EXPLORATION OF POTENTIAL UREOLYTIC BACTERIA FROM NGALAU TARANG SPELEOTHEM, AGAM, WEST SUMATERA

UNDERGRADUATE THESIS

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PADANG, 2025

ABSTRAK

Bakteri ureolitik memiliki peran penting dalam proses biomineralisasi melalui aktivitas enzim urease yang mampu menghidrolisis urea menjadi amonia dan karbonat, sehingga memungkinkan terjadinya presipitasi kalsium karbonat ($CaCO_3$). Penelitian ini bertujuan untuk mengisolasi dan mengkarakterisasi bakteri ureolitik dari speleothem Gua Ngalau Tarang, Agam, Sumatera Barat, serta menguji potensinya dalam menghasilkan presipitasi $CaCO_3$. Isolasi dilakukan menggunakan media selektif B-4 agar, diikuti dengan uji aktivitas urease secara kualitatif dan pengujian presipitasi $CaCO_3$ secara kuantitatif. Dari total 15 isolat yang diperoleh (5 dari stalaktit, 4 dari stalagmit, dan 6 dari flowstone), hanya tiga isolat (STC 4, STG 3, dan FLS 4) yang menunjukkan aktivitas urease positif. Di antara ketiganya, isolat STC 4 menghasilkan presipitat $CaCO_3$ tertinggi sebesar 0,47 gram. Hasil karakterisasi menunjukkan mayoritas isolat berbentuk batang, Gram negatif, dan memiliki morfologi koloni yang beragam. Temuan ini menunjukkan bahwa lingkungan speleotem gua berpotensi menjadi sumber bakteri ureolitik yang aplikatif dalam bidang bioteknologi, khususnya untuk biokonsolidasi dan biocementation.

Kata Kunci : isolasi, bakteri ureolitik, speleothem, enzim urease, presipitasi kalsium karbonat, biomineralisasi.

ABSTRACT

Ureolytic bacteria play a significant role in biomineralization through the activity of urease enzyme, which hydrolyzes urea into ammonia and carbonate, enabling calcium carbonate ($CaCO_3$) precipitation. This study aimed to isolate and characterize ureolytic bacteria from speleothems of Ngalau Tarang Cave, Agam, West Sumatera, and to evaluate their potential in $CaCO_3$ precipitation. Isolation was performed using selective B-4 agar medium, followed by qualitative urease activity testing and quantitative $CaCO_3$ precipitation assay. A total of 15 isolates were obtained (5 from stalactites, 4 from stalagmites, and 6 from flowstones), of which only three isolates (STC 4, STG 3, and FLS 4) exhibited positive urease activity. Among them, isolate STC 4 produced the highest $CaCO_3$ precipitate of 0.47 grams. Characterization results revealed that most isolates were rod-shaped, Gram-negative, and exhibited diverse colony morphologies. These findings suggest that cave speleothems serve as promising habitats for ureolytic bacteria with potential applications in biotechnology, particularly in bioconsolidation and biocementation processes.

Keywoards : isolation, ureolytic bacteria, speleothem, urease enzyme, calcium carbonate precipitation, biomineralization