

# Biodeteriogenic Potential of Bacteria and Fungi Isolated from Deteriorated Areas of Masjed-e Jāmé of Isfahan, UNESCO Cultural Heritage

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## Abstract

The *Masjed-e Jāmé* of Isfahan is one of the largest historic mosques in the Islamic world. It was listed as a World Heritage Site by UNESCO. Due to the arid climate of the region, the building is quite well preserved and presents only localized patterns of alteration. However, due to the risk of biodeteriogenic microorganisms which could be present on these valuable surfaces, this study aimed to isolate the microorganisms associated with the specific deteriorated areas of this monument and determine their deteriorative mechanism. Samples were taken from the deteriorated areas in order to isolate bacteria and fungi. These were tested for their potential to induce biodeterioration *via* CaCO<sub>3</sub> dissolution, pH alteration, and pigment and mineral production. Results revealed that ubiquitous species such as *Penicillium spp.* and *Bacillus spp.* were the most abundant microorganisms isolated from the samples, some of which were able to release organic acids and induce CaCO<sub>3</sub> dissolution. Very often, the isolated fungi showed a combined biodeteriogenic activity due to solubilization and precipitation of CaCO<sub>3</sub>. Rarely was CaCO<sub>3</sub> solubilization combined with pigment release. These findings are a first step toward providing helpful information to assess the biodeteriogenic potential of colonizing microorganisms and planning a preventive method for the conservation of this monument which has never been studied in terms of biodeterioration risk.

**Keywords:** Microorganism, Biodeteriogenic impact, Microbial diversity, Brick, Tile, Gypsum