

Deciphering Mineral-Microbe Interactions in Rann of Kutch (India) for Insights on Astrobiology

Kanak Sharma^{1,2*}, Anand Giri¹, Harshad V. Kulkarni¹

¹School of Civil and Environmental Engineering, Indian Institute of Technology Mandi, Himachal Pradesh, India, 175005.

²Mumbai University, Mumbai, Maharashtra, India, 400032.

*Corresponding author

ABSTRACT

The Rann of Kutch in India is a semi-arid and seasonal salty marsh, estimated to have formed ~ 10,000 years before present as the Arabian sea receded. Today, this semi-arid and hypersaline site can be seen as one of the promising astrobiology analog sites on the Indian subcontinent. The average temperature reaches to 50°C during summers while it can drop below freezing point during winters in this typical tropical savanna and semi-arid region. Therefore, the Rann of Kutch would provide valuable information about the microbial life in the extreme environments. To elucidate the interrelationships between minerals-water-microbes at this site, we collected samples of salt nodules, sediments and surface waters from the selected locations in the Rann of Kutch, Gujrat, India. The mineral samples were collected using sterile techniques at a depth of 5 cm below the surface. Water samples were filtered and analyzed for pH, specific conductance, cations, anions, heavy metals and dissolved organic matter. The mineral samples were characterized for their mineralogical identification using X-ray diffraction, elemental composition using X-ray fluorescence spectroscopy as well as bulk digestion followed by ICP-MS analysis. Preliminary results indicated that the average pH of water samples was 6.94 ± 0.04 , the specific conductance was 66 ± 4 mS/cm (~ 32 ± 1.4 per thousand total dissolved solids), indicating near-neutral and hypersaline aqueous chemistry. The XRD spectra of mineral samples revealed the presence of halite, vaterite (a CaCO_3 polymorph), and some silicate minerals. Further analysis is currently underway to determine the minor mineral phases and presence of biosignature trace elements. Ongoing work includes estimation of bacterial diversity using genomic DNA extraction kit followed by PCR and 16s rRNA sequencing. The findings of these study will help in establishing a relationship between minerals and microbes in arid and hypersaline environments on Earth as well as beyond.

Keywords: Salt-nodules, Sediments, Surface water, Mineral analysis, Mineral-microbe relation

How to Cite

Kanak Sharma, Anand Giri, Harshad V. Kulkarni, "Deciphering Mineral-Microbe Interactions in Rann of Kutch (India) for Insights on Astrobiology", *AIJR Abstracts*, p. 57, Mar. 2025.



©2025 Copyright held by the author(s). Published by AIJR Publisher in "Abstracts of International Conference on Current Perspectives on Extremophiles and Their Biomolecules" (CUPEB 2025), 24-26 March 2025. Organized by Sarojini Naidu Government Girls PG (Autonomous) College, Bhopal-462012 (MP), India.

DOI: 10.21467/abstracts.177

ISBN: 978-81-984081-3-6 (eBook), 978-81-984081-9-8 (Paperback)