

Peer Review

Review of: "Microbial Mediation in Gypsum Dissolution and Its Role in Evaporitic System Transformation in Northern Chilean Salt Flats"

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The manuscript describes changes in gypsum crystals during a 90-day incubation with biofilms derived from microbial communities inhabiting three Andean salterns. Autoclaved brines from these salterns, supplemented with a cultivation medium, were used for the incubations. Corrosion of gypsum crystals and precipitation of new mineral phases within biofilms were observed.

However, the study suffers from several major shortcomings that substantially reduce its scientific impact.

Lack of novelty.

The experimental approach lacks significant novelty. Interactions between microbes and mineral substrates similar to those reported here have already been described in the literature, as is correctly acknowledged by the authors in the Discussion section. The main potential novelty of the study lies in the description of these processes in specific Andean salterns. However, the relevance of this aspect is compromised by the experimental design: the natural brines were autoclaved and supplemented with cultivation medium, and the microbial communities were influenced by prior cultivation. As a result, the experimental conditions differ substantially from the natural environment, and the findings cannot be straightforwardly extrapolated to in situ processes.

Insufficient documentation and lack of quantitative analyses.

The experiments are inadequately documented, and the majority of the results rely on subjective descriptions of visual and microscopic observations. Many of the reported changes appear to be

estimated rather than quantitatively measured. The only analytical method applied was semiquantitative elemental mapping using SEM-EDS.

The study lacks several relatively simple analyses that would substantially improve its scientific robustness. For example, brine chemistry and basic physicochemical parameters (such as pH, ORP, conductivity, and oxygen concentration) should have been measured after autoclaving and at multiple time points during incubation. At a minimum, pH and oxygen concentration should have been monitored, yet this was not done.

Similarly, the microbial community structure was not analyzed. Cell counts and fluorescence-based chlorophyll detection are insufficient to characterize the communities involved. Sequencing of the 16S/18S rRNA genes is a relatively inexpensive and routine approach that would greatly strengthen the study, especially if performed at multiple time points during incubations.

The manuscript could also be improved by applying even simpler and low-cost methods. For instance, the authors state that biofilms protect gypsum crystals from dissolution, yet the crystal surfaces beneath the biofilms were not examined. Given that only ten manually selected crystals were used per microcosm, it would have been straightforward to thoroughly document each crystal by photography and measurement before and after incubation. In the presence of biofilms, crystals should be examined before and after gentle biofilm removal. Ideally, biofilm removal could be conducted in multiple steps with increasing invasiveness, each followed by microscopic examination of the crystal surface. Even the development and validation of this methodology would support the novelty and overall scientific value of the manuscript.

Most importantly, the results of all analyses should be processed quantitatively. Observed changes (e.g., increases or decreases in the number of etching pits) must be statistically evaluated. Qualitative statements such as a treatment “giving the impression of increased dissolution” compared to another treatment are insufficient for a scientific study.

In summary, due to the lack of novelty, insufficient experimental documentation, and absence of quantitative and statistical analyses, the manuscript in its current form does not meet the standards required for publication as a scientific study.

Declarations

Potential competing interests: No potential competing interests to declare.

