Lichen photobionts at high elevations of the hyperarid Atacama Desert

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The Atacama Desert, northern Chile is a hyperarid environment, where the scarce rainfall and high rate of evapotranspiration play primary roles in determining the presence of photosynthetic life. In addition to its extreme dryness, the Atacama holds records for the highest surface ultraviolet (UV) radiations and total solar irradiances ever measured on Earth, which have been reported from its high altitude "Altiplano" and pre-Andean area. We performed an elevational/climatic gradient survey (Altiplano-Monturaqui transit; AMT) in the Atacama Desert between 23º57'S/ 068º10'W and 23º04'S/ 067º28'W from c. 4500 m a.s.l. to c. 2850 m a.s.l. All rock boulders sampled for lichen colonization derived from Pliocene Patao and Tucucaro ignimbrite. Along the AMT (4500-2850 m), the mean annual precipitations range from ~160 mm/yr at the upper sites (ALTI, QD and MIS), to 27 mm/yr at the lower sites (TILO and MTQ). By means of the use of nrITS as barcode we identified the photobionts of all species of lichen-forming fungi found along the gradient. All species were associated with *Trebouxia* spp. In spite of the low diversity of lichen-forming fungi, at least four different *Trebouxia* lineages were found: 1) a lineage close to *T. incrustata*, 2) cf. *T. vagua*, 3) cf. *T. cretacea*, and 4) an undescribed lineage of photobionts so far found only in the Southern Hemisphere.