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Two new *Terfezia* species from Southern Europe

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Abstract

Two new species of *Terfezia*, *Terfezia grisea* and *Terfezia cistophila*, are documented from Spain and Greece, based on morphology and ITS-rDNA sequence data. Macro and micro descriptions with illustrations and ITS phylogenetic data for the two species are provided, which are discussed in relation to similar species in this genus and their host plants.

Key words: desert truffle, hypogeous, mycorrhizal fungi, *Pezizaceae, Cistaceae*

Introduction

The genus *Terfezia* (Tul. & C.Tul.) Tul. & C.Tul. is included in the *Pezizaceae* (Laessøe & Hansen 2007) within the order *Pezizales*. The edible hypogeous ascomata of these fungi are known as "desert truffles" due to their habitat, which is typically arid and semi-arid ecosystems, mostly in the Mediterranean region (Morte *et al*. 2009, Zambonelli *et al*. 2014) and constitute an important economic resource for the local populations (Shavit 2014). Species of *Terfezia* have a long history of culinary and medical uses, because they are rich in nutrients and bioactive compounds (Shavit & Shavit 2014). While in some areas, desert truffles have been traditionally used as food, in most regions interest has only recently been increasing, and these fungi are now treasured for their economical and nutritional value and for research (Kagan-Zur *et al*. 2014).

Most *Terfezia* species establish mycorrhizal symbiosis with plants from family *Cistaceae*, mainly with perennial and annual *Helianthemum* species (Dexheimer *et al*. 1985, Fortas & Chevalier 1992, Gutiérrez *et al*. 2003, Morte & Andrino 2014), and with trees from different phyla (Bordallo *et al*. 2013, Díez *et al*. 2002, Taylor *et al*. 1995). These plants and their associated fungi play a major role in the maintenance of Mediterranean shrub lands and xerophytic grasslands, and thus in preventing erosion and desertification (Honrubia *et al*. 2014). In fact, this mycorrhizal association is well adapted to semiarid climates through the physiological mechanism of drought avoidance (Morte *et al*. 2000, 2010, Turgeman *et al*. 2011). The soils of desert truffles show a remarkable variability that reflects the climatic conditions in which they form. *Terfezia* species (or their host) seem to be able to adapt to a wide range (high or relatively low) of soil pH, edaphic conditions and texture (Bonifacio & Morte 2014).

Some species have been successfully cultivated and new biotechnologies to increase their productive yield and to extend their cultivation areas have been developed (Morte *et al*. 2008, 2009, 2012, Slama *et al*. 2010, Honrubia *et al*. 2014).

Kirk *et al*. (2008) estimated that there are 12 species of *Terfezia* worldwide, while Index Fungorum (2015) lists 48 species. The application of novel molecular methods to hypogeous fungal group, on which desert truffles can be found, allows the discovery of new species. The finding of undiscovered species within the genera of desert truffles will rise throughout the coming years (Bordallo & Rodríguez 2014), similar to those carried out on genera like *Tuber* (Bonito *et al*. 2010).Recently, five species of *Terfezia* have been reported from the Iberian Peninsula (Bordallo *et al*. 2013) and one from the Canary Islands (Bordallo *et al*. 2012). The difficulty of sampling desert truffles implies their discovery only in specific locations. This allows the hypothesis that a thorough study of the same and other collection zones and during different seasons of the year would favour the discovery of new species (Claridge *et al*. 2000a, b, Henkel *et al*. 2012).

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