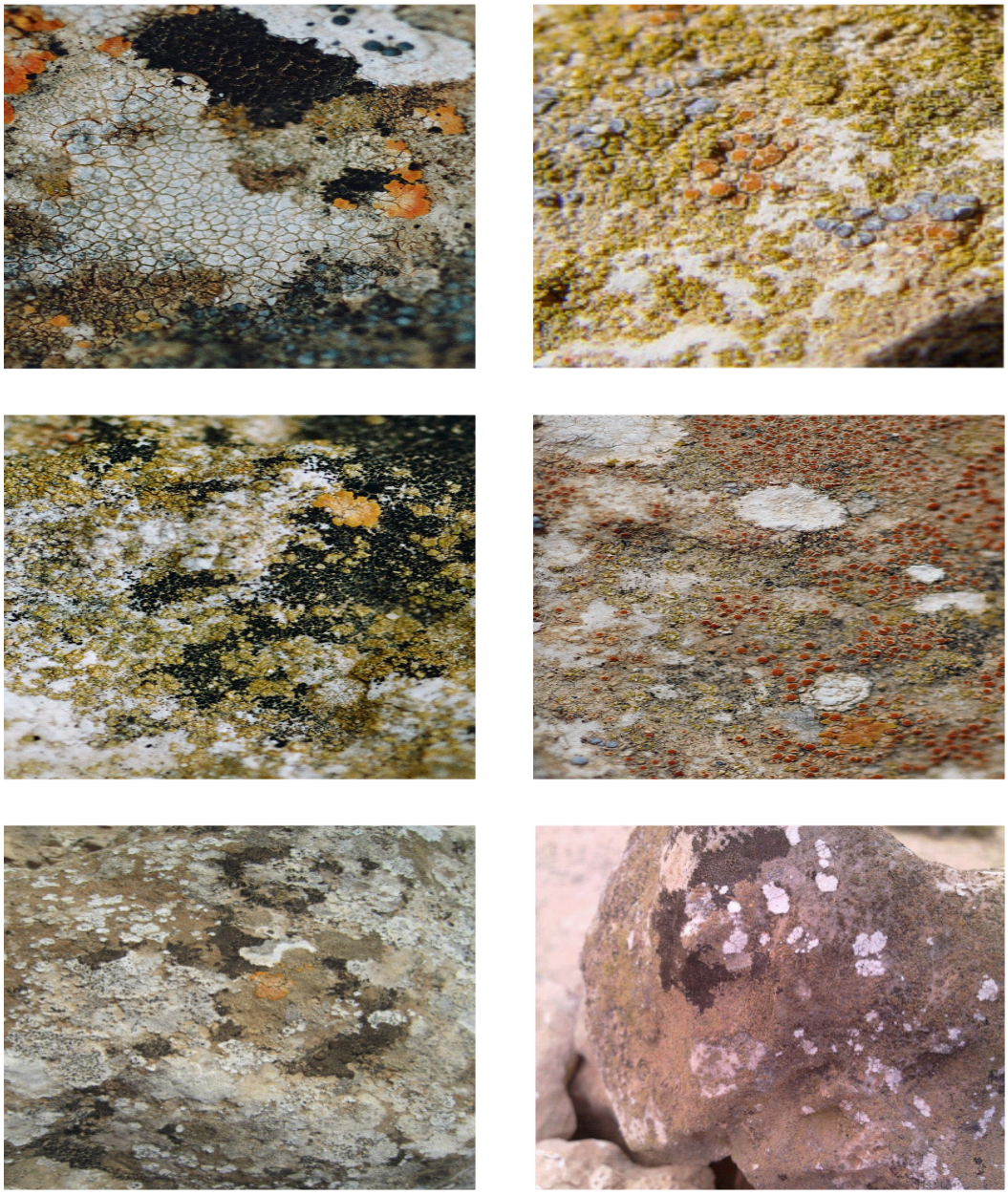
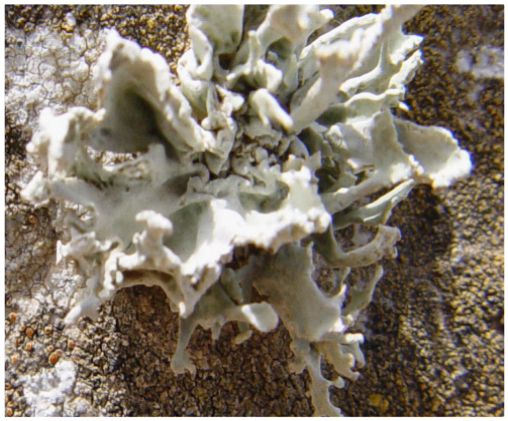


Fig. 2. Dense growth of different species of Crustose lichens in stony deserts.

Fig. 3. *Caloplaca aurantia*, a common arrange-colored lichen on stony deserts in Qatar.

Lecidella euphoria



Ramalina maciformis

Buellia subalbula

Xanthoria parietina

Fig. 4. Common lichens in Qatar.

Discussion

Qatar is well-known for its active economy and its lichen flora is therefore likely to lose much ground before it has ever been explored. This is the more unfortunate as the lichen flora is only poorly known. Lichens biodiversity in Qatar is low except at some investigated area at North and Central Qatar which most of lichens were isolated. This area is still without any pollution or construction. All species recorded during this study have been found in various countries of Arabian Peninsula.

Lichens are among the most valuable biomonitors of atmospheric pollution (Nimis et al., 2002). The diversity of epiphytic lichens is commonly used as a sensitive indicator of the biological effects of air pollutants. Mapping of lichen diversity is becoming routine in several countries since it is quick and inexpensive and provides results on which predictions for human health can be based (Cislaghi and Nimis, 1997).

Field collection of lichens must continue to determine species richness and abundance and their distribution. Thus a study of lichens from areas of major petro-chemical industrial cities may prove useful in the detection of the nature of the pollutants and the extent of air pollution from major industrial cities in Qatar.

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