

Trouble with *Trebouxia*?? Culture experiments and progress in understanding the nutrient requirements of major symbiotic algae

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The genus *Trebouxia* is well known to represent a major photobiont (symbiotic photosynthetic partner) within lichen thalli. In 1980, Trebouxaceae were, regarding their different mode of reproduction, split into *Trebouxia* and *Pseudotrebouxia* (later named *Asterochloris*) and merged again into *Trebouxia*. Nowadays, *Asterochloris* (since the late 1990s) is an own genus again, it is thought to be mainly restricted to associations with lichens in two closely related families, Cladoniaceae and Stereocaulaceae and a few others. John *et al.* (2002) continued to position *Trebouxia* in the large, traditional, though demonstrably artificial order, the Chlorococcales, due to lack of any consensus in considering the results of recent molecular studies. Referring to former studies, *Trebouxia* appears to be closely related to the free-living genus *Pleurastrum*. The question if *Trebouxia* occurs only in lichens and/or also free-living in the natural environment has occupied many lichenologists over several decades; since Vernon Ahmadjian raised this topic as one of high relevance in the seventieth of the 20th century. *Trebouxia* is the most widespread photobiont in lichens, occurring in many different lichen orders. They are not obligatory associated with single species of lichenized fungi as thought in early investigations, since they can be grown independently in culture. Meanwhile, it is also known that a given lichen fungus may form associations with different species of *Trebouxia*. In the very beginning, culturing *Trebouxia* independently had an important impact on the acceptance of lichens as a two-partner-consortium. Nowadays, culture experiments have “evolved” to an important tool for correctly determining species of *Trebouxia* and confirm their relationships to other algal groups by molecular studies. The presentation will highlight a few historical details about “culturing *Trebouxia*”, how they influenced modern culture experiments and show new, improved strategies (e.g. temperature, light regimes, nutrient media compositions, bioreactors) to obtain pure, optimized cultures in larger scale for genetic and genomic approaches. *Trebouxia* algae are found to have exceptional wide ecological amplitudes and adaptations to extreme environmental conditions (influence on the fitness of the lichen symbiosis), such as tolerance of low temperatures, desiccation tolerance of lichens in semiarid habitats (species of the genus *Xanthoparmelia*), tolerance of low intensities of light, etc.