

NEW LICHEN RECORDS FROM TURKEY

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Abstract

Three lichen species, namely *Cladonia grayi* G. Merr. ex Sandst., *Pertusaria subventosa* Malme var. *subventosa*, and *Parmelia squarrosa* Hale are reported as new to Turkey as a result of a lichenological survey in the Burdur region of the country. Descriptions are presented, including geographic distribution, substrate, chemistry, and comparisons with morphologically similar taxa.

Introduction

Although many lichen taxa have recently been recorded for Turkey (Aptroot and Yazici, 2009, 2012; Arslan *et al.*, 2011; Candan and Halıcı, 2011; Karagöz *et al.*, 2011; Karagöz and Aslan, 2012; Kınalıoğlu and Aptroot, 2011; Osyczka *et al.*, 2011; Vondrák *et al.*, 2012; Yazıcı *et al.*, 2010a, b, c), the lichen biota of Turkey is still incompletely known, as is in many parts of the world. Therefore, more studies are needed to achieve a complete lichen flora of Turkey.

Burdur in Turkey has a continental Mediterranean climate with cold, snowy winters and very hot, long and dry summers. The mean annual temperature is 15°C and the temperature ranges from -16°C to 39°C. The mean annual rainfall is about 468 mm and the average humidity is 51.2% (Akman, 1999). Only 25 lichenized fungi have thus far been reported for this region (Çobanoğlu, 2005; Öztürk *et al.*, 2005; Pišút and Guttová, 2008; Şenkardeşler, 2009).

The visited areas, Bucak, and Altınyayla districts, are mountainous with much forest dominated by *Abies*, *Cedrus*, *Ficus*, *Fraxinus*, *Juniperus*, *Olea*, *Pinus*, *Pistacia*, *Prunus*, *Quercus* (especially Altınyayla district), *Rhus* species and alternating streams, lakes, dams (e.g. Yapraklı Dam in Altınyayla district and Karacaören dam in Bucak district) (Baytop and Denizci, 1963). The underforest flora is very abundant in these areas where the bedrock consists mainly of marble.

This paper presents first reports of lichenological exploration in the region of Burdur, southwestern Turkey.

Materials and Methods

Lichen samples were collected on 28 - 29 June 2012, air-dried and examined with a Nikon SMZ1500 stereomicroscope and a Nikon Eclipse 80i compound light microscope. For the identifications relevant keys were consulted (Archer and Elix, 1993; Brodo *et al.*, 2001; Goward, 1999; Messuti *et al.*, 2007; Smith *et al.*, 2009). Thin Layer Chromatography (TLC) analyses were carried out when needed for *Cladonia grayi* and *Pertusaria subventosa* var. *subventosa* (Orange *et al.*, 2001). Vouchers are stored in the Herbarium of the Biology Department, Karadeniz Technical University, Trabzon, Turkey (KTUB). The descriptions are based on Turkish specimens and completed with data from the indicated literatures (Archer and Elix, 1993; Brodo *et al.*, 2001; Dobson, 2005; Duncan, 1970; Goward, 1999; Hale, 1973; Hyvönen, 1985; Wirth, 1995).

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Results

Cladonia grayi G. Merr. *ex* Sandst., Sandstede: Clad. Exs. no.: 1847 (1929). (Fig. 1).

Primary thallus squamulose, shrub-like, mostly curved upwards; upper surface corticate, ± green; rhizines and isidia absent, soralia ± present; upper surface verruculose, minutely warted-squamulose; podetia pale, 1.0-1.5(-1.7) mm high, not blackening; proliferations present and arising strictly from cup margins; podetial squamules few; the cup margins pinkish, rim ± even, not pointed-crownlike; apothecia brown to dark brown; hymenial ascoma 1.0-2.0 mm, stalked; ascospores oblong, with obtuse tips 9-12 × 2-3(-4) µm, without septa, hyaline, colourless; perispore and episporium absent; conidia falcate; fumarprotocetraric acid and grayanic acid present; photobiont *Asterochloris*. Primary thallus C-, K-, KC-, P ± red, medulla P- or yellow, UV+ ice-blue. [Some morphological and chemical characters taken from Goward (1999)].

Habitat: *Cladonia grayi* is a holarctic species, found on soil rich in humus, more rarely on conifer wood, peat, dead leaves, turf, rotting wood, mosses over mineral soil.

Distribution: Costa Rica, North America, Japan, Spain, Italy, Russia, Germany, the Netherlands, Norway, Estonia, Finland, New Zealand and USA. New to Turkey.

Specimen examined: Turkey. Burdur: Altınyayla, between İbecik-Altınyayla, main roadside, 36°58'07.19"N / 29°26'17.70"E, 1348 m, on soil, 29.06.2012, K.Yazici (KTUB 2340).

Notes: *Cladonia grayi* is similar to *C. chlorophaea* (Flörke *ex* Sommerf.) Spreng., and *Cladonia merochlorophaea* Asahina but *C. grayi* has podetia with few detachable microsquamules on the lower half, while these occur abundantly in *C. merochlorophaea*. The presence of fumarprotocetraric acid together with grayanic acid in *C. grayi* helps to distinguish it from *C. chlorophaea* with the exclusive presence of fumarprotocetraric acid (Goward, 1999; Smith *et al.*, 2009). Accompanying species: *Cladonia humilis*.

Parmelia squarrosa Hale, Phytologia 22(1): 29 (1971). (Fig. 2a,b).

Thallus foliose, adnate or ± adnate on its substrata, whitish-grey, greenish or greenish-grey; lobes divaricate, contiguous or imbricate, 0.7-2.5 mm wide. Upper surface plane or foveolate with laminal and marginal pseudocyphellae forming a reticulate network; isidia present, fine and cylindrical, up to 0.5 mm tall and becoming more concentrated in older central areas of the thallus and marginal parts of the lobes. Rhizines squarrose, but mostly simple at the margins of lobe. Apothecia absent. Cortex K+ yellow, medulla K+ yellow turning red, C-, P+ orange. [Some morphological characters taken from Hale (1971)].

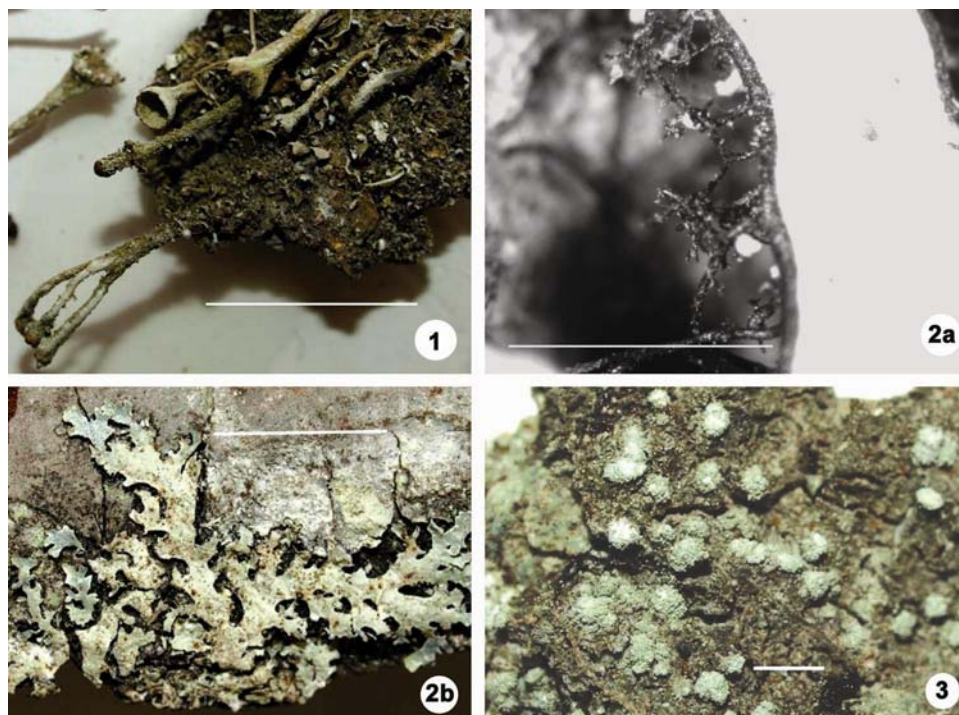
Habitat: *Parmelia squarrosa* commonly grows as epiphyte on deciduous and coniferous trees near the coast and rarely on rock and decayed wood.

Distribution: Mostly found in oceanic areas in temperate and boreal regions. Distributed in America, Asia (Japan, China, Korea, Nepal, Russia), Canada and Europe (the Alps of western Austria and southern Switzerland). This species is new to Turkey.

Specimen examined: Turkey, Burdur: Bucak, between Beşkonak-Kocçaliler, 3 km to Kocçaliler, 37°20'52.64"N / 30°44'12.45"E, 846 m, on *Pinus* sp., 17.07.2012. Accompanying species: *Lepraria* sp., *Parmelia sulcata*, *P. saxatilis* and *P. tiliacea*, K.Yazici (KTUB-2339).

Notes: *Parmelia squarrosa* is similar to *P. saxatilis* but *P. squarrosa* has squarrosely branched rhizines at least in part, while they are always simple or sometimes furcately dichotomously branched in *P. saxatilis*. The upper cortex in *P. squarrosa* is whitish, greenish or greenish-grey while *P. saxatilis* has a shiny, bluish-grey or brownish-grey upper cortex, which is often browning at the tips of lobe (Hale, 1973). The lobes in *P. saxatilis* are more branched and

broader (3-4 mm) than those of *P. squarrosa* (0.7-2.0 mm). The isidia in *P. squarrosa* are mostly on marginal parts of the lobes than those of *P. saxatilis*.



Figs 1-3: 1. *Cladonia grayi* (cups bottom), *Cladonia humilis* (cups above), habitus (Scale = 1 cm). 2a. *Parmelia squarrosa* (with squarrosely branched rhizines), habitus (Scale = 1 mm). 2b. *Parmelia squarrosa* (upper surface of thallus), habitus (Scale= 1cm). 3. *Pertusaria subventosa* var. *subventosa*, habitus (Scale = 1mm)

Pertusaria subventosa* Malme var. *subventosa, Ark. Bot. 28A (no. 9): 7 (1936). (Fig. 3).

Thallus crustose, up to 6 cm in diameter, white to greyish-white or dark grey, thick, cracked and areolate, smooth. Soralia present, ± conspicuous, white, numerous, 0.5-1.8 (-2.0) mm in diameter, scattered or confluent away from the margin, subglobose, occasionally slightly stipitate. Apothecia absent. Soralia K + yellow, KC+ violet, C-, P+ yellow, UV+ bright yellow, containing lichexanthone (major), thamnolic acid (major) and picrolichenic acid (major), rarely with additional norstictic acid. [Some morphological and chemical characters taken from Archer and Elix (1993)].

Habitat: *Pertusaria subventosa* var. *subventosa* is a holarctic species, growing mostly on calcareous rocks.

Distribution: Australia, Brazil, China and New Zealand. New to Turkey.

Specimen examined: Turkey, Burdur: Altınyayla, between İbecik-Altınyayla, main roadside, 36°58'07.19"N/29°26'17.70"E, 1348 m, on soil and calcareous rock, 29.06.2012, K.Yazici (KTUB 2338).

Notes: *Pertusaria subventosa* has morphologically identical three varieties distinguished by the K⁻ reaction of the soralia. The K⁺ yellow reaction of the soralia caused by the presence of thamnolic acid in *P. subventosa* var. *subventosa* differentiates it from the other two varieties lacking this substance on them. Accompanying species: *Lepraria* cf. *lobificans*.

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