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***Acarospora crozalsii* (Lichenized *Ascomycetes*, *Acarosporaceae*), to be re-instated in the Italian lichen flora**

Abstract

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Some samples collected in Liguria by Camillo Sbarbaro and identified as *Acarospora crozalsii*, a species which in the past was often synonymised with *A. complanata*, were analysed. The species, for which a description is provided, is a Mediterranean silicicolous lichen, known from North Africa (Algeria), southern France and Italy. It differs from the similar *A. helvetica* in the euamyloid hymenial gel and the thinner parathecium, and should be re-instated in the list of lichens known from Italy.

Key words: *Acarospora*, Italy, silicicolous, Mediterranean.

Introduction

Acarospora crozalsii B. de Lesd., described from southern France (Bouly de Lesdain 1923), was reported from Liguria (Italy) by Sbarbaro (1956). The species, which belongs to a difficult complex, was considered as a possible synonym of *A. complanata* H. Magn. by Clauzade & Roux (1981), while it was not treated at all by Clauzade & Roux (1985). Following Clauzade & Roux (1981), Nimis (1993, 2016) filed the record by Sbarbaro (1956) under those of *A. complanata* H. Magn., so that the species disappeared from the list of taxa occurring in Italy. Only recently Roux & al. (2019) accepted the species as valid, stating that it occurs in Algeria and in France, but not mentioning the records by Sbarbaro (1956) from Italy. Examining German material sent for identification by Christian Printzen (FR) for a Red List study, the first two authors had at their disposal four poor but sequenced specimens of an areolate *Acarospora* with mostly flat, round, immersed apothecia which looked more like *A. crozalsii* than *A. helvetica* H. Magn., another species of the *A. complanata*-complex. Unfortunately, there were no sequences of *A. crozalsii* in GenBank. The German specimens had IKI+ hemiamyloid hymenial gel, like *A. helvetica*, and not IKI+ euamyloid hymenial gel, as reported for *A. crozalsii* (Bouly de Lesdain 1923; Magnusson 1929). Since Magnusson's reports of hymenial gel stains with IKI had no protocol for repeatable results, we had to verify the hymenial gel stain of *A.*

crozalsii using the protocol for repeatable results by Knudsen & Kocourková (2018). While looking in the Consortium of Lichen Herbaria for some specimens of *A. crozalsii*, we discovered that the Field Museum in Chicago has seven specimens collected by Sbarbaro from Italy, with two verified specimens, one identified by Bouly de Lesdain, the other by Magnusson. The Italian collections were from a Mediterranean coastal zone (Liguria), like the type collection. When the specimens arrived, the first two authors could confirm that the hymenial gel of *A. crozalsii* is IKI+ euamyloid, as reported in the original description, while the German specimens proved to be poor specimens of *A. helvetica*, which is considered as rare in Germany and was reported from Italy (Veneto and Sardinia) by Knudsen & Kocourková (2020).

In this paper, we provide a description of *A. crozalsii*, which should be re-instated in the list of lichens known from Italy, discussing the main differences towards *A. helvetica*.

Material and methods

Herbarium specimens were examined from H and F using a dissecting microscope. At 1000× with compound microscopes the anatomy of hand sections was measured in water. The amyloid reaction of the hymenial gel and subhymenium was tested with fresh undiluted IKI (Merck's Lugol, Sigma-Aldrich 1.09261), following the protocol by Knudsen & Kocourková (2018). A photograph was taken with the digital camera Olympus DP74 mounted on Olympus SZX 16 stereomicroscope using PROMICRA QuickPHOTO CAMERA 3.3 software and stacked using Olympus DeepFocus 3.5 module for increasing the depth of field.

Specimens examined: Algeria, A.R. sur les grés du Diebel-Ouach et sur la route du Kroub, *C. Flagey*. Lichenes Algeriens 130 (Hb. Nylander H! H 9 234 558). France, Var: La Garde on rocks on the Nord-Ouest coast not far from the tram, 1923, *A. Crozals*, U.S., image! (US 168639). Italy, Liguria, Spotorno, supra il "Monte", 9.XII.1951, *C. Sbarbaro* (F! C0095507F Fig. 1), Spotorno (Savona), rupicola, X1.1953, *C. Sbarbaro* (F! C0095542F), Voze (Noli), V 1952, *C. Sbarbaro* (F! C0095540F).

Taxonomy

Acarospora crozalsii B. de Lesd., Bull. Soc. bot. Fr., 70: 280 (1923). Type: France, Var, La Garde, sur rochers volcaniques, Feb. 1923, *A. Crozals* (Hb. Bouly de Lesdain, holotype, lost in WW2, n.v., isotype, UPS, n.v.).

Description. Hypothallus endolithic. Thallus crustose, indeterminate, continuous of irregular, angular areoles separated by deep fissures, mostly (0.5–)1.0(–2.0) mm wide, 0.3–0.5 mm thick. Upper surface flat, usually reddish-brown, epruinose. Lateral surface in upper part brown to black. Epicortex thin, uneven, ca. 10 µm thick. Cortex 25–40(–60) µm thick, the upper layer red-brown, one-cell thick, the lower layer hyaline, the cells round, 2–4 µm wide, or ellipsoid, 4 × 2 µm. Algal layer 60–100 µm thick, even, the algal cells mostly 10–15 µm wide; medulla ca. 200 µm thick, obscure with mostly 2 µm wide substrate crystals, continuous with hypothallus. Areoles often sterile. Apothecia scattered, usually one per areole, flat, even with the upper surface, sometimes reducing

an areole to a thalline margin, or rarely elevated in a narrow thalline margin, or, in the Algerian specimen, sometimes apothecia lower than upper surface. Disc reddish-brown, epruinose, 0.5–1.0 mm wide, round. Parathecium indistinct to 10 μm wide, merging into cortex. Hymenium usually 100 μm tall, epihymenium ca. 10 μm tall, reddish-brown. Paraphyses 1.0–2.0 μm thick, the apices unexpanded in gel caps with pigment mark, or not in gel caps. Hymenial gel IKI+ dark blue, euamyloid. Subhymenium V-shaped, up to 70 μm deep, IKI+ dark blue, euamyloid. Hypothecium indistinct ca. 10 μm wide, framing the subhymenium, continuous with parathecium. Asci 100–200-spored, 60–70 \times 15–18 μm , Ascospores, simple, 3–4.5 \times 1.5–2.0 μm . Spot tests: all negative.

Distribution and Ecology. The species is known from Mediterranean Europe (France and Italy) and North Africa (Algeria). Magnusson (1929) states that the type in France was on basalt according to Crozals, although this was not written on the label. The specimen from Algeria was on sandstone. The labels of Italian specimens did not report either the rock type, nor the elevations. However, in GDOR there are six specimens of *A. crozalsii* collected by Sbarbaro between Spotorno and Bricchetto (near Finale Ligure), and two of them (GDOR 887 and 1001) are stated to be collected on quartzite, all localities being below 200 m. Considering it a Mediterranean species, Magnusson (1929) stated that *A. crozalsii* invaded and destroyed other lichens, probably as a facultative lichenicolous lichen. Roux & al. (2019) state that it is parasitic on *Aspicilia trachytica* in Algeria, but we doubt it is host-specific, as most parasitic *Acarosporaceae* grow on a variety of crustose genera, most often on other *Acarospora* and *Aspicilia*.



Fig. 1. *Acarospora crozalsii* - photo (J. Kocourková) of sample C0095507F, Field Museum (NH): Spotorno, supra il „Monte“, 9.12.1951, leg. C. Sbarbaro.

Discussion

Our description of *Acarospra crozalsii* does not differ significantly from that by Magnusson (1929) or B. de Lesdain (1923). The Algerian specimen appears to be an older one, most areoles having apothecia which were sunken below the upper surface, many areoles being large 1.5–2.0 mm wide. *A. crozalsii* is similar to *A. helvetica*, which also has a continuous-areolate brown thallus, but differs in having an euamyloid hymenial gel and an indistinct, to 10 µm wide parathecium, while *A. helvetica* has a 7–10 µm wide parathecium expanding to 30 µm around disc, sometimes forming an elevated, 50–100 µm wide margin around the apothecia in old specimens (Magnusson 1929; Knudsen & Kocourková 2019). *A. crozalsii* usually has a flat round apothecial disc which is level with the upper surface of the areole, rarely with a slightly elevated, thin thalline margin. In both species the apothecia can be lower than the upper surface of the areole, or reduce the areole to a thalline margin. The thallus of both species can become dispersed on rough, uneven surfaces. *A. crozalsii* should be re-instated in the list of lichens known from Italy, while the records of *A. complanata* for Liguria (Nimis 1993, 2016) should be deleted.

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