

***Parmelia barroenae*, a new lichen species related to *Parmelia sulcata* (*Parmeliaceae*) based on molecular and morphological data**

Pradeep K. DIVAKAR, M. Carmen MOLINA, H. Thorsten LUMBSCH and Ana CRESPO

Abstract: *Parmelia barroenae* is described as new to science in the *P. sulcata* complex on the basis of morphological and molecular data. The new species is superficially similar to *P. sulcata* but differs in having simple rhizines whereas the other species of the complex have squarrose rhizines. Nuclear ITS rDNA and partial β -tubulin gene sequences have been used as molecular markers. In the phylogenetic analysis, *P. sulcata* falls into four well supported clades, one of them corresponds to the morphotype that is described here as a new taxon. Six samples of the new taxon from different locations on the Iberian Peninsula form a strongly supported monophyletic group.

Key words: Ascomycota, Bayesian inference, lichens, *Parmelia*, *Parmelia barroenae*, *Parmeliaceae*, rhizines

Introduction

Phylogenetic studies of some widely distributed lichen species in the *Parmeliaceae* have shown that in many cases the morphological species concept does not coincide with a monophyletic unit. Some traditionally circumscribed species have been shown to include several genetically isolated clades, i.e. phylogenetic species (Kroken & Taylor 2001; Thell *et al.* 2002; Crespo *et al.* 2002; Högnabba & Wedin 2003; Molina *et al.* 2004). These monophyletic groups either have been proposed to represent cryptic species or have merely been described as distinct populations within a variable species.

Parmelia sulcata is a very well known lichen species (with squarrose rhizines and sorediate upper surface), reported from all continents, including Antarctica. It occurs in numerous ecotypes and is one of the most common species in temperate Europe. In Europe it is one of the principal lichens recolonizing cities where atmospheric pollution has recently decreased (Hawksworth & McManus 1989; Crespo *et al.* 1999). Preliminary studies on a worldwide basis using molecular markers have reported an unexpectedly high genetic variability within the species (Crespo *et al.* 1997).

The molecular variability detected is accompanied by an unusual heterogeneity in rhizine morphology among samples of *P. sulcata*. Hale (1987: 48) described rhizine morphology as one of the key characters circumscribing *P. sulcata*: “The most important diagnostic characters of *P. sulcata* are the well-developed laminal soralia and richly squarrosely branched rhizines.” However, other descriptions of this species indicate that it has simple, furcate or squarrose rhizines (e.g. Purvis *et al.* 1992). This may be interpreted as individual variation

P. K. Divikar & A. Crespo (corresponding author): Departamento de Biología Vegetal II, Facultad de Farmacia, Universidad Complutense, Madrid 28040, Spain.

M. C. Molina: Departamento de Matemáticas y Física Aplicadas y Ciencias Naturales, Escuela Superior de Ciencias Experimentales y Tecnología, Universidad Rey Juan Carlos, Madrid 28933, Spain.

H. T. Lumbsch: Department of Botany, The Field Museum, 1400 S. Lake Shore Drive, Chicago, IL 60605, USA.