**Biogeographic distribution of microbialites in Mexico**

L.I. Falcón1, B. Águila11, A. Yánez-Montalvo2, R. A. Mercado-Juárez1, P.M. Valdespino-Castillo3, R.J. Alcántara-Hernández4

*1 Instituto de Ecología, UNAM, Campus Yucatán 97302, Mexico*

*2 ECOSUR Chetumal, Av. Centenario Km. 5.5, Chetumal, Quintana Ro, 77014 Mexico*

*3 Lawrence Berkeley National Laboratory, Berkeley, CA 94720 USA*

*Instituto de Geología, UNAM, CdMx 04510 México*

*\* falcon@ecologia.unam.mx*

Extant microbialites are productive and diverse communities with an evident role in the cycling of major elements that have contributed to the geochemical history of our planet through their diverse metabolic capacities that include mineral precipitation. We present results of several studies conducted in different sites that harbor microbialites in Mexico and Cuba, in dessert ponds, crater-lakes and karstic coastal lagoons. The nested approach we have followed includes 16SrRNA gene high-throughput sequencing, Shotgun metagenomic sequencing, elemental analysis, eco physiological measurements, X-Ray fluorescence (XRF), X-Ray diffraction (XRD), Scanning Electron Microscopy-Energy Dispersive Spectroscopy (SEM-EDS), Fourier Transformed Infrared (FTIR) spectroscopy and Synchrotron Radiation-based Fourier Transformed Infrared (SR-FTIR) spectromicroscopy. Microbialite communities vary in biological and mineralogical composition associated to an environmental effect related to pH, conductivity and availability of reduced forms of nitrogen. These mineral-forming microbial assemblages accumulate major ions, trace elements and biomass from their ambient aquatic environments. Particular bacteria, which are the dominant phototrophs and heterotrophs, show significant correlations with major ion composition, mineral type and transition element content. Elemental cycling of C, N, P and S is associated to different bacteria depending on the microbialite site, yet all communities function similarly regarding their biogeochemical potential.

* Águila B, Alcántara-Hernández RJ, Montejano Zurita GA, López Martínez RA, Falcón LI, Absalón I. Cyanobacteria in microbialites of Alchichica crater lake: a polyphasic characterization (2021) Europ. J. Phycology <https://doi.org/10.1080/09670262.2020.1853815>
* Alcántara-Hernández RJ, Valdespino PM, Centeno CM\*, Alcocer, J., Merino-Ibarra M, Falcón LI. Genetic diversity associated to N cycle pathways in microbialites from Lake Alchichica, Mexico (2017) Aquatic Microbial Ecology. <https://doi.org/10.3354/ame01806>
* Centeno, C. M., Legendre, P., Beltrán, Y., Alcántara-Hernández, R. J., Lidström, U. E., Ashby, M. N., & Falcón, L. I. 2012, FEMS Microbiology Ecology, *82*(3), 724-735.
* Valdespino-Castillo PM, Hu P, Merino-Ibarra M, López-Gómez LM, Cerqueda-Garcia D, González-De Zayas R, Pi-Puig T, Lestayo JA, Holman HYN, Falcón LI. Exploring biogeochemistry and microbial diversity of extant microbialites in Mexico and Cuba (2018) Frontiers in Microbiology. <https://doi.org/10.3389/fmicb.2018.00510>
* Valdespino-Castillo PM, Alcántara-Hernández RJ, Merino-Ibarra M, Alcocer J, Macek M, Moreno-Guillén O, Falcón LI. Phylotype dynamics of bacterial P utilization genes in microbialites and bacterioplankton of a monomictic endorheic lake (2017) Microbial Ecology. https://doi: 10.1007/s00248-016-0862-1
* Yanez-Montalvo, A., Águila, B., Gómez-Acata, S., Mass-Vargas, M., Cabanillas-Terán, N., Vega-Zepeda, A. & Falcón, L. I. 2021. Geomicrobiology Journal, *38*(3), 237-251 <https://doi.org/10.1080/01490451.2020.1836086>
* Yanez-Montalvo A, Gómez-Acata S, Águila B, Hernández-Arana H, Falcón LI\*\*. The microbiome of microbialites in Bacalar lagoon, Mexico (2020) PLoSOne. <https://doi.org/10.1371/journal.pone.0230071>