



Polulichloris henanensis gen. et sp. nov. (Trebouxiophyceae, Chlorophyta), a novel subaerial coccoid green alga

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Abstract

Coccoid green algae are abundant in subaerial habitats, but they are largely unexplored because of their morphological uniformity. Several new genus-level lineages have recently been described on the basis of molecular data. In this study, a coccoid green alga was isolated from surface soil in Zhoukou, Henan Province, China, and the cultured cells were described using light and electron microscopy. The ellipsoidal cell had smooth cell wall and parietal chloroplast with a pyrenoid surrounded by a starch envelope. Reproduction occurred by formation of 2–16 autospores. Molecular phylogenetic analyses based on the nuclear 18S rDNA gene and the chloroplast ribulose-bisphosphate carboxylase gene (*rbcL*) indicated that this coccoid green alga represents a new lineage of the *Watanabea* clade (Trebouxiophyceae, Chlorophyta). Here, we describe this organism as a new genus and species, *Polulichloris henanensis*, gen. et sp. nov.

Key words: Phylogeny, Taxonomy, Subaerial alga, Trebouxiophyceae, *Watanabea* clade

Introduction

Coccoid green algae have traditionally been classified as a subgroup of the green algae, the order Chlorococcales (Komárek & Fott 1983). Introduction of molecular phylogenetic methods into the taxonomy of green algae led to a fundamental revision of these algae, and most of the taxa have been transferred to other orders. Autosporic coccoid green algae are currently known in the Chlorophyceae, Trebouxiophyceae, and Prasinophyceae within the division Chlorophyta (Melkonian *et al.* 1990, Fawley *et al.* 2000, Luo *et al.* 2003, Krienitz *et al.* 2003, Leliaert *et al.* 2012). In the Trebouxiophyceae, autosporic coccoid green algae occur in three major clades: the *Watanabea* clade, the Chlorellales, and the Trebouxiales. Several other clades that include coccoid green algae are the *Elliptochloris* clade (Eliáš *et al.* 2008), the *Xylochloris* clade (Neustupa *et al.* 2011), the *Leptochlorella* clade (Neustupa *et al.* 2013a), the *Chloropyrula* clade (Gaysina *et al.* 2013) and the *Eremochloris* clade (Fučíková *et al.* 2014).

Most members of the *Watanabea* clade are subaerial coccoid autosporic microalgae. This clade was defined by Karsten *et al.* (2005) as a monophyletic lineage of the Trebouxiophyceae. Molecular phylogenetic studies of the Trebouxiophyceae showed that the *Watanabea* clade includes *Viridiella* Albertano, Pollio & Taddei (1991: 347); *Heterochlorella* Neustupa, Němcová, Eliáš & Škaloud (2009: 167); *Heveochlorella* Zhang, Huss, Sun, Chang & Pang, *Kalinella* Neustupa, Němcová, Eliáš & Škaloud (2009: 167); *Chloroidium* Nadson (1906: 189); *Phyllosiphon* Kühn (1878: 25); *Watanabea* Hanagata, Karube, Chihara & Silva (1998: 226); *Desertella* Fučíková, Lewis & Lewis (2014:303); and *Parachloroidium* Neustupa & Škaloud (2013: 413) (Albertano *et al.* 1991, Hanagata *et al.* 1998, Zhang *et al.* 2008, Neustupa *et al.* 2009, 2013b, Darienko *et al.* 2010, Aboal & Werner 2011, Ma *et al.* 2013, Fučíková *et al.* 2014).

Most coccoid autosporic microalgae are not distinguishable using traditional methods because of their reduced, uniform morphology; molecular methods are the primary means of recognizing their taxonomic position. Broad sampling of the 18S rDNA gene among members of the Trebouxiophyceae has made this marker extremely useful for identifying previously unknown lineages. The chloroplast large subunit of the ribulose bisphosphate carboxylase/