Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.33945

Nutrient Cycling potential of Bacteria from the Himalayan Wular Lake soil core.

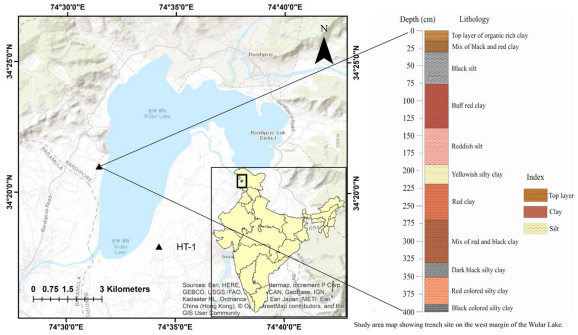
MUKHTAR HASAN AHMAD[1], LOHITHA A[2], SHAMS TABREZ KHAN[2], SHAIK A. RASHID[1] AND JAVID AHMAD GANAI[3]

[1]Department of Geology, Aligarh Muslim University, Aligarh, India
[2]Department of Agriculture Microbiology , Aligarh Muslim University, Aligarh, India
[3]Department of Earth Sciences, University of Kashmir, Srinagar, India.

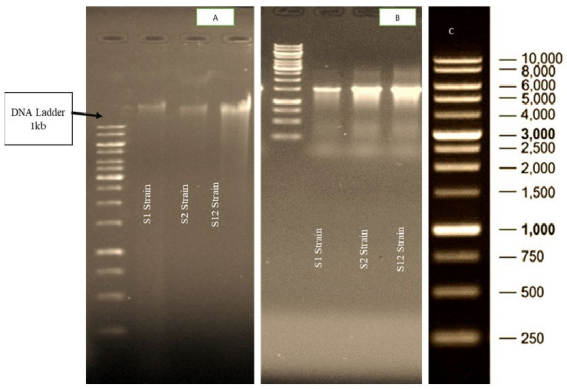
The aerobic culturable bacterial community in a sediment core from the margin of Wular Lake in the Himalayas was investigated for strains potentially involved in nutrient cycling processes. A total of 18 bacterial isolates were obtained, predominantly from the upper sections of the core (depth range: 15–200 cm). These isolates were screened for halotolerance to assess their capacity to withstand saline stress, analogous to conditions in marine environments. Notably, several strains exhibited multifunctional traits, including solubilization of insoluble phosphate, and atmospheric nitrogen fixation. These isolates demonstrated robust salt tolerance, with some growing in media containing up to 12% NaCl. These functional capabilities suggest that the isolated bacteria contribute to mineral nutrient cycling in the lake margin sediments and possess adaptations suited to saline or fluctuating salinity conditions.

Among the identified strains, one can be classified as *Fictibacillus sp*. based on 16S rRNA gene sequencing. Members of this genus have been isolated from diverse habitats, including marine sediments (e.g., *Fictibacillus marinisediminis* from Korean marine sediment), highlighting halotolerant and marine-associated lineages. Another was identified as *Exiguobacterium sp*. While the genus is commonly found in terrestrial soils, freshwater, and extreme environments (including Himalayan glaciers and ice), certain species are well documented from marine settings, such as seawater and sediments. A third strain belonged to *Massilia sp*., a genus frequently reported from cold environments (e.g., Antarctic microbial mats, glacial ice cores) and occasionally marine-influenced niches. The presence of these genera some with documented marine or halotolerant representatives in Himalayan Lake margin sediments is intriguing. It aligns with the geological history of the region: according to established plate tectonic models, the Himalayan orogeny resulted from the closure of the Tethys Ocean.

This raises the possibility that these bacterial lineages represent evolutionary descendants of ancient marine microbial communities that persisted and adapted to post-Tethyan terrestrial/freshwater conditions over geological timescales, particularly in high-altitude, variable environments like the Himalaya. However, these preliminary observations are correlative and require further validation through comprehensive phylogenetic analyses, metagenomic studies, comparative genomics with marine isolates, and palaeoecological investigations to confirm any direct ancestral links or adaptation mechanisms.



Study area map showing trench site on the west margin of the Wular Lake.



(A) Agarose gel electrophoresis of genomic DNA obtained from isolate S1,S2 and S12 bacterial strains (B) Partial 16S rRNA gene product obtained through Polymerase chain reaction as resolved on 1.0% agarose gel (C) DNA Ladder