Biodiversity of indigenous Qatari bacteria, responsible of mineral formation in Qatari sabkhas and soil stabilization by Microbially Induced Carbonate Precipitation

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**BACKGROUND**

Dohat Faishaikh Sabkha in Qatar is mainly considered to be a very significant and rare environment, where mineral precipitation is found. It is known to continuously form calcium magnesium carbonate mineral. Formation of minerals by the involvement of living organisms is known as biomineralization. In this work the bacterial strains are isolated and tested for mineral formation. Along with identification and differentiation by MALDI-TOF MS technique. Therefore, this research demonstrated the indigenous bacteria in Qatari soil that can biomineralize, and thus can be helpful in the future to enhance soil through stabilization process.

**OBJECTIVES**

Here, we intend to:

- Isolate bacteria from Living Mats using Enrichment cultures.
- Investigate the potentialities of the isolates from Dohat Faishaikh sabkha to produce minerals.
- Identify isolates by MALDI-TOF MS
- Differentiate the isolated strains according to their protein profiles.

**RESULTS & DISCUSSION**

The isolated pure bacteria were found to exhibit optimal growth on liquid D-1 medium (35 g/L NaCl) as opposed to LB medium, emphasizing that they are halophilic aerobes. Then, testing for their abilities to form minerals was demonstrated. **Figure 1:** Examples of crystals formed in pure cultures of *Vibrio alginolyticus* as observed by light microscopy (20X) and SEM-EDS.

Among the 8 strains chosen, two were identified with matching species from the MALDI database; isolate number (3) having the code L4-1-1 has been identified as *Micrococcus luteus* with a relatively high score of 2.401, and isolate number (10) having the code L1-3-1 has been identified as *Vibrio alginolyticus* with a score of 2.052. After identification, differentiation of the strains was the second step for further subspecies level classification.

**SIGNIFICANCE**

A collection of isolates from Qatari Sabkhas was studied. They were isolated, purified, identified, and differentiated by MALDI-TOF MS. Their potential to form biominerals was studied. This research demonstrated the occurrence and diversity of bacteria found in Qatari soils, that are specifically unique in adapting to harsh conditions.

**METHODOLOGY**

1- Samples were taken from sabkha mats previously collected from Khor Al Adai. In addition a new mat was collected from Dohat Faishaikh. At sterilized conditions the mats were stored at -20 °C for 2 days, then sectioned into 6 layers using sterile blades.

2- The subsamples of both the old and the new mats were enriched in liquid D1 media composed 10g yeast, 5g peptone, 1g glucose, 8g magnesium acetate, 1g calcium acetate, 75g sodium chloride per litre for 4 days.

3- The ability of isolated strains to mediate carbonate precipitation was examined using the prepared solid medium D-1 (35, 75, & 100 g/L NaCl) and LB media. The petri dishes were observed under a light microscope at 20X magnification regularly to check for any precipitation.

4- Scanning Electron Microscopy-Energy Dispersive X-ray Spectroscopy (SEM-EDS) was used to investigate the composition and structure of the precipitated carbonate at different concentrations.

5- The ethanolic/formic acid extraction procedure was followed to extract proteins for MALDI-TOF MS and the identification was carried out by the Bruker Biotyper software by comparison of spectra within database. Identification and differentiation was done according to the m/z peaks of the corresponding protein profiles of every isolated strain.

**REFERENCES**


**POST-PROJECT PLANS**

Future projects can focus on enhancing soil stabilization on larger scales by using indigenous bacteria from Qatari soil in order to withstand soil erosion caused by winds.

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