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Description of a new species of soil algae, *Parietochloris grandis* sp. nov., and study of its fatty acid profiles under different culturing conditions



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ABSTRACT

The new species *Parietochloris grandis* sp. nov. is described from forest soil in the Dnipropetrovsk region, Ukraine. The description is based on morphological features and the phylogenetic analysis of partial SSU rDNA and *rbcL* genes. Phylogenetic analysis places *P. grandis* in the *Parietochloris* clade, within the family Trebouxiophyceae. The novel strain formed a strongly supported monophyletic lineage with the type species of *Parietochloris*, *P. alveolaris*. *P. grandis* differed from other species in the *Parietochloris* clade by the size and form of vegetative cells and the large number of zoospores in zoosporangia. A number of experiments with different phosphates and nitrates concentrations were conducted to evaluate changes in fatty acid profile and biomass. The dominant fatty acids during cultivation on standard BG-11 medium, as well as with the phosphates concentrations ranged from 0.22 to 2 mM, were linoleic acid (24–25%), palmitic acid (12–14%), linolenic acid (9–12%), and oleic acid (7–11%). The content of arachidonic acid and eicosapentaenoic acid ranged from 3.5 to 4.5% and 0.7% to 0.8%, respectively. The fatty acid profile and total fatty acids varied significantly under different nutrient deficiency. The greatest variation was found for oleic acid (9–46%) and linolenic acid (2–13%). The percentage of arachidonic acid was the highest with a standard nitrates concentration in the medium (5%) and the lowest in the absence of phosphates and nitrates (1.3–1.5%), but the absolute content in dry biomass was similar in all variants of the experiment (6.5–9.3 mg g⁻¹ dry weight). The absence of nitrogen and both nitrogen and phosphorus led to a 3-fold increase in TFA in comparison with the control. Thus, this strain can be considered in biotechnological application as a potential producer of the essential linoleic acid or oleic acid.

1. Introduction

Parietochloris Shin Watanabe et Floyd is one of many poorly known genera of green algae (Chlorophyta). It was separated from the genus *Neochloris* Starr with its included species having mononuclear cells and naked zoospores with counter-clockwise absolute orientation of the flagellar basal bodies [1]. *Parietochloris alveolaris* (H.C. Bold) Shin Watanabe et Floyd in Deason et al. (basonym: *Neochloris alveolaris* H.C. Bold), the type species of the genus, was isolated from a spring-fed

calcareous pool (USA, Tennessee) [2]. From an ecological point of view, species in *Parietochloris* are found in terrestrial environments, such as soils. They have also been identified from habitat types such as steppe, meadow, forest and floodplain at different climatic zones: equatorial, subequatorial, tropical, subtropical and temperate zone [3–5]. According to modern taxonomic concepts, the genus belongs to the algal class Trebouxiophyceae but does not form a monophyletic group [6,7]. The numerous phylogenetic studies of the coccoid green algae now available confirm the presence of hidden diversity within the group.

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